Estimating the Effects of the CPTPP and RCEP in a General Equilibrium Framework with Global Value Chains*

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Abstract

We have witnessed increasing prominence of trade in intermediate products. International fragmentation of production chains has been motivated by sourcing intermediate inputs from more cost-efficient producers to enhance efficiency. In order to estimate the effects of trade agreements on countries linked to global value chains (GVCs) more accurately, we utilize the GTAP database and inter-country input-output tables to construct a global computable general equilibrium (CGE) model that disaggregates imports of intermediate products by country of origin. Using this modified model, we estimate the welfare and sectoral output effects of two mega-regional trade agreements (MRTAs) involving Asian countries – the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the Regional Comprehensive Economic Partnership (RCEP). The initial results suggest that while incorporating the GVC structure does not significantly affect the overall welfare results, the magnitudes of changes in sectoral output become considerably greater in several industries.

JEL Classification: F13, F14, F15, F17

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1. Introduction

Global value chains (GVCs) have become a key feature of world trade, with over half of world trade consisting of intermediate goods and services. International fragmentation of production chains, or production networks, has been motivated by sourcing intermediate inputs from more cost-efficient producers to enhance efficiency. A number of recent studies have examined the relationship between the depth of trade agreements and production networks trade/GVC-related trade. Orefice and Rocha (2014) show that a one percent increase in the depth of an agreement increases production networks trade by about 12 percentage points. Blyde et al. (2015) indicate that economic integration facilitates the formation of cross-border production networks and that this effect is stronger when agreements are deeper. Ruta (2017) suggests that deep trade agreements have a larger impact on GVC-intensive sectors, while Laget et al. (2018) find that the depth of agreements increases GVC-related trade among participating countries.[1]

While previous studies have shown a positive relationship between the depth of trade agreements and GVC-related trade, it is important to assess whether GVCs enlarge the economic effects of mega-regional trade agreements (MRTAs), such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the Regional Comprehensive Economic Partnership (RCEP). The objectives of this paper are to estimate the welfare and sectoral output effects of CPTPP and RCEP using a dynamic computable general equilibrium (CGE) model that incorporates the GVC structure, and to compare the results with those obtained from a conventional dynamic CGE model.

Empirical studies incorporating the GVC structure in a general equilibrium framework are scarce. Cai et al. (2015) use a GVC-based dynamic CGE model to evaluate the impact of the Transatlantic Trade and Investment Partnership (TTIP) on BRICS economies. A work-in-progress paper by Greenville et al. (2017) attempt to examine the effects of policy reform on agro-food GVC participation using the OECD METRO model. Walmsley and Minor (2017) assess the effects of the U.S. reversal of the NAFTA using the ImpactECON Global Supply Chain (IESC) model, which allows for differences in the sourcing of

[1] For measures of GVC-related trade, Laget et al. (2018) use (1) different components of value added trade based on the World Input-Output Database (WIOD) and (2) trade in parts and components.

imports by firms, final consumers and the capital goods sector. In none of these studies, however, a comparison between the policy effects obtained from the model incorporating the GVC structure and those obtained from a conventional model is made.

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

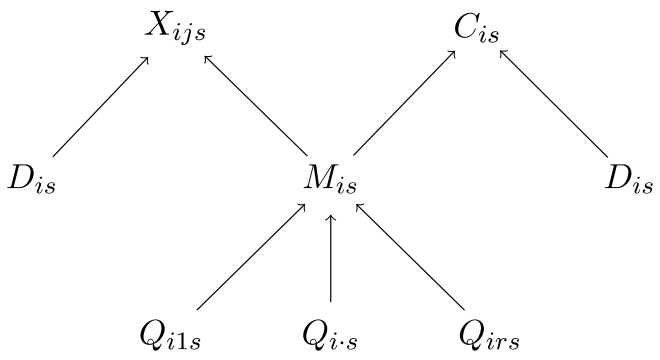
2.1 Modified Dynamic GTAP Model with the GVC Structure

For our numerical simulations undertaken for this study, we incorporate the GVC structure into the dynamic GTAP model (Ianchovichina and McDougall, 2012), which is a multi-sector, multi-region recursive dynamic computable general equilibrium (CGE) model of global trade. While introducing capital accumulation and international mobility of capital, the dynamic GTAP model retains the standard features in the comparative static GTAP model (Hertel, 1997). Constant returns to scale and perfect competition are assumed in all sectors. While capital and skilled and unskilled labor are mobile across sectors, land and natural resources are sector-specific and immobile. Products are differentiated on the basis of their origin, in keeping with the Armington assumption (Armington, 1969). The fictional global transport sector provides the services that account for the difference between FOB and CIF values (i.e. the transport margin) for each commodity shipped along a specified route.

We modify the import demand in the dynamic GTAP model to reflect the GVC structure in which each agent determines demands for imports and domestically produced goods. To highlight the modification, we first outline the GTAP model's import demand structure in Figure 1. In country s, producers in sector j demand intermediate input i, X_{ijs}, for production, and consumers also demand good i, C_{is}. Domestically produced good i, D_{is}, and a composite of import bundle i, M_{is}, meet the aggregate demand for good i. At the border of country s, imports from different trading partners, Q_{irs}, are aggregated into the composite import bundle. Thus, there are two stages of aggregation: first at the bottom of

diagram, aggregation of imports from trading partners to a composite import bundle, and then aggregation of the composite import bundle with domestically produced goods. This is the double-nest Armington import demand structure implemented in the GTAP model, where the constant elasticity of substitution (CES) specification is used for each aggregation.

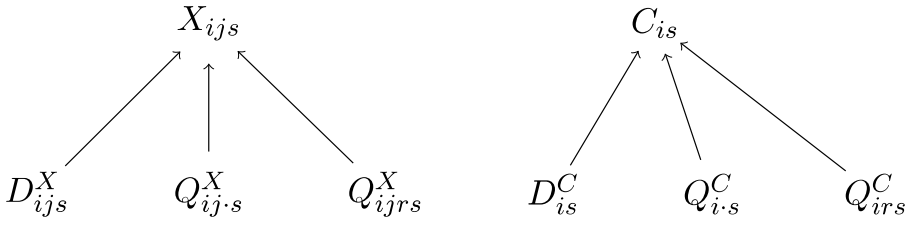
Figure 1. Import sourcing at border, double-nest Armington specification



Source: Own construction

Figure 2 shows the import demand in our modified model with the GVC structure. Each agent, such as producer and consumer (superscript X and C, respectively), determines demands for domestic goods and imports from different trading partners simultaneously. Note that the import composite used in the GTAP model is absent from this single-nest Armington specification.

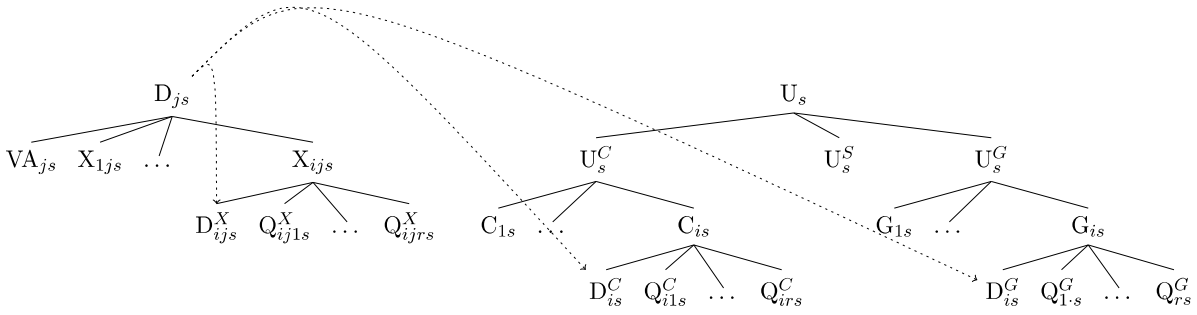
Figure 2. Import sourcing by agents, single-nest Armington specification



Source: Own construction

In the double-nest specification the source composition of imported products is the same for producers and consumers, whereas in the single-nest specification the source composition of imported products is different between producers and consumers. In other words, the source composition of imported intermediates and that of imported final goods and services are different.

Figure 3. Schematic view of the model structure



Source: Own construction

Structure of our model is summarized in Figure 3. The tree at the left-hand side provides domestic producers' demand structure. For the production of D_{js}, the Leontief production function combines the value-added composite VA_{js} and intermediate inputs X_{ijs}. The value-added composite consists of skilled and unskilled labor, capital and specific factors. Domestically produced good D_{js} is supplied to producers for intermediate input use, to private household for consumption, and to government household for its purchases of goods and services. In the right-hand tree, a representative household's utility U_s, the basis of welfare measure, is derived from sub-utilities of private household U_s^C, government household U_s^G and savings U_s^S, using a Cobb-Douglas-type function. The private household's utility is then determined by the constant difference elasticity (CDS) function of the composite goods C_{is}, whereas the government household utility is determined by the CES function. Because of the non-homotheticity in private household's utility, the adjustment to shift the distribution parameter of expenditures is introduced by McDougall (2003). Our modifications to reflect the GVC structure in the dynamic GTAP

model does not change the mechanism of capital accumulation and international capital mobility.

2.2 Data, aggregation and initial tariffs

To reflect the current and prospective states of the global economy, we rely on the GTAP database version 9 (Aguiar et al., 2016) and economic forecasts from international organizations. The GTAP database records the entire global economy with detailed information on 57 sectors in 140 regions. With this database, we are able to observe the economic structure of production, consumption, and international trade and protection, benchmarked at the year 2011. The GTAP database is supplemented with international factor income flows arising from domestic and foreign asset holdings. To reduce the computational burden, we have aggregated the data to 17 countries/regions and 14 sectors, as shown in Table 1. As we introduce the agent-based demands for the GVC structure to the dynamic GTAP model, we increase dimensionality in demands and corresponding data. This requires more computational resource.

We have not completed all the data work necessary to incorporate world input-output tables into the dynamic GTAP model, due to a change in the database. We initially utilized the World Input-Output Database (WIOD) (http://www.wiod.org/), but it only includes world input-output tables for 43 countries and the rest of the world. Since Singapore, Brunei, Malaysia, the Philippines, Thailand and Vietnam are aggregated into the rest of the world, we needed to apply import shares of several available countries to those of missing countries. We then discovered that the OECD's inter-country input-output (ICIO) tables (http://www.oecd.org/sti/ind/inter-country-input-output-tables.htm) includes most of the missing countries. Although we have incorporated the agent specific import shares extracted from the ICIO tables into the model, we are still in the process of creating a globally consistent GTAP-ICIO database. As a result, the results presented in Section 4 are preliminary.

The sectoral tariff rates on 11 commodities and tariff equivalents of nontariff barriers (NTBs) on three services sectors are summarized in Table 2. There are significant differences in the tariff rates and NTBs across the countries/regions. Since Singapore's

tariffs are zero on almost all products and Brunei's tariffs are generally very low with the exception of some food products and motor vehicles, the weighted averages of Singapore and Brunei's tariff rates are extremely low. U.S. tariff rates are also very low, except on some food products and textiles and apparel. In Japan, Korea and India, tariff rates on agricultural and food products are quite high. In manufacturing the tariff rate on textiles and apparel is relatively high in many countries/regions and exceeds 10% in Thailand, Vietnam, India and the rest of the world. The tariff rate on motor vehicles exceeds 15% in China, Malaysia, Thailand, Vietnam, the rest of ASEAN, Australia and India.

Ad valorem tariff equivalents of NTBs on services 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 on services than tariff rates on commodities. The magnitudes of NTBs are particularly high in China, Indonesia & the Philippines, Vietnam and India.

3. The Baseline and Policy Scenarios

3.1 The Baseline Scenario

The baseline scenarios is a hypothetical future state of the global economy that forms the basis of the comparisons against the policy scenarios. We use the projections for the total population, working-age population, and GDP as well as gross investment. Projections for the total and working-age population growth rates are computed from United Nations (2017) based on the medium projection variant. Projections for the growth rates of real GDP and gross investment are obtained from International Monetary Fund (2018). We extrapolate the real GDP growth rates in 2023 to the end of the simulation period of 2035. Given the projections of the total population, working-age population, and real GDP for 2011–2035, the model can compute technological change as a measure of productivity.

The baseline also includes the trade accords that have already been agreed and in effect, such as the ASEAN-China, ASEAN-Korea, ASEAN-Japan, ASEAN-India, EU-Korea, Korea-US, China-Korea, Australia-Japan, Australia-Korea and Australia-China FTAs. We

assume a gradual reduction of import tariffs, and the tariffs are reduced by 80%, except for agriculture and food products, among the member countries of the FTAs that are currently 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 the following two scenarios are to be examined using the model with the GVC structure and the standard dynamic GTAP model:

Scenario 1 (*CPTPP*): CPTPP over the period 2019-2028; CPTPP + 6 from 2024-2033.

Scenario 2 (*RCEP*): RCEP from 2021-2030, RCEP + Taiwan (RCEP + 1) from 2026-2035.

In Scenario 1, we assume that 11 CPTPP member countries will implement the agreement 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 United States and five other economies that have expressed an interested in joining the CPTPP – Korea, Indonesia, the Philippines, Thailand and Taiwan – will become new members in 2024 and complete the implementation in 2033.

In Scenario 2, we assume that 10 ASEAN countries, Australia, China, India, Japan, Korea and New Zealand will reach final agreement on the RCEP by 2020 and will implement the agreement over the 2021-2030 period. The RCEP is expected to be open to new members, and we assume that Taiwan will become a new member in 2026.

In both scenarios it is assumed that the tariff rates on goods other than agriculture and food products decline linearly to zero during the implementation periods. Tariff cuts on agriculture and food products under the CPTPP are weighted averages of tariff cuts of commodities belonging to these sectors, such as rice, wheat, vegetables, meats, dairy products and beverages. Those under the RCEP are assumed to be moderately smaller since tariff cuts in the RCEP are expected to be less comprehensive than the CPTPP. Tariff equivalents of NTBs on services are reduced by respectively 25 and 20 percent over the implementation periods among the member countries under the first and second scenarios. Lower cuts are assumed in the second scenario because the depth of the RCEP agreement

is expected to be lower. In addition to reductions in tariffs and NTBs, time cost of trade – e.g. shipping delays arising from regulatory procedures and inadequate infrastructure – is assumed to fall by 25 percent among the member countries.[2]

It is also assumed 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 the CPTPP and/or RCEP. 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; Lileeva, 2008; Chen et al., 2009; Amiti and Khandelwal, 2013; Halpern et al., 2015).

4. Preliminary Results

4.1 Welfare Effects

We use a representative household's utility U_S as the welfare measure, as noted in section 2.1. Economic welfare is mainly determined by allocative efficiency, the terms of trade, the contribution to equivalent variation (EV) of change in the price of capital investment goods, and the contribution to EV of change in equity owned by a region. The welfare effects of the CPTPP and RCEP in percent changes for the years 2025, 2030 and 2035 are summarized in Table 3.

Under the CPTPP scenario, economic welfare of the CPTPP member countries increases during 2025-2035 and that of the six candidate economies for future membership increases in 2030 and 2035. Welfare gains are relatively large in Singapore & Brunei, Malaysia and Thailand in 2030 and 2035. Welfare changes for member and nonmember countries that are projected using the model with the GVC structure (Table 3, panel B) are very similar to those that are projected using the standard dynamic GTAP model (panel A). While the incorporation of the GVC structure can affect the magnitudes of sectoral output changes greatly, which will be shown in the next section, the effects on the overall welfare

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

are small and vary across countries/regions. For example, for the year 2035, estimated welfare gains using the model with the GVC structure are slightly larger than those using the standard model in Singapore & Brunei, Thailand and Australia, but the opposite relation holds in Japan, Taiwan, Malaysia and Vietnam.

In the RCEP scenario, economic welfare of the RCEP members increases during 2025-2035 and that of Taiwan increases in 2030 and 2035. Economic welfare of nonmember countries/regions – i.e. the United States, the CPTPP members in the Western Hemisphere (Canada, Mexico, Chile and Peru), EU-28 and the rest of the world – decreases slightly in 2030 and 2035. Again, the incorporation of the GVC structure affects the welfare results only modestly, and whether it increases or decreases economic welfare varies across countries/regions.

For the countries that are members of both the CPTPP and RCEP (i.e. Japan, Singapore & Brunei, Malaysia, Vietnam, Australia and New Zealand), welfare gains in 2035 are larger under the CPTPP except for Australia. Australia's lower welfare gains under the CPTPP scenario compared with the RCEP scenario might be attributable to significantly smaller increases in exports of agricultural and food products after the United States is assumed to become a member of the CPTPP in 2024. For the other member countries, welfare gains are greater in 2035 under the CPTPP scenario largely because tariff cuts in agricultural and food products are slightly higher and, more importantly, reductions in NTBs in services trade are assumed to be larger.

One of the limitations of the model is that parts and components, assembly and final products categorized in the same sector are not disaggregated. For example, parts and components, assembly and final products of electronic equipment, such as personal computers, smartphone and computer chips, are included in the same sector. To capture fragmentation of production processes and GVC trade more precisely, a model that disaggregates sectors among parts, assembly and final products would be required. Constructing a CGE model that disaggregate sectors by type of activities (e.g. sourcing intermediates, assembling and supplying final products) would be a possible future extension, but it requires a new extensive database.

4.2 Sectoral Output Adjustments

Table 4 presents the sectoral output adjustments for selected countries in 2035, expressed in percent changes relative to the baseline for that year. The results obtained using the standard dynamic GTAP model are provided in panel A, whereas those obtained using the dynamic GTAP model with the GVC structure are summarized in panel B. Under the CPTPP scenario, Vietnam, Malaysia, Indonesia & the Philippines and Thailand significantly increase output of textiles and apparel, largely resulting from significant increases in their exports to the United States, which is assumed to become a CPTPP member in 2024, and other CPTPP members in the Western Hemisphere (Canada, Mexico, Chile and Peru).

Several ASEAN countries, particularly Malaysia and Thailand, expand production of metals, machinery, electronic equipment, motor vehicles and other transport equipment. All of these sectors contain both final products and intermediate inputs (e.g. iron and steel and parts and components of machinery, electronic equipment, motor vehicles and other transport equipment). An important reason why output of those sectors increases in several ASEAN countries is because tariff elimination reduces costs of intermediates, lowering average and marginal costs of producers. As a result of a fall in the prices of machinery and electronic equipment produced in countries such as Malaysia, Thailand and Vietnam, Japan increases imports of these products from Southeast Asia and reduces demand for domestically produced products. This causes output contraction in machinery and electronic equipment in Japan. Output decreases in many sectors in China, a nonmember, but the percent reductions are quite small.

When each agent decides how much to allocate intermediate/final products between domestic and imported products and where to source them simultaneously, rather than deciding them in two steps, the absolute values of sectoral output changes become greater in a substantial majority of sectors (Table 4, panel B). For example, the percent increases in output of motor vehicles in Japan and that of machinery and electronic equipment in Vietnam become considerably larger. Similarly, the percent reductions in output of textiles and apparel in the United States and other CPTPP members in the Western Hemisphere become significantly greater.

Under the RCEP scenario, the percent increases in output of textiles and apparel in Vietnam and Thailand become significantly smaller compared with the CPTPP scenario, and output of textiles and apparel in Indonesia & the Philippines and Malaysia is projected to decrease. Since the RCEP members' exports to nonmembers such as the United States and Canada slightly decrease, the ASEAN countries' exports of these products drastically fall. Another important reason might be that China, which has comparative advantage in textiles and apparel, is a member country.

In agricultural and manufacturing sectors other than textiles and apparel, intra-RCEP+1 trade is greater than intra-CPTPP+6 trade in many products for the countries that are both the members of RCEP+1 and CPTPP+6. This is particularly the case in machinery and electronic equipment for Thailand and Vietnam, where both sectors expand by greater percentages under the RCEP scenario. Services sectors expand in every member country as higher total output increases demand for capital including construction, and reductions in NTBs on services trade promote trade in services. Again, sectoral output changes become larger in most sectors when the model with the GVC structure is employed.

5. Conclusion

We have attempted to estimate the welfare and sectoral output effects of the CPTPP and RCEP using the dynamic GTAP model that incorporates the GVC structure, and to compare the results with those obtained from the standard dynamic GTAP model. The preliminary results suggest that the incorporation of the GVC structure has little impact on the magnitudes of welfare effects of each country/region, while it might affect the magnitudes of sectoral output changes substantially. However, since we are still in the process of creating a globally consistent GTAP-ICIO database, we hope to revise and complete the paper by June 2019.

References

Aguiar, A., B. Narayanan, and R. McDougall (2016). An overview of the GTAP 9 data base. *Journal of Global Economic Analysis*, 1(1), 181-208.

Amiti, M., and A. Khandelwal (2013). Import competition and quality upgrading. *Review of Economics and Statistics*, 95(2), 476-490.

Armington, P. S. (1969). A theory of demand for products distinguished by place of production. *IMF Staff Papers*, 16, 159-178.

Blyde, J., A. Graziano, and C. Volpe Martincus (2015), Economic integration agreements and production fragmentation: Evidence on the extensive margin. *Applied Economics Letters*, 22(10), 835-842.

Brown, D. K., K. Kiyota, and R. M. Stern (2010). Computational analysis of the menu of U.S.-Japan trade policies. RSIE Discussion Paper No. 611. Ford School of Public Policy, University of Michigan.

Cai, S., Y. Zhang, and B. Meng (2015). Spillover effects of TTIP on BRICS economies: A dynamic GVC-based CGE model. IDE Discussion No. Papers 485. Institute of Developing Economies, Japan External Trade Organization.

Chen, N., J. Imbs, and A. Scott (2009). The dynamics of trade and competition. *Journal of International Economics*, 77, 50-62.

Gilbert, J., T. Furusawa, and R. Scollay (2018). The economic impact of the Trans‐Pacific Partnership: What have we learned from CGE simulation? *The World Economy*, 41(3), 831-865.

Greenville, J., K. Kawasaki, and D. Flaig (2017). Policy drivers of agro-food GVC participation. GTAP Resource No. 5277. Center for Global Trade Analysis, Purdue University.

Halpern, L., M. Koren, and A. Szeidl (2015). Imported inputs and productivity. *American Economic Review*, 105(12), 3660-3703.

Hertel, T. W., ed. (1997). *Global Trade Analysis: Modeling and Applications*. Cambridge: Cambridge University Press.

Hummels, D. L., and G. Schaur (2013). Time as a trade barrier. *American Economic Review*, 103(7), 2935-59.

Ianchovichina, E., and R. McDougall (2012). Theoretical structure of dynamic GTAP. In: E. Ianchovichina and T. L, Walmsley, eds., *Dynamic Modeling and Applications for Global Economic Analysis*. Cambridge: Cambridge University Press.

International Monetary Fund (2018). *World Economic Outlook Database*, April 2018. Washington, DC: International Monetary Fund.

Laget, E., A. Osnago, N. Rocha, and M. Ruta (2018). Deep trade agreements and global value chains. World Bank Policy Research Working Paper 8491.

Lee, H. and K. Itakura (2018). The welfare and sectoral adjustment effects of mega-regional trade agreements on ASEAN countries. *Journal of Asian Economics*, 55, 20-32.

Lileeva, A. (2008). Trade liberalization and productivity dynamics: Evidence from Canada. *Canadian Journal of Economics*, 41(2), 360-390.

McDougall, R. (2003). A new regional household demand system for GTAP. GTAP Technical Paper No. 20, Center for Global Trade Analysis, Purdue University.

Minor, P. (2013). Time as a barrier to trade: A GTAP database of ad valorem trade time costs. ImpactEcon, Second Edition.

Miroudot, S., D. Rouzet, and F. Spinelli (2013), Trade policy implications of global value chains: Case studies. OECD Trade Policy Papers No. 161, Paris: OECD. Available at http://dx.doi.org/10.1787/5k3tpt2t0zs1-en

Orefice, G., and N. Rocha (2014), Deep integration and production networks: An empirical analysis. *World Economy*, 37(1), 106-136.

Ruta, Michele (2017). Preferential trade agreements and global value chains: Theory, evidence, and open questions. In: World Bank et al., *Global Value Chain Development Report 2017: Measuring and Analyzing the Impact of GVCs on Economic Development*, 175-185.

Trefler, D. (2004). The long and short of the Canada-U.S. Free Trade Agreement. *American Economic Review*, 94(4), 870-895.

United Nations (2017). *World Population Prospects: The 2017 Revision*. New York: United Nations.

Walmsley, T., and P. Minor (2017). Reversing NAFTA: A supply chain perspective. Working Paper 007, Rev. 2. Boulder, CO: ImpactECON.

Wang, Z., S. Mohan, and D. Rosen (2009). Methodology for estimating services trade barriers. Rhodium Group and Peterson Institute for International Economics.

Table 1: Regional and sectoral aggregation

A. Regional aggregation

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

B. Sectoral aggregation

	Sector	Corresponding commodities/sectors in the GTAP 9 database
1	Agricultural products	GTAP sectors 1-12, processed rice
2	Fuels and other resources	Coal, oil, gas, forestry, fishing, minerals nec
3	Food products	GTAP sectors 19-26, excluding processed rice
4	Textiles and apparel	Textiles, wearing apparel, leather products
5	Petro and chemical products	Petroleum & coal products, Chemical, rubber & plastic products
6	Metals	Iron and steel, nonferrous metal, fabricated metal products
7	Machinery	Machinery and equipment
8	Electronic equipment	Electronic equipment
9	Motor vehicles	Motor vehicles and parts
10	Other transport equipment	Transport equipment nec
11	Other manufactures	Wood products; paper products, publishing, mineral products nec, manufactures nec
12	Construction and utilities	Construction, electricity, gas manufacture and distribution, water
13	Trade and transport	Trade, sea transport, air transport, other transport
14	Other services	Communication, financial services, all other services

Source: GTAP database, version 9.

Note: WH-TPP = CPTPP members in the Western Hemisphere.
nec = not elsewhere classified.

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

	Sector	Japan	China	Korea	Taiwan	Singapore & Brunei	Indones & Phillipines	Malaysia	Thailand	Vietnam
1	Agricultural products	13.7	4.4	156.8	4.4	0.0	5.1	13.0	15.4	3.8
2	Fuels and other resources	0.0	0.2	2.2	0.1	0.0	0.4	1.4	0.1	3.2
3	Food products	17.6	8.7	30.7	11.9	1.0	5.9	6.4	12.3	10.9
4	Textiles and apparel	9.0	4.1	8.3	7.1	0.1	2.6	7.8	10.5	10.9
5	Petro and chemical prod	0.7	4.4	4.5	1.9	0.0	2.4	3.4	6.5	5.2
6	Metals	0.4	2.3	1.8	0.6	0.0	2.6	9.7	2.9	2.8
7	Machinery	0.0	5.5	5.5	1.9	0.2	3.1	2.3	6.2	3.5
8	Electronic equipment	0.0	1.5	0.5	0.2	0.0	0.4	0.1	2.3	1.5
9	Motor Vehicles	0.0	17.5	7.0	12.5	1.4	8.6	15.0	28.6	20.2
10	Other transport equipment	0.0	2.8	1.3	1.5	0.0	2.0	1.2	5.1	10.3
11	Other manufactures	1.0	3.2	4.8	2.8	0.1	2.6	7.5	6.7	10.7
12	Construction and utilities	5.0	25.2	13.0	10.8	0.8	63.7	17.4	44.9	53.7
13	Trade and transport	18.3	85.1	27.7	24.1	1.7	85.8	29.5	57.4	74.1
14	Other services	17.9	80.2	30.1	27.0	1.9	87.8	30.5	56.1	75.3

	Sector	Rest of ASEAN	Australia	New Zealand	India	United States	WH-TPP members	EU-28	Rest of world
1	Agricultural products	6.1	0.3	0.0	21.5	0.6	1.2	1.1	8.3
2	Fuels and other resources	3.2	0.0	0.0	1.4	0.0	0.3	0.0	0.6
3	Food products	10.2	1.3	1.1	58.1	2.1	9.8	2.4	14.0
4	Textiles and apparel	8.6	6.2	6.8	12.3	9.5	8.0	3.6	11.6
5	Petro and chemical prod	7.6	1.0	0.9	7.1	1.1	0.5	0.4	4.3
6	Metals	3.3	1.9	1.6	8.7	0.7	0.7	0.3	4.1
7	Machinery	5.5	1.9	2.1	7.5	0.8	0.8	0.4	4.8
8	Electronic equipment	9.7	0.5	0.4	1.8	0.2	0.4	0.5	3.5
9	Motor Vehicles	17.8	18.2	5.6	20.3	0.6	1.4	0.6	9.9
10	Other transport equipment	5.7	1.6	0.5	7.9	0.5	1.3	0.6	6.4
11	Other manufactures	7.4	2.7	1.4	9.1	0.9	1.4	0.4	6.4
12	Construction and utilities	20.6	4.3	1.0	109.7	2.3	15.7	5.6	30.9
13	Trade and transport	24.4	12.9	5.8	139.7	6.8	25.7	9.9	42.5
14	Other services	16.6	15.5	5.0	138.9	7.5	26.1	9.9	44.2

Sources: Sectors 1-11: GTAP database, version 9. Sectors 12-14: 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: The welfare effects under the CPTPP and RCEP scenarios
(percent changes in equivalent variations relative to real income)

A. Dynamic GTAP model

	CPTPP			RCEP		
	2025	2030	2035	2025	2030	2035
Japan	0.3	1.0	1.8	0.3	1.0	1.6
China	0.0	0.0	0.2	0.4	1.3	2.2
Korea	0.4	1.8	3.6	1.3	3.3	4.4
Taiwan	0.3	1.5	3.1	-0.2	0.8	3.0
Singapore & Brunei	1.0	2.4	3.8	1.0	2.5	3.5
Indones & Philippines	0.0	0.5	1.3	0.2	0.9	1.8
Malaysia	0.9	2.3	4.0	0.7	2.1	3.5
Thailand	0.4	2.1	4.3	0.9	2.3	3.5
Vietnam	0.7	1.7	2.8	0.3	0.9	1.9
Rest of ASEAN	-0.1	-0.2	-0.3	0.2	0.8	1.6
Australia	0.1	0.2	0.3	0.1	0.4	0.8
New Zealand	0.6	1.4	2.2	0.3	1.0	1.9
India	0.0	0.0	0.0	0.7	1.9	2.8
United States	0.0	0.2	0.5	0.0	-0.1	-0.2
WH-TPP members	0.3	0.9	1.6	-0.1	-0.2	-0.2
EU-28	0.0	0.0	-0.1	0.0	-0.2	-0.4
Rest of world	-0.1	-0.2	-0.3	-0.1	-0.2	-0.2

B. Modified dynamic GTAP model with GVC structure

	CPTPP			RCEP		
	2025	2030	2035	2025	2030	2035
Japan	0.3	0.9	1.7	0.3	1.0	1.6
China	0.0	0.1	0.2	0.4	1.3	2.3
Korea	0.4	1.8	3.6	1.1	3.0	4.2
Taiwan	0.3	1.4	2.9	0.0	1.2	3.3
Singapore & Brunei	1.0	2.5	3.9	1.1	2.8	3.9
Indones & Philippines	0.0	0.4	1.3	0.3	0.9	1.9
Malaysia	0.8	2.2	3.9	0.7	2.2	3.5
Thailand	0.4	2.0	4.5	0.9	2.6	4.0
Vietnam	0.7	1.7	2.7	0.3	1.0	1.8
Rest of ASEAN	-0.1	-0.2	-0.2	0.2	0.8	1.6
Australia	0.1	0.3	0.5	0.1	0.4	0.9
New Zealand	0.5	1.3	2.2	0.3	1.0	1.8
India	0.0	0.1	0.1	0.6	1.9	3.0
United States	0.0	0.2	0.5	0.0	-0.1	-0.1
WH-TPP members	0.3	0.9	1.6	-0.1	-0.2	-0.2
EU-28	0.0	0.0	-0.1	0.0	-0.1	-0.2
Rest of world	-0.1	-0.2	-0.3	-0.1	-0.2	-0.2

WH-TPP members: CPTPP members in the Western Hemisphere (i.e. Canada, Mexico, Chile and Peru).
Source: Model simulations.

Table 4: Sectoral output adjustments for selected countries in 2035 under the CPTPP and RCEP scenarios
(percent changes relative to the baseline)

A. Dynamic GTAP model

	Japan		China		Indones & Philippines		Malaysia	
Sector	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP
Agricultural products	-1.4	-1.2	-0.3	0.5	0.2	0.8	0.7	0.8
Fuels and other resources	1.0	0.9	-0.1	0.9	0.5	0.9	0.9	0.9
Food products	0.5	1.1	-0.3	1.2	0.3	4.3	1.1	4.6
Textiles and apparel	-1.1	-8.2	-0.9	-0.4	19.2	-1.8	27.2	-0.1
Petro and chemical prod	4.4	5.1	-1.1	1.6	1.9	0.9	5.8	2.0
Metals	1.4	2.6	-0.1	1.7	6.5	4.4	8.3	12.6
Machinery	-1.5	-2.5	0.3	2.4	3.0	0.8	11.9	4.2
Electronic equipment	-2.3	-2.7	0.2	0.1	0.2	2.9	6.2	4.7
Motor Vehicles	1.4	2.4	-1.0	2.4	4.1	3.1	6.1	4.8
Other transport equipment	-0.6	-5.0	0.0	4.0	-1.8	-1.5	13.0	9.4
Other manufactures	0.9	1.4	-0.3	2.7	4.4	3.3	5.6	3.2
Construction and utilities	4.8	4.9	-1.1	6.1	8.5	5.9	9.9	7.4
Trade and transport	1.1	1.1	0.0	1.7	2.2	2.1	7.8	6.1
Other services	1.0	0.9	0.0	1.4	0.5	1.3	1.8	1.9

	Thailand		Vietnam		United States		WH-TPP members	
Sector	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP
Agricultural products	-0.1	0.4	0.2	0.9	0.6	0.0	0.7	0.1
Fuels and other resources	0.5	0.9	0.9	0.9	0.6	0.0	1.1	0.0
Food products	0.4	7.8	-1.6	-1.2	2.1	-0.2	2.4	-0.4
Textiles and apparel	9.5	1.3	51.4	4.9	-4.0	0.2	-3.1	0.1
Petro and chemical prod	4.2	2.9	1.7	0.5	0.9	-1.3	4.9	-1.6
Metals	4.5	9.4	3.2	7.4	-1.0	-0.8	4.8	-2.7
Machinery	8.9	11.1	4.9	8.5	-0.7	-1.2	2.5	-1.6
Electronic equipment	7.7	14.6	4.4	10.3	0.5	-0.5	1.9	-0.8
Motor Vehicles	9.6	10.5	3.9	2.1	-0.1	-1.0	4.1	-1.4
Other transport equipment	11.6	8.7	4.9	-0.7	-0.2	0.0	0.5	-1.3
Other manufactures	6.9	6.4	7.3	0.9	0.3	-0.6	4.0	-1.7
Construction and utilities	20.1	17.8	13.0	6.0	0.6	-1.9	6.4	-3.7
Trade and transport	6.5	7.5	5.0	2.8	0.3	-0.3	1.8	-0.6
Other services	1.9	2.6	1.0	0.9	0.1	-0.1	0.6	-0.2

Table 4 (continued)

B. Modified dynamic GTAP model with GVC structure

	Japan		China		Indones & Philippines		Malaysia	
Sector	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP
Agricultural products	-1.3	-1.0	-0.2	0.5	0.0	0.6	0.3	0.6
Fuels and other resources	1.1	0.9	-0.1	0.9	0.5	0.9	0.9	0.8
Food products	-2.8	-0.1	-0.2	0.9	0.0	10.8	6.9	16.8
Textiles and apparel	-1.2	-14.9	-1.0	0.0	20.9	-2.6	38.3	3.1
Petro and chemical prod	6.2	6.0	-1.1	2.4	0.9	0.6	6.2	3.5
Metals	2.2	5.5	0.3	-0.2	4.8	4.0	3.5	6.9
Machinery	0.2	-2.5	0.3	2.2	1.4	0.1	12.9	5.4
Electronic equipment	-5.2	-7.0	-0.4	0.3	-1.0	2.3	7.5	5.3
Motor Vehicles	4.2	3.8	-0.9	1.4	1.5	1.7	4.9	4.1
Other transport equipment	0.8	-7.2	-0.1	4.5	-2.0	-2.1	15.1	11.3
Other manufactures	0.6	0.3	-0.2	2.9	3.8	3.4	3.0	1.0
Construction and utilities	3.9	3.9	-1.0	5.7	8.2	6.6	9.6	7.6
Trade and transport	0.7	0.7	0.2	1.5	1.8	2.1	7.9	6.5
Other services	0.7	0.7	0.0	1.2	0.3	1.1	1.2	1.4

	Thailand		Vietnam		United States		WH-TPP members	
Sector	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP	CPTPP	RCEP
Agricultural products	-0.4	-0.1	0.5	1.1	0.7	0.0	0.7	0.1
Fuels and other resources	0.4	0.8	0.9	0.9	0.6	0.0	1.1	0.0
Food products	2.4	14.3	-6.8	-4.2	2.2	-0.2	1.8	-0.2
Textiles and apparel	10.9	0.9	57.3	8.8	-10.2	-0.4	-7.5	-0.1
Petro and chemical prod	3.2	3.8	0.8	0.1	0.5	-1.3	5.3	-1.4
Metals	3.8	10.2	3.0	8.8	-0.7	-1.6	4.2	-1.9
Machinery	8.7	11.3	7.8	13.8	-0.8	-1.9	1.7	-1.5
Electronic equipment	7.1	13.6	6.0	14.1	1.2	-1.5	1.6	-1.5
Motor Vehicles	9.9	11.6	-5.3	-1.6	-1.4	-0.9	4.0	-1.3
Other transport equipment	11.5	8.1	-0.3	-6.1	0.4	-0.5	-0.2	-1.2
Other manufactures	6.6	6.4	4.3	-2.4	0.4	-0.8	3.5	-1.2
Construction and utilities	20.2	20.6	11.1	4.8	0.5	-1.8	5.5	-3.6
Trade and transport	7.0	8.8	3.5	2.1	0.2	-0.2	1.6	-0.5
Other services	1.3	2.5	-0.8	0.2	0.1	0.0	0.4	-0.2

Source: Model simulations.