TPP, RCEP, and Japan's Agricultural Policy Reforms*

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Abstract

In this paper we compare welfare effects and the extent of sectoral adjustments under the proposed Trans-Pacific Partnership (TPP) agreement and the Regional Comprehensive Economic Partnership (RCEP) accords using a dynamic computable general equilibrium (CGE) model from the perspective of Japan. The ambitious goals of both organizations, as well as overlapping membership, make comparisons of different scenarios particularly intriguing. Another objective of this paper is to examine the effects of Japan's agricultural policy reforms on its agricultural output. If agricultural reforms, such as phasing out *gentan* and consolidation of agricultural land, lead to an improvement in productivity of agricultural sectors, then the extent of output contraction of agricultural and processed food sectors in Japan would be reduced significantly except for dairy products. This suggests the importance of carrying out agricultural reforms in Japan for region-wide trade accords.

Keywords: TPP, RCEP, CGE model, Japan, agricultural policy reform

JEL Classification Codes: F15, F17

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1. Introduction

In response to slow progress in the Doha Round, Asian countries have accelerated bilateral and regional trade initiatives. While global free trade is the ultimate goal, many countries strive not to be left out of the recent wave of free-trade agreements (FTAs). Negotiations for two major FTAs in the region – Trans-Pacific Partnership (TPP) and Regional Comprehensive Economic Partnership (RCEP) – are in progress. Japan joined the Trans-Pacific Partnership (TPP) negotiations in July 2013 as the 12th member, and Korea has decided to join TPP negotiations and has started engaging in consultations with the TPP members. RCEP was launched in November 2012 and negotiations among 10 ASEAN countries and their six FTA partners started in May 2013. Both TPP and RCEP are open to new members, and some other Asian countries are expected to join TPP in the relatively near future. Over the longer term, there is a strong possibility that enlarged TPP and/or enlarged RCEP will lead to the creation of a Free Trade Area of the Asia-Pacific (FTAAP).

Using a global dynamic computable general equilibrium (CGE) model, we evaluate the welfare and sectoral output effects of Asian-track and three TPP-track scenarios. In Scenario 1 (Asian-track), an RCEP agreement is presumed to be implemented over the 2017-2025 period and FTAAP over the 2023-2030 period. In Scenario 2-A (TPP-track A), we assume that the 12 countries that are currently negotiating a TPP agreement plus Korea (TPP-13) will implement a trade accord over the period 2015-22.[1] Three additional countries – Indonesia, the Philippines and Thailand – are assumed to join the TPP in 2018 and complete preferential liberalization with the TPP-13 countries by 2025. Finally, it is hypothesized that FTAAP is implemented during 2023-2030 as in Scenario 1. Scenario 2-B (TPP-track B) adds an additional assumption that productivity of Japan's agricultural sectors increases by 1% per annum starting in 2016, resulting from its policy reforms. In Scenarios 1, 2-A and 2-B, we assume that rice is excluded from trade liberalization in RCEP, TPP and FTAAP. In Scenario 2-C (TPP-track C), we assume that tariffs on rice are

[1] Although the twelve negotiating countries are likely to sign a TPP agreement first, Korea is expected to be approved as a new member in a relatively short period thereafter.

cut by 50% in FTAAP over the implementation period to examine the sensitivity of the tariff cut on the rice sector in Japan.

A number of studies have quantified the effects of various FTAs in the Asia-Pacific region using a CGE model (e.g., Itakura and Lee, 2012; Kawai and Wignaraja, 2009; Lee et al., 2009; Li and Whalley, 2012; Petri, Plummer and Zhai, 2012ab). While Petri et al.'s (2012b) study was the first to examine the effects of Asian-track and Trans-Pacific-track, RCEP had not been launched at the time of their writing. As a result, the Asian-track of a China-Japan-Korea FTA, followed by ASEAN+3 FTA (EAFTA) and FTAAP in their study is no longer realistic. One of our aims is to construct FTA sequences that are reasonable estimates of the future sequences of region-wide FTAs in the Asia-Pacific.

Another goal of this paper is to show that agricultural policy reforms in Japan would be indispensable to avoid sharp reductions in output of many agricultural and food products resulting from region-wide FTAs. We will not know whether any agricultural products will be exempted from tariff liberalization until an agreement is reached. However, we assume that rice will be excluded in three of the four policy scenarios because Japan is unlikely to join TPP without an exclusion of rice.[2]

An overview of the model and data is given in the next section, followed by descriptions of the baseline and policy scenarios in section 3. In section 4 assessments of welfare and sectoral output effects under each policy scenario are offered. Concluding remarks are provided in the final section.

2. Analytical Framework and Data

2.1 Overview of the Dynamic GTAP Model

The numerical simulations undertaken for this study are derived from the dynamic GTAP model, described in detail by Ianchovichina and McDougall (2001) and Ianchovichina and Walmsley (2012). This model extends the comparative static framework of the standard GTAP model developed by Hertel (1997) to the dynamic framework by

[2] During the US-Japan bilateral negotiations in April 2014, the two sides made important progress over access to Japan's agriculture market, but there was still a considerable gap before the US and Japan could reach an agreement on the TPP at the time of writing.

incorporating international capital mobility and capital accumulation. The dynamic GTAP model allows international capital mobility and capital accumulation, while it preserves all the features of the standard GTAP, such as constant returns to production technology, perfectly competitive markets, and product differentiation by countries of origin, in keeping with the so-called Armington assumption.[3] At the same time, it enhances the investment theory by incorporating international capital mobility and ownership. In this way it captures important FTA effects on investment and wealth that are missed by a static model.

In the dynamic GTAP model, each of the regions is endowed with fixed physical capital stock owned by domestic firms. The physical capital is accumulated over time with new investment. This dynamics are driven by net investment, which is sourced from regional households' savings. The savings in one region are invested directly in domestic firms and indirectly in foreign firms, which are in turn reinvested in all regions. The dynamics arising from positive savings in one region is related to the dynamics from the net investment in other regions. Overall, at the global level, it must hold that all the savings across regions are completely invested in home and overseas markets.

In the short run, an equalization of the rates of return seems unrealistic, and there exist well-known empirical observations for "home bias" in savings and investment. These observations suggest that capital is not perfectly mobile, causing some divergence in the rates of return across regions. The dynamic GTAP model allows inter-regional differences in the rates of return in the short run, which will be eventually equalized in the very long run. It is assumed that differences in the rates of return are attributed to the errors in investors' expectations about the future rates of return. During the process, these errors are gradually adjusted to the actual rate of return as time elapses, and eventually they are eliminated and a unified rate of return across regions can be attained. Income accruing from the ownership of the foreign and domestic assets can then be appropriately incorporated into total regional income.

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[3] See Armington (1969). The model uses a nested CES structure, where at the top nested level, each agent chooses to allocate aggregate demand between domestically produced goods and an aggregate import bundle, while minimizing the overall cost of the aggregate demand bundle. At the second level, aggregate import demand is allocated across different trading partners, again using a CES specification, wherein the aggregate costs of imports are minimized.

Participating in an FTA could lead to more investment from abroad. Trade liberalization often makes prices of goods in a participating country lower due to removal of tariffs, creating an increase in demand for the goods. Responding to the increased demand, production of the goods expands in the member country. The expansion of production is attained by using more intermediate inputs, labor, capital, and other primary factor inputs. These increased demands for production inputs raise the corresponding prices, wage rates, and rental rates. Higher rental rates are translated into higher rates of return, attracting more investment from both home and foreign countries.

2.2 Data, aggregation, and initial tariffs

In this study we employ the GTAP database version 8.1, which has a 2007 base year and distinguishes 129 countries/regions and 57 sectors (Narayanan et al., 2012). For the purposes of the present study, the data has been aggregated to 22 countries/regions and 32 sectors, as shown in Table 1. Foreign income data are obtained from the International Monetary Fund (IMF)'s *Balance of Payments Statistics*, which are used to track international capital mobility and foreign wealth. The values of key parameters, such as demand, supply and CES substitution elasticities, are based upon previous empirical estimates. The model calibration primarily consists of calculating share and shift parameters to fit the model specifications to the observed data, so as to be able to reproduce a solution for the base year.

The sectoral tariff rates for the 22 countries/regions in 2007 are summarized in Table 2. There are striking differences in the tariff structures across the countries/regions. Singapore is duty free with the exception of alcohol and tobacco. The exceptionally high tariff rate on rice in Japan stands out. The tariff rates in a number of other agricultural and food products in Japan are also high, as well as in Korea and India. With the exception of Australia, New Zealand and Chile, the tariff rates on some agricultural and food products are also relatively high in other regions, such as sugar in the United States, Russia and the EU, dairy products and meats in Canada, and rice in the Philippines. In manufacturing the tariff rates on textiles and apparel are relatively high in all regions except China, Singapore, Chile and the EU. The tariff rate on motor vehicles exceeds 20% in Thailand, Vietnam and India.

Ad valorem tariff equivalents of nontariff barriers (NTBs) in nine services sectors are computed as weighted averages of the gravity-model estimates of Wang et al. (2009) and the values employed by the Michigan Model of World Production and Trade (e.g. Brown, Kiyota and Stern, 2010). There are even greater variations in tariff equivalents of NTBs in services than in commodities.

3. The Baseline and Policy Scenarios

3.1 The Baseline Scenario

In order to evaluate the effects of region-wide FTAs in the Asia-Pacific, the baseline scenario is first established, showing the path of each of the 22 economies/regions over the period 2007-2030. The baseline contains information on macroeconomic variables as well as expected policy changes. The macroeconomic variables in the baseline include projections for real GDP, gross investment, capital stocks, population, skilled and unskilled labor, and total labor. Real GDP projections were obtained from IMF's *World Economic Outlook Database*. The data on gross fixed capital formation were acquired from the IMF's *IFS Online*. Projections for population were taken from the U.S. Census Bureau's *International Data Base*, while those for labor were obtained from International Labor Organisation (ILO)'s *Economically Active Population Estimates and Populations*.

The projections for population, investment, skilled labor and unskilled labor obtained for over 150 countries were aggregated, and the growth rates were calculated to obtain the macroeconomic shocks describing the baseline. Changes in the capital stocks were not imposed exogenously, but were determined endogenously as the accumulation of projected investment. Any changes in real GDP not explained by the changes in endowments are attributed to technological change.

In addition, policy projections are also introduced into the baseline. The policies included in the baseline are those which are already agreed upon and legally binding, including the ASEAN Free Trade Area (AFTA), the ASEAN-China, ASEAN-Korea, ASEAN-Japan, ASEAN-Australia-New Zealand, ASEAN-India, EU-Korea, and Korea-US FTAs. It is assumed that tariffs are cut by 80% among the member countries of the FTAs

that are being implemented. Rice is excluded from tariff liberalization in FTAs that include Japan or Korea as a member country.

3.2 Policy Scenarios

Welfare and sectoral output effects of region-wide FTAs and their implications for Japan and Emerging Asia are to be evaluated in this study. The following four scenarios are designed and summarized in Table 3.

***Scenario 1** (Asian-track)*: RCEP over the period 2017-2025 and FTAAP from 2023-2030. Rice is excluded from tariff liberalization.

***Scenario 2-A** (TPP-track A)*: TPP-13 over the period 2015-2022, TPP-16 from 2018-2025, and FTAAP from 2023-2030. Rice is excluded.

***Scenario 2-B** (TPP-track B)*: Same as Scenario 2-A, except that efficiency on overall output for Japan's agricultural sectors is assumed to increase by 1% per annum from 2016.

***Scenario 2-C** (TPP-track C)*: Same as Scenario 2-B, except that tariffs on rice are cut by 50% in FTAAP over the implementation period.

It is assumed that tariff rates on commodities (except rice where noted) decline linearly to zero and tariff equivalents of NTBs in services are reduced by 20 percent during the periods in consideration among the member countries. In addition, time cost of trade – e.g. shipping delays arising from regulatory procedures and inadequate infrastructure – is assumed to fall by 20 percent among them.[4]

Petri, Plummer and Zhai (2012b) also compare Asian-track and TPP-track FTAs. There are, however, three notable differences between their scenarios and ours. First, we allow FTAAP to start before the full implementation of RCEP or TPP. Since both of these region-wide FTAs are open to new members, there is a relatively strong possibility that they would include all the APEC members before they are fully implemented. Second, while Petri et al. (2012b) assume that a China-Japan-Korea (CJK) FTA is implemented first in the Asian-track, we assume that an RCEP agreement would be reached roughly at the same time as a CJK FTA. This is because there are high political tensions, including

[4] For a detailed analysis of time cost of trade, see Minor and Hummels (2011).

territorial disputes, between China and Japan, as well as between Japan and Korea. Such disputes and tensions represent an additional barrier that must be surmounted in negotiations aiming to fashion an FTA. Third, mainly because RCEP negotiations started more than three years after the first round of TPP negotiations in Melbourne, we assume that it takes a few years longer for RCEP to reach an agreement than TPP.

Three caveats should be borne in mind when interpreting the results presented in the next section. First, investment liberalization among the member countries is not considered because it requires data on foreign direct investment (FDI) flows by source and host countries and industry, which are unavailable. A challenging extension of the paper would be to endogenize FDI flows to consider attraction of these flows to developing member countries, which may have a significant impact, as were the cases for Mexico joining NAFTA in 1994 and Spain and Portugal joining the EU in 1986. Second, NTBs in manufacturing are not incorporated in this study due to a lack of reliable empirical estimates. NTBs also exist in a number of manufacturing sectors, including automobiles, pharmaceutical products, and some food products. In these products regulatory and other barriers, such as stringent standards and testing and certification procedures, exist. Thus, reductions of NTBs in manufacturing are expected to enlarge the benefits of the FTAs. Third, we do not incorporate compliance costs associated with rules of origin (ROOs), nor the cost-mitigating effects arising from consolidating FTAs. As smaller FTAs are consolidated, the harmful "noodle bowl" effects – caused by different FTAs having different ROOs and varying coverage – can be mitigated. The compliance cost eventually becomes zero when all countries participate in a trade agreement because there will be no ROOs under global trade liberalization (GTL). These issues are left for future research.

4. Empirical Findings

4.1 Welfare Effects

Economic welfare is largely determined by four factors: (1) allocative efficiency, (2) the terms of trade, (3) the contribution to equivalent variation (EV) of change in the price of capital investment goods, and (4) the contribution to EV of change in equity owned by a region. The fourth factor is determined by the change in equity income from

ownership of capital endowments, and it can be further decomposed into three parts: a change in the domestic capital stock, a change in household income earned on capital abroad, and a change in the domestic capital owned by foreigners.

With respect to these four factors, the direction of a welfare change may be summarized as follows. The allocative efficiency effect is generally positive for members of region-wide FTAs. This effect is particularly large for a country with high average initial tariffs. However, it may become negative when the extent of trade diversion is considerably large in FTAs with relatively low intraregional trade. The terms-of-trade effect is usually positive for the members with low average initial tariffs and negative for those with high initial tariffs. An increase in the price of capital investment goods generally raises welfare. A welfare change resulting from a change in the equity holdings is positive if the sum of the region's foreign income receipts and an increase in the domestic capital stock is greater than the foreign income payment, and vice versa.

The welfare results for the five policy scenarios, as percentage point deviations in equivalent variation from the baseline for the years 2020, 2025 and 2030, are summarized in Table 4. Under Scenario 1 (Asian-track), the welfare level of all RCEP countries increases in 2020-2030, whereas that of all APEC members increases in 2030. The welfare gains in 2025 for RCEP countries range from 1.2% (Japan) to 4.3% (Korea), while those in 2030 for the APEC members range from 0.1% (United States) to 4.9% (Korea). The economic welfare of several nonmember regions decreases slightly in 2020 and/or 2025. Taiwan is not a member of the RCEP grouping, and its welfare is predicted to fall by 0.5% in 2020 largely because the shares of its trade with ASEAN+6 countries is high (about 60% of its total trade) and the extent of trade diversion would be relatively large. Thus, it has a strong incentive to convince the other APEC members of the benefits of FTAAP, as its welfare is projected to increase by 4.5% in 2030 when FTAAP is assumed to be fully implemented.

In Scenario 2-A (TPP-track A), economic welfare of prospective TPP-16 countries increases during 2020-2030. The welfare gains in 2025 for TPP-16 countries range from 0.2% (United States) to 2.9% (Vietnam), whereas those in 2030 for the APEC members range from 0.2% (United States) to 4.7% (Korea). Eight East Asian economies, namely

Japan, Korea, Singapore, Indonesia, Malaysia, the Philippines, Thailand and Vietnam, are both RCEP and probable TPP-16 members. Other than Malaysia and the Philippines, these economies' welfare gains in 2025 are smaller under the TPP-track than under the Asian-track, which is mainly caused by substantially smaller trade with TPP-16 members than trade with RCEP members.[5] However, the differences in welfare gains between the two tracks are relatively small in 2030 and are sensitive to assumptions on the baseline scenario.[6]

In Scenario 2-B (TPP-track B), productivity of Japan's agricultural sectors is assumed to increase by one percent per annum starting in 2016, resulting from its policy reform. The Japanese government has approved a plan to phase out *gentan* – the system that has paid farmers to reduce rice crops since 1971 – by 2018. In addition, in December 2013 the Japanese Diet enacted a bill to consolidate small plots of agricultural land.[7] Under this law, prefectural governments will establish farmland banks. The banks will borrow pieces of farmland from small-scale part-time farmers or those who have stopped farming, and consolidate and lease them to large-scale farmers. Both phasing out *gentan* and consolidation of agricultural land are expected to improve productivity of agricultural sectors in Japan. Other prospective reforms include provisions of direct payments to full-time farmers, abolitions of subsidies to part-time farmers, lessening regulations on corporations to participate in agricultural production, and reforming the distribution system of agricultural inputs and final products. It remains to be seen to what extent the Japanese government would carry out agricultural policy reforms.

If the Japanese government is successful in accomplishing reforms and improving productivity of its agricultural sectors, then Japan's welfare gains in 2030 are projected to increase by 0.4 percentage point (from 1.6% to 2.0%) compared with the case of no reforms. Other countries' economic welfare is virtually unchanged. Considering that

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[5] Itakura and Lee (2012) find similar results.

[6] In the present study, tariffs are cut by 80% among the members of the FTAs included in the baseline scenario. Lee and Itakura (2013) show that more countries benefit from the TPP-track when tariffs are cut by 100% among the members of the FTAs included in the baseline.

[7] Honma (2010) states that agricultural land per farm in Japan is about 1/120 of that in the United States and between 1/45 and 1/20 of that in European countries.

agriculture accounted for only 1.1% of Japan's GDP in 2012, an increase of 0.4 percentage point in welfare is large. Lower prices of agricultural products would reduce intermediate input cost of processed food sectors and some services sectors.

In Scenarios 1, 2-A and 2-B, we assume that rice is excluded from tariff liberalization in RCEP, TPP and FTAAP. In Scenario 2-C (TPP-track C), we assume that tariffs on rice are cut by 50% (from 422% to 211%) in FTAAP over the implementation period to examine the sensitivity of the tariff cut on the rice sector in Japan. This would further increase Japan's welfare gain in 2030 by 0.1 percentage point (from 2.0% to 2.1%).

4.2 Sectoral Output Adjustments in Japan

Structural adjustments and resource reallocations result from trade accords. The FTA groupings and differences in the initial tariff rates across sectors and member countries play a critical role in determining the direction of the adjustments in sectoral output. Other factors that affect the magnitude and direction of output adjustments for each product category include the import-demand ratio, the export-output ratio, the share of each imported intermediate input in total costs, and the elasticity of substitution between domestic and imported products.[8]

Table 5 presents the sectoral output effects for Japan for the year 2030. The change in rice output is rather small under Scenarios 1, 2-A and 2-B because the tariff rate on this commodity is assumed to be fixed. Output of other grains, sugar, livestock, meats and dairy products contracts considerably under Scenarios 1 and 2-A, in which productivity in all sectors is fixed. When agricultural productivity in Japan is assumed to increase by 1% per annum in Scenario 2-B, the extent of contraction would be reduced significantly except for dairy products. In the meat sector output changes become positive, suggesting that

[8] A sector with a larger import-demand ratio generally suffers from proportionately larger output contraction through greater import penetration when initial tariff levels are relatively high. In contrast, a sector with a higher export-output ratio typically experiences a larger extent of output expansion, as a result of the removal of tariffs in the member countries. The share of imported intermediate inputs in the total cost of a downstream industry (e.g., the share of imported textiles in the cost of the apparel industry) would evidently affect the magnitude and direction of output adjustments in the latter sector. Finally, the greater the values of substitution elasticities between domestic and imported products, the greater the sensitivity of the import-domestic demand ratio to changes in the relative price of imports, thereby magnifying the effects of FTAs.

appropriate policy reforms would sufficiently strengthen the competitiveness of Japan's livestock and meat sectors.

Under both the Asian-track and the TPP-track, the manufacturing and services sectors in Japan generally increase with the exception of apparel, electronic equipment, other transport equipment and air transport. The contraction of the apparel sector results from the removal of relatively high tariffs and sharp increase in imports from China and a number of ASEAN countries. The reduction in output of electronic equipment in Japan under TPP, RCEP and FTAAP is also reported by Petri et al. (2014) and might result from fragmentation of production processes and substantial increase in imports of electronic parts and components from emerging Asia, particularly Indonesia, Thailand and Vietnam.[9] For similar reasons, output of other transport equipment contracts in Japan. Finally, the reduction in air transport appears to suggest that Japan's comparative advantage in sea transport and the resulting substitution from air transport to sea transport.

5. Conclusion

In this paper, we have used the dynamic GTAP model to investigate how region-wide FTAs in Asia might affect the welfare changes and sectoral output adjustments. The tariff rate on rice is assumed to be fixed in three of the four policy scenarios. A comparison of the Asian-track (RCEP followed by FTAAP) and the TPP-track (TPP-13 followed by enlarged TPP and FTAAP) suggest that more Asian countries are expected to realize larger welfare gains under the Asian-track. This is largely caused by the fact that most Asian countries have greater trade shares with RCEP countries than with prospective TPP-16 countries. However, the differences in welfare gains between the two tracks are relatively small in 2030 and are sensitive to assumptions on the baseline scenario.

[9] The sectoral output effects for countries/regions other than Japan are available upon request from the corresponding author. Kimura and Obashi (2010, 2011) show the increasing importance in machinery parts and components in intra-East Asian trade, particularly in electronic parts and components. In 2007, 17% of total intra-regional merchandise exports are accounted for by ICT-related parts and components in East Asia, whereas the corresponding figures are only 2-3% in Europe and the Americas (Kimura and Obashi, 2010, p. 10).

In the second TPP-track scenario, it is assumed that Japan's agricultural policy reforms would result in an increase in productivity of its agricultural sectors by 1% per annum. Under this scenario, Japan's overall welfare gains are expected to increase by 0.4 percentage point relative to the case where productivity is fixed. In the third TPP-track scenario, tariffs on rice are cut in half during the implementation of FTAAP. It is shown that this would further increase Japan's welfare gain in 2030 by 0.1 percentage point.

With respect to sectoral output adjustments, there appear to be no significant differences between the Asian-track and TPP-track for countries that are both members of RCEP and TPP-16. In Japan, output of many agricultural and processed food sectors contract, while that of manufacturing and services sectors expand with the exception of apparel, electronic equipment, other transport equipment and air transport. In many emerging Asian countries, output of textiles, apparel, machinery, electronic equipment and other transport equipment is projected to increase.

When Japan's agricultural productivity is assumed to increase by 1% per annum, the extent of output contraction of agricultural and processed food sectors in the country would be reduced significantly except for dairy products. Output changes in some of the products, such as meats and other crops, are predicted to become positive, indicating the beneficial effects of agricultural policy reforms in Japan. Finally, when tariffs on rice are cut in half in the third TPP-track scenario, rice output in Japan is projected to fall by 13%.

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Table 1: Regional and sectoral aggregation

A. Regional aggregation

	Country/region	Corresponding economies/regions in the GTAP 8 database
1	Japan	Japan
2	China	China, Hong Kong
3	Korea	Korea
4	Taiwan	Taiwan
5	Singapore	Singapore
6	Indonesia	Indonesia
7	Malaysia	Malaysia
8	Philippines	Philippines
9	Thailand	Thailand
10	Vietnam	Vietnam
11	Rest of ASEAN	Cambodia, Lao People's Democratic Republic, Myanmar, rest of Southeast Asia
12	India	India
13	Australia	Australia
14	New Zealand	New Zealand
15	United States	United States
16	Canada	Canada
17	Mexico	Mexico
18	Chile	Chile
19	Peru	Peru
20	Russia	Russian Federation
21	EU-28	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom
22	Rest of world	All the other economies/regions

Table 1 (continued)

B. Sectoral aggregation

	Sector	Corresponding commodities/sectors in the GTAP 8 database
1	Rice	Paddy rice, processed rice
2	Other grains	Wheat, cereal grains nec
3	Sugar	Sugar, sugar cane and sugar beet
4	Other crops	Vegetables and fruits, oil seeds, plant-based fibers, crops nec
5	Livestock	Cattle, sheep and goats, animal products nec, raw milk, wool
6	Fossil fuels	Coal, oil, gas
7	Natural resources	Forestry, fishing, minerals nec
8	Meats	Cattle, sheep, goat, and horse meat products, meat products nec
9	Dairy products	Dairy products
10	Other food products	Vegetable oils, food products nec, beverages and tobacco products
11	Textiles	Textiles
12	Apparel	Wearing apparel, leather products
13	Wood and paper	Wood products, paper products, publishing
14	Petroleum products	Petroleum, coal products
15	Chemical products	Chemical, rubber, plastic products
16	Steel	Iron and steel
17	Nonferrous metal	Nonferrous metal
18	Metal products	Fabricated metal products
19	Machinery	Machinery and equipment
20	Electronic equipment	Electronic equipment
21	Motor vehicles	Motor vehicles and parts
22	Other transport equip.	Transport equipment nec
23	Other manufactures	Mineral products nec, manufactures nec
24	Construction and utilities	Construction, electricity, gas manufacture and distribution, water
25	Trade	Trade
26	Sea transport	Sea transport
27	Air transport	Air transport
28	Other transport	Other transport
29	Communication	Communication
30	Financial services	Insurance, financial services nec
31	Other private services	Business services, recreation and other services
32	Government services	Public administration and defense, education, health services

Source: GTAP database, version 8.1.

Note: nec = not elsewhere classified.

Table 2: Tariff rates on merchandise imports and tariff equivalents of nontariff barriers on services, 2004 (%)

	Sector	Japan	China	Korea	Taiwan	Singapore	Indonesia	Malaysia	Philippines	Thailand	Vietnam	Rest of ASEAN
1	Rice	421.7	1.4	4.7	0.2	0.0	8.6	39.7	49.9	5.8	13.5	2.6
2	Other grains	27.4	1.7	5.2	2.9	0.0	2.6	0.0	5.1	2.5	4.2	1.5
3	Sugar	39.4	0.1	3.6	10.4	0.0	20.4	0.0	21.7	12.1	16.5	6.2
4	Other crops	4.6	2.8	51.2	8.2	0.0	2.2	10.6	6.7	13.1	13.0	8.0
5	Livestock	5.7	15.7	6.5	5.2	0.0	3.0	0.1	5.9	4.7	1.3	3.3
6	Fossil fuels	0.0	0.1	2.7	1.0	0.0	0.0	2.2	3.0	0.0	1.1	1.1
7	Natural resources	0.2	0.3	1.1	1.5	0.0	1.0	0.2	2.9	1.5	2.1	2.9
8	Meats	24.1	4.7	29.3	16.3	0.0	3.6	0.3	15.8	15.5	18.8	4.7
9	Dairy products	53.3	6.4	45.0	11.2	0.0	4.3	0.8	1.8	9.1	17.3	7.1
10	Other food products	9.9	4.7	30.6	14.3	0.6	7.0	10.6	5.6	14.6	16.3	10.9
11	Textiles	6.3	5.3	8.4	7.6	0.0	7.5	7.1	7.2	6.6	28.8	7.7
12	Apparel	9.6	4.0	8.9	8.1	0.0	7.5	7.9	9.1	20.2	19.1	11.6
13	Wood and paper	1.0	1.7	1.9	0.9	0.0	3.1	4.6	5.0	5.8	7.8	5.3
14	Petroleum products	0.3	4.5	4.4	2.6	0.0	0.7	0.4	2.4	9.2	14.7	8.4
15	Chemical products	1.0	6.1	4.8	3.0	0.0	3.7	3.8	4.0	7.0	4.5	3.8
16	Steel	0.9	3.9	0.3	0.4	0.0	4.1	17.4	2.9	4.1	3.9	2.2
17	Nonferrous metal	0.4	2.8	2.4	1.0	0.0	2.8	3.4	2.0	1.5	0.9	3.6
18	Metal products	0.4	8.2	5.3	6.1	0.0	6.0	8.4	6.5	11.2	10.9	4.1
19	Machinery	0.1	6.1	5.3	3.1	0.0	2.7	2.2	2.4	5.1	4.4	4.5
20	Electronic equipment	0.0	1.2	1.2	1.9	0.0	0.6	0.1	0.5	1.5	4.7	6.2
21	Motor vehicles	0.0	14.6	7.2	12.1	0.0	11.9	14.0	11.6	23.6	23.2	19.1
22	Other transport equip.	0.0	2.8	1.2	3.9	0.0	1.8	2.0	3.9	3.8	12.2	7.2
23	Other manufactures	0.6	6.0	6.0	5.0	0.0	6.5	6.7	5.3	8.7	15.8	6.0
24	Construction and utilities	5.0	25.2	13.0	10.8	0.0	64.4	17.4	52.6	44.9	53.7	20.6
25	Trade	22.7	109.6	33.0	28.8	1.3	98.5	36.0	80.2	63.5	82.7	32.5
26	Sea transport	7.6	21.5	15.7	12.6	1.3	67.3	17.6	53.5	40.5	54.4	6.4
27	Air transport	19.5	61.5	29.4	25.4	1.3	91.9	32.1	74.6	58.7	76.7	28.4
28	Other transport	20.2	74.3	30.2	26.1	1.3	93.4	33.0	75.8	59.7	78.0	14.9
29	Communication	17.8	48.1	27.4	23.6	1.3	88.4	30.0	71.5	56.1	73.5	32.8
30	Financial services	17.1	83.3	30.4	27.5	1.5	92.5	30.2	72.6	58.1	74.7	20.0
31	Other private services	16.6	81.2	29.2	26.7	1.5	91.1	29.8	70.8	54.9	73.7	7.3
32	Government services	25.9	84.1	34.3	29.1	2.8	97.8	36.5	76.9	61.5	84.2	24.1

Table 2 (continued)

	Sector	India	Australia	New Zealand	United States	Canada	Mexico	Chile	Peru	Russia	EU-27	Rest of world
1	Rice	39.0	0.0	0.0	1.9	0.0	0.2	5.8	17.7	9.3	8.9	15.9
2	Other grains	98.9	0.0	0.0	0.0	0.0	12.2	0.5	8.0	2.4	1.3	9.9
3	Sugar	91.7	0.0	0.0	24.2	0.4	5.1	2.6	2.5	50.1	25.7	15.0
4	Other crops	34.1	0.4	0.0	2.1	0.2	1.3	1.1	8.0	5.7	1.5	8.5
5	Livestock	11.9	0.1	0.0	0.3	16.3	0.5	0.3	6.7	4.3	0.4	3.8
6	Fossil fuels	11.1	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.1	0.0	1.3
7	Natural resources	9.6	0.1	0.0	0.1	0.0	1.6	0.1	6.9	2.6	0.1	1.5
8	Meats	21.7	0.2	0.8	2.4	31.0	0.7	3.4	10.8	23.8	5.1	19.8
9	Dairy products	31.9	2.1	1.3	15.0	146.0	6.1	0.9	16.3	7.4	1.4	14.0
10	Other food products	79.8	1.6	1.0	2.1	10.9	2.5	1.1	4.0	12.9	1.5	13.1
11	Textiles	15.9	9.1	6.0	7.0	6.5	4.6	3.3	13.5	12.4	2.1	9.6
12	Apparel	13.2	11.7	11.5	9.8	11.7	16.7	3.8	16.3	16.5	3.4	10.0
13	Wood and paper	13.5	3.0	1.3	0.2	0.6	1.6	0.9	5.8	11.3	0.1	5.4
14	Petroleum products	13.9	0.0	0.1	0.7	0.3	0.8	1.7	2.5	4.0	0.2	4.5
15	Chemical products	13.8	1.9	1.5	1.1	0.6	1.3	0.8	6.1	8.7	0.4	4.0
16	Steel	19.0	3.4	1.6	0.2	0.1	2.4	1.2	6.0	3.0	0.1	4.8
17	Nonferrous metal	14.9	0.6	0.9	0.6	0.0	0.6	0.8	4.4	3.9	0.4	1.3
18	Metal products	14.9	4.3	3.0	1.4	1.0	2.8	1.1	7.1	12.1	0.4	6.8
19	Machinery	14.0	2.3	2.5	0.7	0.4	2.8	0.8	5.4	4.4	0.4	4.9
20	Electronic equipment	2.4	0.9	0.9	0.3	0.2	1.4	0.6	5.1	6.0	0.7	3.6
21	Motor vehicles	24.7	12.4	7.2	0.6	1.0	3.5	3.1	7.2	10.6	0.9	9.7
22	Other transport equip.	6.5	0.8	0.6	0.4	0.7	1.6	0.2	8.9	9.3	0.7	4.7
23	Other manufactures	14.7	2.8	2.6	1.2	1.1	3.4	1.1	9.0	12.3	0.6	6.0
24	Construction and utilities	109.7	4.3	1.0	2.3	9.2	40.8	25.8	27.2	52.9	5.6	26.7
25	Trade	153.3	18.2	8.2	6.8	20.7	61.8	33.8	51.0	73.5	12.0	48.2
26	Sea transport	109.6	3.3	3.3	6.8	6.0	38.8	16.7	30.7	48.2	5.4	22.0
27	Air transport	144.1	15.1	5.7	6.8	17.6	56.9	30.2	46.7	68.1	11.1	49.5
28	Other transport	146.1	15.7	6.2	6.8	18.3	58.0	31.0	47.7	69.3	10.3	39.9
29	Communication	139.2	13.4	4.3	6.8	15.9	54.3	28.3	44.4	65.3	9.3	36.6
30	Financial services	139.5	13.5	4.3	7.8	19.8	57.6	27.5	46.4	65.9	8.7	43.3
31	Other private services	137.1	13.5	3.7	7.8	19.2	58.2	26.5	43.8	65.1	9.7	40.5
32	Government services	154.8	23.5	10.2	6.3	17.5	60.3	33.0	47.3	69.7	14.2	45.8

Sources: Sectors 1-23: GTAP database, version 8.1. Sectors 24-32: averages of the gravity-model estimates of Wang et al. (2009) and the values employed by the Michigan Model of World Production and Trade.

Table 3: Policy scenarios and assumptions

	2015-16	2017	2018-19	2020-22	2023-25	2026-2030
Scenario 1: Asian-track		RCEP (ASEAN+6 FTA) (2017-2025)				
					FTAAP (2023-2030)	
	Assumptions: 1) NTBs on services and logistic time in merchandise trade are cut by 20%. 2) Rice is excluded from trade liberalization.					
Scenario 2-A: TPP-track A	TPP-13 (2015-2022)					
			TPP-16 (2018-2025)			
					FTAAP (2023-2030)	
	Assumptions: 1) NTBs on services and logistic time in merchandise trade are cut by 20%. 2) Rice is excluded from trade liberalization.					
Scenario 2-B: TPP-track B	TPP-13 (2015-2022)					
			TPP-16 (2018-2025)			
					FTAAP (2023-2030)	
	Assumptions: 1) NTBs on services and logistic time in merchandise trade are cut by 20%. 2) Rice is excluded from trade liberalization. 3) Starting in 2016, efficiency on overall output (ao) for sectors 1-5 in Japan increases by 1% every year, resulting from Japan's agricultural policy reform.					
Scenario 2-C: TPP-track C	TPP-13 (2015-2022)					
			TPP-16 (2018-2025)			
					FTAAP (2023-2030)	
	Assumptions: 1) NTBs on services and logistic time in merchandise trade are cut by 20%. 2) Rice is excluded from trade liberalization in TPP-13 and TPP-16. Tariffs on rice are cut by 50% in FTAAP over the implementation period. 3) Starting in 2016, efficiency on overall output for sectors 1-5 in Japan increases by 1% per annum, resulting from Japan's agricultural policy reform.					

Note: RCEP: 10 ASEAN members plus China, Japan, Korea, India, Australia and New Zealand. TPP-13: Australia, Canada, Brunei, Chile, Japan, Korea, Malaysia, Mexico, New Zealand, Peru, Singapore, United States and Vietnam. TPP-16: TPP-13 plus Indonesia, the Philippines and Thailand.

Table 4: The welfare effects of region-wide FTAs
(Percentage deviations in utility from the baseline)

	Scenario 1 (Asian-track)			Scenario 2-A (TPP-track A)			Scenario 2-B (TPP-track B)			Scenario 2-C (TPP-track C)		
	2020	2025	2030	2020	2025	2030	2020	2025	2030	2020	2025	2030
Japan	0.4	1.2	1.5	0.5	1.1	1.6	0.7	1.3	2.0	0.7	1.4	2.1
China	0.6	1.4	1.6	-0.2	0.5	1.7	-0.2	0.5	1.7	-0.2	0.5	1.7
Korea	1.5	4.3	4.9	1.2	2.8	4.7	1.2	2.8	4.7	1.2	2.8	4.7
Taiwan	-0.5	0.3	4.5	-0.1	1.4	5.2	-0.1	1.4	5.3	-0.1	1.4	5.3
Singapore	0.7	2.2	2.0	0.9	1.8	1.7	0.9	1.8	1.7	0.9	1.8	1.7
Indonesia	0.6	1.9	2.2	0.4	1.5	1.8	0.4	1.5	1.8	0.4	1.5	1.8
Malaysia	0.3	1.4	1.9	0.8	1.5	1.9	0.8	1.5	1.9	0.8	1.5	1.9
Philippines	0.6	1.4	1.6	0.5	1.7	2.2	0.5	1.7	2.2	0.5	1.7	2.2
Thailand	1.0	2.5	2.3	0.5	2.4	2.5	0.5	2.3	2.4	0.5	2.3	2.4
Vietnam	1.2	3.6	4.4	2.1	2.9	3.6	2.0	2.8	3.6	2.0	2.9	3.6
Rest of ASEAN	0.6	2.2	2.9	-0.1	0.7	2.6	-0.1	0.7	2.6	-0.1	0.7	2.6
India	1.3	1.5	0.5	-0.1	-0.7	-1.6	-0.1	-0.7	-1.6	-0.1	-0.7	-1.6
Australia	0.8	3.0	3.5	0.3	0.6	0.9	0.3	0.6	0.9	0.3	0.6	0.9
New Zealand	0.3	0.8	1.4	0.7	1.5	1.6	0.7	1.5	1.6	0.7	1.5	1.6
United States	-0.1	-0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2
Canada	-0.1	0.3	1.1	0.6	0.8	1.0	0.6	0.8	1.0	0.6	0.8	1.0
Mexico	-0.1	0.4	1.2	0.8	1.3	1.3	0.8	1.3	1.3	0.8	1.3	1.3
Chile	0.0	0.4	1.4	0.7	1.5	1.2	0.7	1.5	1.1	0.7	1.5	1.1
Peru	0.0	0.2	0.5	0.1	0.3	0.5	0.1	0.3	0.5	0.1	0.3	0.5
Russia	-0.1	0.3	1.1	-0.1	0.3	0.9	-0.1	0.3	0.9	-0.1	0.3	0.9
EU-28	-0.1	-0.3	-0.6	0.0	-0.2	-0.6	0.0	-0.2	-0.6	0.0	-0.2	-0.6
Rest of world	-0.1	-0.1	0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	-0.1	-0.1	0.0

Definitions of scenarios:

Scenario 1 (Asian-track): RCEP over the period 2017-2025 and FTAAP from 2023-2030. Rice is excluded. Scenario 2-A (TPP-track A): TPP-13 over the period 2015-2022, TPP-16 from 2018-2025, and FTAAP from 2023-2030. Rice is excluded. Scenario 2-B (TPP-track B): Same as scenario 2-A, except that efficiency on overall output for Japan's agricultural sectors is assumed to increase by 1% per annum from 2016. Scenario 2-C (TPP-track C): Same as scenario 2-B, except that tariffs on rice are cut by 50% in FTAAP over the implementation period.

Source: Model simulations.

Table 5: Japan's sectoral output adjustments for the year 2030
(Percentage deviation from the baseline)

	Scenarios			
Sector	1	2-A	2-B	2-C
Rice	-0.3	-0.2	-2.0	-13.3
Other grains	-36.5	-37.0	-8.0	-7.5
Sugar	-6.5	-6.6	0.0	0.2
Other crops	-4.3	-4.3	1.3	0.9
Livestock	-13.6	-13.8	-0.2	-0.1
Fossil fuels	-2.0	-2.0	-2.3	-2.4
Natural resources	2.3	2.1	2.5	2.5
Meats	-14.1	-14.5	4.2	4.4
Dairy products	-34.0	-34.2	-27.6	-27.5
Other food products	0.4	0.6	1.7	1.9
Textiles	12.6	13.9	13.3	13.3
Apparel	-4.4	-4.1	-4.0	-4.0
Wood and paper	0.0	-0.2	-0.2	-0.2
Petroleum products	3.8	3.9	3.9	3.8
Chemical products	3.4	3.0	2.8	2.7
Steel	2.7	2.2	1.9	1.9
Nonferrous metal	4.0	5.4	5.1	5.1
Metal products	1.7	1.8	1.8	1.8
Machinery	0.9	0.1	-0.4	-0.4
Electronic equipment	-3.9	-4.0	-4.3	-4.3
Motor vehicles	4.4	3.3	2.9	2.9
Other transport equip.	-5.9	-6.8	-7.2	-7.2
Other manufactures	2.2	2.8	2.8	2.9
Construction and utilities	3.7	4.6	5.1	5.1
Trade	1.2	1.2	1.6	1.6
Sea transport	2.7	0.8	0.7	0.7
Air transport	-1.1	-1.8	-1.9	-1.9
Other transport	0.9	1.0	1.1	1.1
Communication	0.9	0.9	1.1	1.1
Financial services	0.5	0.4	0.6	0.6
Other private services	1.0	1.0	1.2	1.3
Government services	0.6	0.6	0.8	0.8

Source: Model simulations.