Winners and Losers from the Comprehensive and Progressive Agreement for Trans-Pacific Partnership

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Abstract

On 8 March 2018, eleven Asia-Pacific nations signed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), or TPP-11, without the United States. The objectives of this paper are to estimate economic welfare gains and losses from the CPTPP for member and nonmember countries, paying particular attention to the extent of losses to the United States of not participating in the pact, using a dynamic computable general equilibrium (CGE) model. Sectoral output effects are examined to identify winners and losers. Our results indicate that the United States will lose an opportunity to gain 0.7% in its economic welfare by 2034 when it never participates in the CPTPP, and that its welfare gain will be reduced by 0.3 percentage point when its participation in the CPTPP is delayed by five years. By 2034 member countries of mega-regional trade agreements (MRTAs) will realize an increase in economic welfare of 0.6-3.7% a year compared with the baseline.

At the sectoral level, U.S. agricultural producers and the processed food industry would be losers because their exports of grains, meat, dairy products and other agricultural and food products to TPP-11 countries, particularly to Japan, would be reduced. Eventually, the United States would observe that it is disadvantaged and might change its mind about joining the TPP. If the U.S. were a member of the TPP from the outset of its implementation, then only three sectors are estimated to contract. While output of textiles and apparel declines by 4.2-6.0% and that of steel decreases slightly, output of all agricultural and food products, a wide range of manufacturing products and most services is projected to expand.

JEL Classification: F13, F14, F15, F17

Keywords: CPTPP, MRTA, RCEP, FTAAP, CGE model

1. Introduction

Until the U.S. withdrawal from the Trans-Pacific Partnership (TPP) in January 2017, the Asia-Pacific region was moving toward consolidations of bilateral free trade agreements (FTAs). Combining smaller FTAs would enlarge the welfare gains from increased trade creation and mitigate the cost of different rules of origin associated with a large number of FTAs (e.g. Kawai and Wignaraja, 2009; Itakura and Lee, 2012). Negotiations for the Regional Comprehensive Economic Partnership (RCEP) among the ten ASEAN countries, Australia, China, India, Japan, Korea and New Zealand started in 2013 and might accelerate amid the U.S. withdrawal from the TPP. In addition, in March 2018 eleven other TPP signatories agreed to enter into a revised pact and signed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), or TPP-11, without U.S. participation. Furthermore, while it may still be a long way to realize a Free Trade Area of the Asia-Pacific (FTAAP), APEC leaders agreed to consider the eventual realization of FTAAP at the APEC Summit in Lima in November 2016.

The objectives of this paper are to estimate economic welfare effects of alternative sequencings of mega-regional trade agreements (MRTAs) for the Asia-Pacific countries and to evaluate the extent of losses to the United States from its withdrawal from the TPP using a dynamic computable general equilibrium (CGE) model. We offer two plausible sequencings of MRTAs in the Asia-Pacific. The first is the implementation of the 16-member RCEP, followed by RCEP + Taiwan and an FTAAP. The second is the implementation of CPTPP, followed by an enlarged CPTPP and an FTAAP. In addition, a hypothetical scenario in which the implementation of the original TPP including the United States as a member is considered for a comparison.

A number of studies have quantified the effects of plurilateral FTAs and/or MRTAs in the Asia-Pacific region using a CGE model (e.g., Cheong, 2013; Kawasaki, 2015; Lee et al., 2009; Li and Whalley, 2014; Petri et al., 2012, 2014; Petri and Plummer, 2016; World Bank, 2016). Using a dynamic CGE model, Lee et al. (2009) find that a reduction in administrative and technical barriers and a fall in the trade and transport margins have greater effects on economic welfare of member countries than tariff elimination. Cheong and Tongzon (2013) and Kawasaki (2015) show that real GDP gains will be larger under

the RCEP than under the TPP. In both studies Singapore and Vietnam's income gains are relatively large, particularly under the RCEP. Malaysia's income gains are also large in Kawasaki's (2015) study. Li and Whalley (2014) demonstrate that China's participation in the TPP would significantly benefit China and moderately increase economic welfare of other TPP members.

Petri et al. (2012)'s study is the first to compare Asian track and Trans-Pacific (or TPP) track FTAs. They assume that a China-Japan-Korea FTA is implemented before an East Asian FTA and an FTAAP under the Asian track. They find that by far Vietnam is the largest beneficiary under both tracks. Several countries' welfare gains are found to be larger under the TPP track than under the Asian track. In a subsequent study, Petri et al. (2014) assume that the TPP will expand from 12 to 17 members to include China, Indonesia, Korea, the Philippines and Thailand.[1] Using more recent data and estimates on nontariff barriers (NTBs), Petri and Plummer (2016) updates Petri et al. (2012)'s study. Economic welfare of the 12 TPP members, expressed as percent change from the baseline in 2030, ranges from 0.5% in the United States to 8.1% in Vietnam. World Bank's (2016) results are similar, as smaller and more open member countries (e.g. Vietnam and Malaysia) are expected to attain relatively large welfare gains.

Two caveats should be borne in mind when interpreting the results presented in the next section. First, reductions of barriers on foreign direct investment (FDI) among the member countries is not considered because it requires data on FDI flows by source and host countries and industry, which are not published. For example, UNCTAD (2017) provides FDI data by source and host countries, but not by industry. A challenging extension of the study would be to endogenize FDI flows to consider attraction of these flows to developing member countries, which is expected to produce additional welfare gains. Second, we do not incorporate compliance costs associated with rules of origin (ROOs), nor the cost-mitigating effects arising from consolidating FTAs. This is because it is difficult to measure or estimate compliance costs. However, such costs are expected to fall as smaller FTAs are consolidated into an MRTA. Compliance costs would eventually

[1] It might be more reasonable to assume, however, that China's participation in the TPP comes after the other countries' accession because it is expected to take longer to meet the high standards of the TPP, including competition policy, government procurement and intellectual property rights.

become zero when all countries participate in a trade agreement because there will be no ROOs under global trade liberalization.

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 adjustment effects 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 (2012). This model extends the comparative static framework of the standard GTAP model developed by Hertel (1997) to the dynamic framework by 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.[2] 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

[2] 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.

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.

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 9, which has a 2011 base year and distinguishes 140 countries/regions and 57 sectors (Aguiar et al., 2016). For the purposes of the present study, the data has been aggregated to 23 countries/regions and 29 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 on 22 commodities and tariff equivalents of nontariff barriers (NTBs) on seven services sectors 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. U.S. tariff rates are low, except on sugar, dairy products, textiles and apparel. In Japan and Korea, tariff rates on several agricultural and food products are quite high. With the exception of Singapore, Australia, New Zealand, Chile and Peru, the tariff rates on some agricultural and food products are also relatively high in other countries, such as rice in Malaysia, the Philippines and Russia, sugar in Thailand and India, meats in Canada and Russia, and dairy products in India and Canada. In manufacturing the tariff rates on apparel exceed 10% in a number of countries, including the United States, Japan, Thailand, Vietnam, Mexico and Russia. The tariff rate on motor vehicles exceeds 15% in China, Brunei, Malaysia, Thailand, Vietnam, the rest of ASEAN, India, Australia and Russia.

Ad valorem tariff equivalents of NTBs in services sectors are computed as unweighted 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. They are particularly high in China, India, Indonesia, the Philippines and Vietnam.

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 23 economies/regions over the period 2011-2035. 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, and total labor. Real

GDP projections and gross investment were obtained from International Monetary Fund (2016). Projections for population were taken from the United Nations (2015), while those for labor were based on the working-age population (15-64 years old).

The projections for population, investment, and 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. Trade accords included in the baseline are those which are already agreed among the member countries, including the ASEAN-China, ASEAN-Korea, ASEAN-Japan, ASEAN-Australia-New Zealand, ASEAN-India, EU-Korea, Korea-US, Australia-Japan, Australia-Korea, Australia-China and China-Korea FTAs. It is assumed that tariffs are cut by 80% among the member countries of the FTAs that are being implemented. Productivity is assumed to increase by 1 percent per year in every sector in all countries/regions.

3.2 Policy Scenarios

Welfare and sectoral output effects of MRTAs and their implications for ASEAN countries are to be evaluated in this study. The following three scenarios are designed and summarized in Table 3.

Scenario 1 *(Asian track)*: RCEP over the period 2019-2028, RCEP + Taiwan from 2024-2033 and FTAAP from 2028-2035.

Scenario 2 *(Trans-Pacific track 1)*: TPP-11 (CPTPP) from 2019-2028, TPP-16 from 2024-2033, and FTAAP from 2028-2035.

Scenario 3 *(Trans-Pacific track 2)*: Same as Scenario 2, except that the United States is assumed to reverse its decision to withdraw from the TPP.

In all three scenarios, 80% of FTAAP is assumed to be implemented in 2035. In Scenario 1, we assume that 10 ASEAN countries, Australia, China, India, Japan, Korea

and New Zealand will reach final agreement on the RCEP by 2018 and will implement the agreement over the 2019-2028 period. The RCEP is expected to be open to new members, and we assume that Taiwan will become a new member in 2024. Although it is uncertain as to when an FTAAP will be realized, it is assumed that the FTAAP consisting of the APEC member countries, Brunei, Cambodia, India and Laos will come into effect in 2028.[3]

In Scenario 2, we assume that 11 CPTPP member countries will implement the agreefment over the 2019-2028 period. The members will keep the option for a future participation by the United States and other countries. We assume that the U.S. and four other countries that have expressed an interested in joining the TPP – Thailand, Indonesia, the Philippines and Korea – will become new members in 2024 and complete the implementation in 2033. This is followed by FTAAP, which will enter into force in 2028.

Scenarios 3 is a hypothetical scenario in which the 12 signatories of the original TPP will implement the TPP over the 2019-2028 period, followed by an enlargement in 2024 and a creation of the FTAAP in 2028 as in Scenario 2. This scenario is added to capture the differences in the welfare and sectoral effects between the U.S. participation from the beginning of the TPP/CPTPP implementation and a delay in its participation.

In all MRTAs it is assumed that the tariff rates on commodities other than rice, other grains, sugar, meats and dairy products 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. We assume that the tariff rates on five agricultural products will be reduced by 2 percent for rice, 50 percent for other grains (wheat, feed grains and other grains), 5 percent for sugar, 75 percent for meats, and 5 percent for dairy products, which are rough approximations of what were agreed during the TPP negotiations.[4] In addition to reductions in tariffs and NTBs, time cost of trade – e.g. shipping delays arising from

[3] Cambodia, India, Laos and Myanmar are not APEC members. However, since they are RCEP members, it would be more natural to assume that they will become members of the envisioned FTAAP.

[4] During the TPP negotiations, the minimum access quota or tariff-rate quota was agreed on rice, wheat and sugar, whereas the tariff rates would be reduced on beef, pork and some dairy products.

regulatory procedures and inadequate infrastructure – is assumed to fall by 20 percent among them.[5]

We also assume that productivity in agricultural and manufacturing sectors will increase gradually from 1 percent a year (baseline) to 1.1 percent a year over a 10-year period during which the country becomes a member of an MRTA.[6] Previous studies have shown that import liberalization results in an increase in productivity through greater competition in liberalized sectors, larger imports of technology-intensive intermediate and capital goods, and increasing the quality and variety of intermediate inputs available to domestic producers. Trefler (2004) finds that the Canada-U.S. FTA resulted in large increases in labor productivity in industries with steep tariff cuts, whereas Lileeva (2008) finds that Canada's tariff cuts raised industry-level productivity by increasing the market shares of highly productive plants. Using a model with firm heterogeneity, Chen et al. (2009) show that trade openness exerts a positive effect on productivity and a negative effect on markups in the short run. Using highly disaggregated U.S. data, Amiti and Khandelwal (2013) exhibit a significant and positive relationship between import tariffs and quality upgrading for products close to the world quality frontier. Halpern et al. (2015) find that imports have a significant and large effect on firm productivity and that one-quarter of the productivity growth in Hungary during 1993-2002 was caused by imported inputs. Ahn et al. (2016) suggest that removal of remaining tariffs could increase aggregate productivity of developed countries by around 1 percent on average.

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

[5] For a detailed analysis of time cost of trade, see Hummels and Schaur (2013) and Minor (2013).

[6] For example, under Scenario 1 productivity in sectors 1-22 is assumed to increase from 1% a year in 2019 to 1.1% a year in 2029 for RCEP countries, from 1% a year in 2024 to 1.1% a year in 2034 for Taiwan, and from 1% a year in 2028 to 1.07% a year in 2035 for the rest of FTAAP countries (i.e. Canada, Chile, Mexico, Peru, Russia and the United States).

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 MRTAs. This effect is particularly large for a country with high average initial tariffs. Theoretically, it might 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. Previous studies (e.g. Brown, 1987; Balistreri and Markusen, 2009) have shown that monopoly power implicit in national product differentiation is the source of strong terms-of-trade effects resulting from tariff changes in models that incorporate the Armington assumption. 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 of the three policy scenarios, as changes in equivalent variations relative to the baseline for the years 2022, 2028 and 2034, are summarized in Table 4. Panel A of the table gives absolute changes in billions of US dollars in 2011 prices, whereas panel B provides percent changes. Under Scenario 1, economic welfare of the RCEP members increases during 2022-2034, whereas that of the envisaged FTAAP members increases in 2034. The welfare gains for the RCEP countries in 2034, compared with the baseline scenario in the same year, range from $2.1 billion (Brunei) to $543.8 billion (China) in absolute values. In terms of percent changes from the baseline in the same year, they range from 1.1% (Australia) to 3.7% (Singapore and Thailand). While the terms of trade of countries with zero or low initial tariff rates (e.g. Singapore and Australia) improve, those of countries with high initial tariff rates (e.g. Thailand, Vietnam and the rest of ASEAN) deteriorate, often significantly reducing the welfare gains. For example, whereas real GDP gains for Thailand and Vietnam in 2034 are 7.1% and 6.4%,

welfare gains for these countries in the same year are respectively 3.7% and 3.2%.[7] The economic welfare of several nonmember countries/regions decrease slightly – e.g. contraction of 0.1% for the United States, Chile, Russia, EU-28 and the rest of the world in 2022 or 2028 and reductions of 0.1-0.4% for EU-28 and the rest of the world in 2028-34.

In Scenario 2, economic welfare of the TPP-11 countries likewise increases during 2022-2034 and that of the prospective FTAAP members increases in 2034. The percentage changes in welfare of seven countries that are members of both the RCEP and CPTPP (i.e. Japan, Singapore, Brunei, Malaysia, Vietnam, Australia and New Zealand) under this scenario are less than or equal to those in Scenario 1. For each of the seven countries, this result is largely caused by a significantly greater trade share with other RCEP members than with other TPP-11 countries.

Since China is the largest trading partner for all seven countries, its exclusion from the TPP and CPTPP causes smaller welfare gains for almost all of these countries in all years under Scenarios 2 and 3 compared with Scenario 1. In 2034 and 2035, the welfare gains for Singapore are roughly equal among the three scenarios largely because the FTAAP will be mostly implemented by those years.

Scenario 3 is included mainly to compare the welfare results of the United States under the first two scenarios with this hypothetical scenario. Not surprisingly, U.S. welfare changes are considerably greater in Scenario 3 that assumes its participation at the start of the TPP/CPTPP than in Scenario 2, which assumes that its participation is delayed by five years. The difference in welfare gains for the U.S. between the two scenarios is projected to be $53.7 billion in constant dollars or 0.3 percentage point in 2034. Furthermore, if the United States never joins the CPTPP, it will lose an opportunity to gain $120 billion or 0.7 percent of its economic welfare. For Canada, Mexico, Chile and Peru, welfare gains are moderately larger in Scenario 3.

4.2 U.S. Sectoral Output Adjustments

[7] The real GDP results are available upon request from the corresponding author.

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 (Itakura and Lee, 2012).

Table 5 presents the sectoral output adjustments for the United States, expressed in percent changes relative to the baseline in 2030. Under the Asian track (Scenario 1), the U.S. is not a member of an MRTA until the FTAAP is assumed to enter into force in 2028. Output of several agricultural and food products increases slightly, whereas that of many manufacturing and services sectors decreases either slightly or moderately.

If the U.S. were a member of the TPP from the outset of its implementation (Scenario 3), then only three sectors are estimated to contract. While output of textiles and apparel declines by 4.2-6.0% and that of steel decreases slightly, output of all agricultural and food products, a wide range of manufacturing products and most services is projected to expand. When the U.S. participation in the CPTPP is delayed by five years (Scenario 2), the extent of output gain in expanding sectors becomes smaller. In addition, the number of contracting sectors increases. Compared with Scenario 3, U.S. agricultural producers and the processed food industry would be losers because their exports of grains, meat, dairy products and other agricultural and food products to TPP-11 countries, particularly to Japan, would be reduced when the U.S. is not a member of the TPP.

5. Conclusion

In this paper, we have used the dynamic GTAP model to investigate how MRTAs might affect economic welfare of the Asia-Pacific countries. Under the first scenario in which the proposed RCEP agreement is implemented over the 2019-2028 period, followed by RCEP + Taiwan from 2024-2033 and the FTAAP from 2028-2035, the welfare gains for the RCEP countries in 2034 range from 1.1% to 3.7%. In the second scenario, CPTPP is implemented over the 2019-2028 period, followed by an extension of its membership to

Korea, Indonesia, the Philippines, Thailand and the United States and an implementation of the enlarged CPTPP during 2024-2033. It is then followed by an implementation of the FTAAP during 2028-2035. Under this scenario, the percentage changes in welfare of the countries that are members of both the RCEP and CPTPP are found to be less than or equal to those in the first scenario.

The third scenario is included mainly to compare the welfare effects of the TPP/CPTPP with and without U.S. participation at the start of the trade pact. It is found that the United States loses an opportunity to gain 0.7% in its economic welfare by 2034 when the TPP is never implemented, and that its welfare gain will be reduced by 0.3 percentage point when its participation in the TPP is delayed by five years. Furthermore, under the first scenario, the U.S. welfare changes relative to the baseline are projected to be negative until 2031 before they become positive in 2032, which is the fifth year of implementation of the FTAAP.

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Table 1: Regional and sectoral aggregation

A. Regional aggregation

	Country/region	Corresponding economies/regions in the GTAP 9 database
1	United States	United States
2	Japan	Japan
3	China	China, Hong Kong
4	Korea	Korea
5	Taiwan	Taiwan
6	Singapore	Singapore
7	Brunei	Brunei Darussalam
8	Indonesia	Indonesia
9	Malaysia	Malaysia
10	Philippines	Philippines
11	Thailand	Thailand
12	Vietnam	Vietnam
13	Rest of ASEAN	Cambodia, Laos, rest of Southeast Asia
14	India	India
15	Australia	Australia
16	New Zealand	New Zealand
17	Canada	Canada
18	Mexico	Mexico
19	Chile	Chile
20	Peru	Peru
21	Russia	Russian Federation
22	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
23	Rest of world	All the other economies/regions

Table 1 (continued)

B. Sectoral aggregation

	Sector	Corresponding commodities/sectors in the GTAP 9 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	Meats	Cattle, sheep, goat, and horse meat products, meat products nec
7	Dairy products	Dairy products
8	Other food products	Vegetable oils, food products nec, beverages and tobacco products
9	Fossil fuels	Coal, oil, gas
10	Natural resources	Forestry, fishing, minerals nec
11	Textiles	Textiles
12	Apparel	Wearing apparel, leather products
13	Petroleum products	Petroleum, coal products
14	Chemical products	Chemical, rubber, plastic products
15	Steel	Iron and steel
16	Nonferrous metal	Nonferrous metal
17	Metal products	Fabricated metal products
18	Machinery	Machinery and equipment
19	Electronic equipment	Electronic equipment
20	Motor vehicles	Motor vehicles and parts
21	Other transport equip.	Transport equipment nec
22	Other manufactures	Wood products; paper products, publishing, mineral products nec, manufactures nec
23	Construction and utilities	Construction, electricity, gas manufacture and distribution, water
24	Trade	Trade
25	Transport	Sea transport, air transport, other transport
26	Communication	Communication
27	Financial services	Insurance, financial services nec
28	Other private services	Business services, recreation and other services
29	Government services	Public administration and defense, education, health services

Source: GTAP database, version 9.

Note: nec = not elsewhere classified.

Table 2: Tariff rates on merchandise imports and tariff equivalents of nontariff barriers on services, 2011 (%)

	Sector	United States	China	Japan	Korea	Taiwan	Singapore	Brunei	Indonesia	Malaysia	Philippines	Thailand	Vietnam
1	Rice	0.8	0.6	240.6	4.9	0.6	0.0	0.0	7.1	39.9	40.1	18.7	10.8
2	Other grains	0.0	1.2	12.1	250.3	1.7	0.0	0.0	4.8	0.0	2.3	26.4	2.7
3	Sugar	6.0	47.5	26.1	3.1	7.5	0.0	0.0	10.1	0.0	24.0	43.4	6.1
4	Other crops	0.6	3.0	5.1	130.7	6.9	0.0	0.4	1.8	13.4	3.1	14.3	4.3
5	Livestock	0.3	14.9	4.9	6.0	1.4	0.0	0.0	3.0	0.1	3.2	9.0	1.5
6	Meats	1.7	6.0	37.4	29.1	9.9	0.0	0.0	4.8	0.2	14.1	25.2	14.2
7	Dairy products	10.3	5.7	53.5	57.3	8.9	0.0	0.0	4.7	1.1	1.0	10.5	4.7
8	Other food products	1.7	7.0	8.5	30.7	12.8	0.4	17.0	6.9	8.2	2.8	11.9	11.1
9	Fossil fuels	0.0	0.2	0.0	2.5	0.0	0.0	0.0	0.0	1.8	0.0	0.0	1.2
10	Natural resources	0.0	0.1	0.2	0.5	1.1	0.0	0.1	0.9	0.1	2.0	2.0	3.3
11	Textiles	6.9	4.1	5.4	7.8	6.2	0.0	1.2	2.0	7.3	2.1	6.4	10.0
12	Apparel	10.9	4.0	11.3	8.8	8.1	0.0	2.8	5.2	8.4	3.5	21.1	14.3
13	Petroleum products	0.8	3.4	0.7	3.7	1.7	0.0	0.8	1.5	0.5	0.1	2.6	8.2
14	Chemical products	1.2	4.7	0.8	4.8	1.9	0.0	1.5	3.9	4.9	2.2	7.1	3.3
15	Steel	0.2	3.2	0.4	0.4	0.1	0.0	0.0	3.3	18.7	0.8	3.9	1.7
16	Nonferrous metal	0.5	0.8	0.4	2.5	0.5	0.0	0.0	2.1	3.2	0.5	0.4	1.0
17	Metal products	1.6	7.9	0.4	4.9	4.7	0.0	0.0	4.5	9.9	2.6	10.9	8.1
18	Machinery	0.8	5.5	0.0	5.5	1.9	0.0	11.6	3.9	2.3	1.0	6.2	3.5
19	Electronic equipment	0.2	1.5	0.0	0.5	0.2	0.0	4.9	0.2	0.1	0.6	2.3	1.5
20	Motor vehicles	0.6	17.5	0.0	7.0	12.5	0.0	18.8	8.6	15.0	8.5	28.6	20.2
21	Other transport equip.	0.5	2.8	0.0	1.3	1.5	0.0	0.2	1.4	1.2	4.5	5.1	10.3
22	Other manufactures	0.9	3.2	1.0	4.8	2.8	0.0	2.3	2.8	7.5	2.2	6.7	10.7
23	Construction and utilities	2.3	25.2	5.0	13.0	10.8	0.0	20.6	64.4	17.4	52.6	44.9	53.7
24	Trade	6.8	109.6	22.7	33.0	28.8	1.3	32.5	98.5	36.0	80.2	63.5	82.7
25	Transport	6.8	52.4	15.8	25.1	21.4	1.3	16.6	84.2	27.6	68.0	53.0	69.7
26	Communication	6.8	48.1	17.8	27.4	23.6	1.3	32.8	88.4	30.0	71.5	56.1	73.5
27	Financial services	7.8	83.3	17.1	30.4	27.5	1.5	20.0	92.5	30.2	72.6	58.1	74.7
28	Other private services	7.8	81.2	16.6	29.2	26.7	1.5	7.3	91.1	29.8	70.8	54.9	73.7
29	Government services	6.3	84.1	25.9	34.3	29.1	2.8	24.1	97.8	36.5	76.9	61.5	84.2

Table 2 (continued)

	Sector	Rest of ASEAN	India	Australia	New Zealand	Canada	Mexico	Chile	Peru	Russia	EU-28	Rest of world
1	Rice	5.5	11.1	0.0	0.0	0.0	0.0	4.8	0.0	108.3	5.7	9.0
2	Other grains	1.0	4.2	0.0	0.0	0.0	0.6	1.8	2.9	3.9	1.5	8.0
3	Sugar	2.6	58.3	0.0	0.0	0.2	18.4	3.5	0.0	20.3	12.3	9.9
4	Other crops	9.6	23.1	0.4	0.0	0.2	2.1	0.6	3.6	8.3	1.0	8.1
5	Livestock	6.8	5.8	0.1	0.0	10.4	0.3	0.3	1.8	7.2	0.5	9.2
6	Meats	26.0	17.3	0.1	1.7	33.8	1.1	3.8	3.2	31.2	5.4	18.8
7	Dairy products	8.4	41.0	2.2	2.5	191.3	8.3	1.1	0.0	12.7	1.1	11.3
8	Other food products	9.6	58.7	1.3	1.0	8.7	3.9	1.1	0.8	12.9	1.6	13.3
9	Fossil fuels	1.0	0.6	0.0	0.0	0.0	0.0	1.4	0.0	1.2	0.0	0.3
10	Natural resources	4.3	5.8	0.0	0.0	0.0	1.2	0.1	0.3	5.2	0.1	1.5
11	Textiles	8.2	13.0	5.5	4.7	6.3	5.7	3.2	7.6	14.3	2.6	9.9
12	Apparel	12.0	10.2	6.7	8.6	10.7	16.0	3.3	10.4	17.7	4.2	12.3
13	Petroleum products	12.1	5.4	0.0	0.2	0.1	0.2	0.1	0.0	2.4	0.3	3.6
14	Chemical products	4.5	7.5	1.5	1.2	0.4	1.0	0.7	1.4	8.5	0.5	4.3
15	Steel	2.2	5.3	3.3	1.8	0.0	1.6	1.5	0.0	5.4	0.0	4.4
16	Nonferrous metal	2.9	9.3	0.4	0.7	0.0	1.1	1.2	0.0	4.8	0.4	1.0
17	Metal products	5.0	9.5	3.6	2.4	0.6	1.5	0.8	0.9	10.5	0.5	7.4
18	Machinery	5.5	7.5	1.9	2.1	0.2	1.6	0.4	0.6	3.2	0.4	5.1
19	Electronic equipment	9.7	1.8	0.5	0.4	0.1	0.7	0.2	1.4	3.9	0.5	3.5
20	Motor vehicles	17.8	20.3	18.2	5.6	1.0	2.4	0.7	2.3	17.0	0.6	8.7
21	Other transport equip.	5.7	7.9	1.6	0.5	0.6	3.8	0.2	2.7	5.4	0.6	6.5
22	Other manufactures	7.4	9.1	2.7	1.4	0.7	2.5	0.9	2.7	11.0	0.4	6.0
23	Construction and utilities	20.6	109.7	4.3	1.0	9.2	40.8	25.8	27.2	52.9	5.6	26.7
24	Trade	32.5	153.3	18.2	8.2	20.7	61.8	33.8	51.0	73.5	12.0	48.2
25	Transport	16.6	133.3	11.4	5.1	14.0	51.2	26.0	41.7	61.9	8.9	37.1
26	Communication	32.8	139.2	13.4	4.3	15.9	54.3	28.3	44.4	65.3	9.3	36.6
27	Financial services	20.0	139.5	13.5	4.3	19.8	57.6	27.5	46.4	65.9	8.7	43.3
28	Other private services	7.3	137.1	13.5	3.7	19.2	58.2	26.5	43.8	65.1	9.7	40.5
29	Government services	24.1	154.8	23.5	10.2	17.5	60.3	33.0	47.3	69.7	14.2	45.8

Sources: Sectors 1-22 GTAP database, version 9. Sectors 23-29: 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

	2019-2023	2024-2027	2028	2029-2033	2034-35
Scenario 1: Asian track	RCEP (ASEAN+6 FTA) (2019-2028)				
		RCEP + Taiwan (2024-2033)			
			FTAAP (2028-2035) (80% implemented)		
Scenario 2: Trans-Pacific track 1	TPP-11 (2019-2028)				
		TPP-16 (2024-2033)			
			FTAAP (2028-2035) (80% implemented)		
Scenario 3: Trans-Pacific track 2	TPP-12 (2019-2028)				
		TPP-16 (2024-2033)			
			FTAAP (2028-2035) (80% implemented)		

Note: RCEP: 10 ASEAN countries, Australia, China, India, Japan, Korea and New Zealand. TPP-11 (CPTPP): Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. TPP-12: TPP-11 plus the United States. TPP-16: TPP-12 plus Korea, Indonesia, the Philippines and Thailand. FTAAP: 10 ASEAN countries, Australia, Canada, Chile, China, India, Japan, Korea, Mexico, New Zealand, Peru, Russia, Taiwan and the United States.

Table 4: The welfare effects of mega-regional trade agreements: Changes in equivalent variations relative to the baseline

A. Absolute changes (US$ billion in 2011 prices)

	Scenario 1 (Asian track)			Scenario 2 (Trans-Pacific track 1)			Scenario 3 (Trans-Pacific track 2)		
	2022	2028	2034	2022	2028	2034	2022	2028	2034
United States	-3.5	-11.4	20.8	-0.5	15.2	66.3	9.7	55.7	120.0
Japan	14.5	58.3	103.0	4.8	42.0	109.6	7.0	46.6	112.7
China	30.0	195.9	543.8	-0.3	13.3	202.3	-1.3	17.0	211.8
Korea	5.2	24.1	44.8	-0.1	10.3	38.7	-0.1	11.2	40.3
Taiwan	-0.9	4.2	18.4	0.0	1.6	13.5	0.0	2.1	14.4
Singapore	1.4	5.8	8.4	0.6	4.1	8.5	0.7	4.1	8.5
Brunei	0.1	0.5	2.1	0.0	0.3	1.1	0.0	0.2	0.9
Indonesia	3.0	20.8	51.7	-0.2	5.8	32.1	-0.4	4.8	31.1
Malaysia	0.9	6.1	14.8	0.8	5.2	14.1	1.0	5.4	14.2
Philippines	0.8	3.7	10.7	0.0	1.3	7.4	-0.1	1.2	7.3
Thailand	1.6	6.7	13.5	-0.1	3.5	12.0	-0.2	3.7	12.4
Vietnam	0.9	4.6	11.0	0.6	4.2	10.6	1.5	5.9	11.3
Rest of ASEAN	0.3	2.0	5.5	0.0	-0.3	0.8	-0.1	-0.5	0.7
India	8.4	50.4	137.4	0.0	4.6	57.7	0.0	6.8	62.7
Australia	2.6	12.0	21.0	0.8	4.5	11.9	0.9	3.8	10.3
New Zealand	0.3	1.5	3.0	0.2	1.3	2.8	0.2	1.2	2.7
Canada	-0.4	-0.6	6.5	1.3	8.3	18.2	2.9	9.5	17.3
Mexico	-0.1	-0.3	6.7	1.2	10.5	24.9	3.0	13.4	26.1
Chile	-0.1	-0.2	2.3	0.3	2.3	6.4	0.5	2.7	6.5
Peru	0.0	0.0	1.3	0.3	1.6	3.8	0.4	1.6	3.7
Russia	-1.1	-0.4	17.5	-0.3	-3.0	7.0	-0.7	-5.4	4.4
EU-28	-2.9	-22.6	-78.2	0.4	0.0	-40.1	0.3	1.8	-38.4
Rest of world	-8.3	-28.2	-46.0	-1.5	-22.2	-70.1	-3.8	-31.6	-79.3

Definitions of scenarios:

Scenario 1: RCEP over the period 2019-2028, RCEP + Taiwan from 2024-2033 and FTAAP from 2028-2035. Scenario 2: TPP-11 (CPTPP) from 2019-2028, TPP-16 from 2024-2033, and FTAAP from 2028-2035. Scenario 3: Same as Scenario 2, except that the United States does not withdraw from the TPP. In all three scenarios, 80% of FTAAP is assumed to be implemented in 2035.

Table 4: The welfare effects of mega-regional trade agreements: Changes in equivalent variations relative to the baseline (continued)

B. Percent changes

	Scenario 1 (Asian track)			Scenario 2 (Trans-Pacific track 1)			Scenario 3 (Trans-Pacific track 2)		
	2022	2028	2034	2022	2028	2034	2022	2028	2034
United States	0.0	-0.1	0.1	0.0	0.1	0.4	0.1	0.3	0.7
Japan	0.3	1.0	1.7	0.1	0.7	1.8	0.1	0.8	1.8
China	0.3	1.2	2.4	0.0	0.1	0.9	0.0	0.1	0.9
Korea	0.4	1.8	3.1	0.0	0.8	2.7	0.0	0.8	2.8
Taiwan	-0.2	0.8	3.0	0.0	0.3	2.2	0.0	0.4	2.3
Singapore	0.5	2.3	3.7	0.2	1.6	3.7	0.2	1.6	3.7
Brunei	0.2	0.8	1.6	0.1	0.5	0.9	0.1	0.3	0.7
Indonesia	0.3	1.3	2.4	0.0	0.4	1.5	0.0	0.3	1.5
Malaysia	0.3	1.4	2.8	0.2	1.2	2.7	0.3	1.2	2.7
Philippines	0.3	1.4	3.1	0.0	0.5	2.2	0.0	0.4	2.2
Thailand	0.5	2.0	3.7	0.0	1.1	3.3	-0.1	1.1	3.4
Vietnam	0.5	1.8	3.2	0.3	1.7	3.1	0.8	2.4	3.3
Rest of ASEAN	0.2	1.0	1.9	0.0	-0.2	0.3	-0.1	-0.3	0.2
India	0.3	1.4	2.8	0.0	0.1	1.2	0.0	0.2	1.3
Australia	0.2	0.7	1.1	0.1	0.3	0.6	0.1	0.2	0.5
New Zealand	0.2	0.9	1.7	0.2	0.8	1.6	0.1	0.7	1.6
Canada	0.0	0.0	0.3	0.1	0.4	0.8	0.2	0.5	0.8
Mexico	0.0	0.0	0.5	0.1	0.9	2.0	0.3	1.2	2.1
Chile	0.0	-0.1	0.7	0.1	0.8	1.9	0.2	1.0	2.0
Peru	0.0	0.0	0.5	0.1	0.7	1.4	0.2	0.7	1.4
Russia	-0.1	0.0	0.6	0.0	-0.1	0.2	0.0	-0.2	0.1
EU-28	0.0	-0.1	-0.4	0.0	0.0	-0.2	0.0	0.0	-0.2
Rest of world	-0.1	-0.2	-0.3	0.0	-0.2	-0.4	0.0	-0.2	-0.5

Source: Model simulations.

Table 5: U.S. sectoral output adjustments: Percent changes relative to the baseline in 2030

Sector	Scenario 1 (Asian track)	Scenario 2 (Trans-Pacific track 1)	Scenario 3 (Trans-Pacific track 2)
Rice	0.8	0.0	0.2
Other grains	-0.1	-0.1	0.2
Sugar	0.0	0.2	0.6
Other crops	-0.1	0.3	0.6
Livestock	0.6	1.0	1.7
Meats	1.2	1.9	3.4
Dairy products	0.0	0.1	0.8
Other food products	0.2	0.9	1.7
Fossil fuels	0.0	0.1	0.6
Natural resources	0.1	0.1	0.3
Textiles	-3.0	-4.2	-4.2
Apparel	-3.9	-5.8	-6.0
Petroleum products	-0.4	0.5	1.4
Chemical products	-0.5	0.2	0.7
Steel	-0.4	-0.5	-0.7
Nonferrous metal	0.9	1.9	2.2
Metal products	-0.4	-0.1	0.2
Machinery	-0.3	-0.1	0.1
Electronic equipment	0.9	1.0	1.7
Motor vehicles	-0.2	0.1	1.1
Other transport equip.	0.5	0.1	0.1
Other manufactures	-0.2	0.1	0.5
Construction and utilities	-1.0	0.1	1.0
Trade	-0.2	0.0	0.3
Transport	0.0	0.3	0.6
Communication	-0.1	0.0	0.1
Financial services	-0.1	0.0	0.0
Other private services	-0.1	0.0	0.1
Government services	0.0	0.0	0.0

Source: Model simulations.

Table 6: Japan's sectoral output adjustments: Percent changes relative to the baseline in 2030

Sector	Scenario 1 (Asian track)	Scenario 2 (Trans-Pacific track 1)	Scenario 3 (Trans-Pacific track 2)
Rice	-0.5	-0.5	-0.6
Other grains	-3.1	-4.7	-5.9
Sugar	0.0	0.1	0.2
Other crops	-2.2	-1.3	-1.4
Livestock	-1.6	-3.8	-5.2
Meats	-2.8	-6.7	-9.1
Dairy products	0.9	0.9	0.9
Other food products	0.9	1.0	1.0
Fossil fuels	-1.8	-1.1	-1.2
Natural resources	1.1	0.8	0.7
Textiles	0.6	-1.5	-0.9
Apparel	-9.8	-3.1	-3.0
Petroleum products	2.6	1.9	1.9
Chemical products	2.6	0.8	1.0
Steel	1.7	0.5	0.5
Nonferrous metal	4.3	2.4	2.4
Metal products	0.9	0.4	0.4
Machinery	-0.6	-2.2	-2.1
Electronic equipment	-1.0	-1.6	-1.6
Motor vehicles	2.9	1.5	1.5
Other transport equip.	-7.9	-5.0	-4.8
Other manufactures	1.3	0.5	0.5
Construction and utilities	4.3	4.1	4.0
Trade	1.0	0.8	0.9
Transport	0.3	0.0	0.0
Communication	0.6	0.4	0.5
Financial services	0.2	0.0	0.1
Other private services	0.8	0.6	0.6
Government services	0.3	0.2	0.2

Source: Model simulations.