Indo-Pacific cooperation: what do trade simulations indicate?

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Abstract

This paper investigates the potential economic effect of 'Indo-Pacific' regional economic cooperation and compares with the extended CPTPP. The Computable General Equilibrium (CGE) results show that the quadrilateral alliance between the United States, Japan, Australia, and India shows although a substantial economic gain whilst South and East Asia join with the Indo-Pacific cooperation, the economic benefit would be enormous. The findings also indicate that South and East Asian improved trade facilitation could bring huge gain as a large part of Indo-Pacific trade has remained unrealized. The trade transaction cost is one of the major trading barriers prohibiting the growth of Indo-Pacific intra-regional trade. The study reinforces that improvement in infrastructure and connectivity that leads to less trade transportation costs should be a necessary step to realise Indo-Pacific trade potential.

Keywords: Indo-Pacific, Trade, Regional integration, Trade facilitation, CGE

JEL Classification: F14, F15, F17

1 Introduction

The regional dynamics in the Asia–Pacific region are changing rapidly. China's "Belt and Road Initiative" has gained enormous attention. The USA has withdrawn from the Trans-Pacific Partnership (TPP) Agreement and TPP11, which is now called Comprehensive and Progressive Trans-Pacific Partnership (CPTPP) and has been signed on 8 March 2018 in Chile. The Regional Comprehensive Partnership (RCEP)[1] has also gained momentum recently. The trilateral free trade agreement (FTA) between China, Japan, and South Korea, the USA and the EU free trade agreement (FTA) (Transatlantic Trade and Investment Partnership—TTIP),[2] and other regional trade agreements have been emerging due to the deadlock of the WTO's Doha Round. Against this backdrop, a new regional bloc called 'Indo-Pacific' has gained high prominence. Originally, this regional cooperation was aimed to foster a quadrilateral alliance (also known as Quad) between

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[1] The Regional Comprehensive Economic Partnership (RCEP) has developed amongst 16 countries: the 10 members of ASEAN (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam) and the six countries with which ASEAN has existing FTAs—Australia, China, India, Japan, Korea, and New Zealand. RCEP is a significant step in the evolution of trade policy frameworks in East Asia over the past decade. Total population of the region is over 3 billion people and a trade share estimated at around 29% of global trade, covering GDP of about US$ 23 trillion (World Bank 2018b).

[2] The USA and the EU reaffirmed their commitment to conclude expeditiously a comprehensive and ambitious Transatlantic Trade and Investment Partnership (TTIP) that already accounts for nearly half of global output (EU 2017).

Table 1 Indo-Pacific's share in the World, 2017. Source: Authors' calculation based on WDI (2018a), World Bank

Indicators	Share in World (%)
Surface area	44
Population	65
Economic size (GDP, current US$)	62
Economic size (GDP, PPP $ term)	66
Merchandise trade	46

the United States, Japan, Australia, and India. However, several South, Southeast, East Asian and Pacific Island economies including Vietnam, New Zealand, Bangladesh, Sri Lanka and some of the Indian Ocean Rim (IOR) countries have shown interests in joining the Indo-Pacific group.

The attributes of the Indo-Pacific are quite appealing. The region comprises at least 38 countries that share 44% of world surface area and 65% of world population, and account for 62% of world-GDP and 46% of the world's merchandise trade (Table 1). However, the region faces complex challenges in terms of economy, security and the environment.[3]

Most of the Indo-Pacific studies however talk about maritime strategic and geopolitical aspects of the region. David (2012), for example, explores the political and maritime strategic discourse of the Indo-Pacific concept and tries to explore the maritime challenges that are being faced by India in the Indian Ocean and by the USA in the Pacific Ocean. He also discusses the different strategic pathways to meet the challenges. USAID (2015) attempts to inspect the trade relationship link of India with the Southeast and East Asian countries in the context of the Indo-Pacific. Mohan (2017) discusses the relevance of the Indo-Pacific alliance briefly, whilst Singh (2017) attempts to explore the maritime security under the Indo-Pacific context. De (2018), on the other, identifies scope for deepening Indo-Pacific cooperation in connectivity. Scott (2019) evaluates Indonesia's grappling with the Indo-Pacific and concludes that whilst Indonesia certainly is on the rise as an Indo-Pacific actor, its continuing naval weakness undermines Indonesia's "maritime nexus" stance suggesting a closer synergy for Indonesia with the US and Japanese Free and Open Indo-Pacific initiative is suggested. Although most of the literature has argued that the Indo-Pacific cooperation is simply an emerging idea, which is yet to take a formal shape of regional cooperation bloc.

The Computable General Equilibrium (CGE)-based welfare analysis is one of the growing areas for economic analysis of different regional integration including TPP, TTIP, RCEP, and many other free trade agreements. Within the Global Trade Analysis Project (GTAP)-based studies, most assume fixed factor supplies and variable factor prices. Gilbert et al. (2018) provide a detailed synthesis of CGE literature and discuss the economic impact of TPP. Kawasaki (2017) and Whittaker et al. (2013) allow for capital accumulation effects. Several papers modify the underlying theory of GTAP. USITC (2016) introduces an elastic labour supply, whilst Akgul et al. (2015) present firm heterogeneity in an exciting proof of

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[3] Refer, for example, Chandra and Ghosal (2018).

concept. Rahman and Ara (2015), Strutt et al. (2015) and Petri and Plummer (2016) attempt to quantify the impact of TPP, TTIP and RCEP on different regions. Cheong and Tongzon (2013) analyse the economic effects of TTP and RCEP and argue that the TPP should be extended for its economic benefit to all Asian countries, including the China. Rollo et al. (2014) evaluate some of the potential effects of TTIP economic integration on low-income countries. Berden et al. (2009) calculate the effects of tariff and NTMs reduction of the proposed TTIP and find that EU GDP may be 0.7% higher whilst the USA GDP could increase by 0.3% per year starting 2018 compared to the baseline scenario.

Ciuriak et al. (2016) use a modified version of the GTAP model with recursive dynamics model. The approach is similar to that of the GTAP-Dyn model described in Ianchovichina and McDougall (2001) and utilised in several studies (Cheong and Tongzon 2013; Lee and Itakura 2013). In other innovations, Li and Whalley (2014) employ an Armington-type model. Roh and Oh (2016) also introduce firm heterogeneity. Strutt et al. (2015) estimate the potential economic of TPP on New Zealand economy using GTAP-Dyn and find that the welfare gains to New Zealand ranging from US$ 371 million (tariffs only) to US$ 1.8 billion (tariffs plus NTMs). The above brief review shows that various aspects of TPP, CPTPP, TTIP, and RCEP have been analysed using CGE. However, there is no single research to quantify the impact on Indo-Pacific regional economic cooperation. It would, therefore, be interesting to see the implications of the Indo-Pacific trade deal.

With the above background, the objective of this paper is to make a comparative analysis of likely impact of tariff reduction and trade facilitation under the Indo-Pacific regional integration on various macro- and trade variables. The main aim of the study is to explore different free trade agreements under the canopy of the Indo-Pacific framework. We simulate reductions of tariff and improved trade facilitation in CGE models. This study has the potential to provide profound insights into the currently active policy debate on the regional mega deal. Rest of the paper is arranged as follows. Followed by Introduction in Sect. 1, methodology is briefed in Sect. 2. Section 3 presents the results and conclusions are drawn in Sect. 4.

2 Methodology and structure of GTAP model

The most common modelling technique for estimating economic impacts of a trade agreement with economy-wide effects involves the CGE modelling framework of GTAP. The CGE model and GTAP structure are presented in Hertel (1997).[4] The basic structure of the GTAP database includes industrial sectors, households, governments, and global sectors across countries. Countries and regions in the world economy are linked together through trade. Prices and quantities are simultaneously determined in both factor markets and commodity markets. The main factors of production are skilled and unskilled labour, capital, natural resources and land (Hertel 1997).

Producers operate under constant returns to scale, where the technology is described by the Leontief and CES functions. Two broad categories of inputs are identified: intermediate inputs and primary factors of productions. In the model, firms minimise costs of inputs given their level of output and fixed technology. First, producers use composite units of

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[4] Refer Hertel (1997) for a full introduction to the database.

intermediate inputs and primary factors in fixed proportions following a Leontief production function. At the second level of the production nest, intermediate input composites are obtained combining imported bundles and domestic goods of the same input–output group.

Trade policy including NTMs can affect the price of traded goods relative to domestically produced goods. As a result, a key relationship for model analysis is the degree of substitution between imported and domestic goods. This key relationship is commonly identified as the Armington elasticity.[5] It is assumed that domestically produced goods and imports are imperfectly substituted.

Households' behaviour in the model is determined from an aggregate utility function. The aggregate utility is modelled using a Cobb–Douglas utility function with constant expenditure shares. This utility function includes private consumption, government consumption and savings. Current government expenditure goes into the regional household utility function as a proxy for government provision of public goods and services. Private households' consumption is explained by a constant difference elasticity expenditure function.

Domestic support, tariff and NTMs are modelled as ad valorem equivalents. These policies have a direct impact on the production and consumption sectors in the model. The simulation represents what the economy would look like if the policy change or shock had occurred. The difference in the values of the endogenous variables in the baseline and the simulation represents the effect of the policy change. So, the model should be able to provide the effect on trade and production patterns if the trade policy was changed.

This study uses data from GTAP version 9,[6] which has the base year of 2011. Version 9 of the GTAP database covers 57 commodities, 140 regions/countries and eight factors of production. The GTAP framework has strength because of theoretical rigour, its ability to represent direct and indirect interactions amongst all sectors of an economy and precise detailed quantitative results. The strength of the multi-country CGE model is that it incorporates elegantly the features of neoclassical general equilibrium and real international trade models in an empirical framework (Thierfelder et al. 2007). The model's results may be very sensitive to the assumptions and data used.

2.1 Assumptions of GTAP model

The main assumption of standard GTAP model is a single regional household with an aggregated utility function. This allocates the regional expenditure across three components that is private expenditure, the government expenditure and savings (Hertel 1997). The model assumes that the regional household sell its endowment commodities to the domestic firms and earn income. The aggregate utility is modelled using a Cobb–Douglas utility function with constant expenditure shares. The firms, in turn, combine these endowment commodities with intermediate commodities and produce goods for final demand. Producers operate under constant returns to scale, where the technology is described by the Leontief and CES functions. It is assumed that domestically produced goods and imports are imperfectly substituted. The one is a global bank that

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[5] The constant elasticity of substitution (CES) specification for the trade substitution elasticity is derived from Armington (1969).

[6] Recently GTAP Version 10 has been released.

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works as intermediary between global savings and regional investment. The other sector is the trade accounts' and transports' activities. The global bank creates a composite investment good and then supplies this to the regional households to satisfy their saving demands based on a common price for all the savers.

2.2 Closures

Model closure statements define which variables are endogenous and which are exogenous. The standard GTAP closure has considered for this analysis. Hertel and Tsigas (1997) and Burfisher (2016) discuss the detailed structure of GTAP closure and how to modify the closure for a particular analysis. To modify the model's standard closure statement, it requires to swap an exogenous variables for an endogenous variable. In this study, we assume that there is perfect competition in all sectors. Production factors, i.e., capital and labour, are assumed to be fully mobile between sectors, whereas land and natural resources are treated as sluggish to move (Burfisher 2016). Fixed balance of trade, that is, for a country, allows domestic savings to adjust to maintain a fixed ratio between trade balance and national income. Government spending is assumed as a constant share of government income. The expected rate of return drives investment as in the standard GTAP model, and total domestic savings is by the sum of private household savings and government budget. Hence, the trade balance is endogenous.

The global bank in the GTAP model uses receipts from the sale of a homogeneous savings commodity to the individual regional households to purchase shares in a portfolio of regional investment goods. The size of this portfolio adjusts to accommodate changes in global savings. Therefore, the global closure in this model is neoclassical (Hertel 1997).

2.3 The GTAP model for macroeconomic analysis[7]

The bilateral import tariffs amongst these countries are presented in Table 2. Bilateral average applied import tariffs of Australia and the USA are much lower compared to others. However, Australia imposes comparatively higher tariffs when importing from Japan and India, especially on food grains and processed foods. Japan's import duties on Australia and the USA are also lower, but Japan maintains higher tariffs when importing from India. The USA maintains high tariffs importing from both Japan and India. It is surprising that Indian average applied tariffs on imports from Australia, Japan, and the USA are relatively low, compared to its trade partners.

As mentioned earlier, we use Version 9 of the GTAP database. Data on regions and commodities are aggregated to meet the objectives of this study. The Version 9 of the GTAP database covers 57 commodities, 140 regions/countries and eight factors of production. For the sake of convenience, the 140 regions have been aggregated into 15 regions whereas the 57 sectors have been aggregated into 10 sectors as shown in Appendix.

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[7] Refer Hertel (1997) for a full introduction to the database, available at https://www.gtap.agecon.purdue.edu.

Table 2 Bilateral average applied import tariff rate for 2011. Source: GTAP version 9

	Australia's import tariff on			Japan's import tariff on			USA's import tariff on			India's import tariff on		
	Japan	USA	India	Australia	USA	India	Australia	Japan	India	Australia	Japan	USA
GrainsCrops	35.4	0.2	35.1	0.1	3.6	12.3	0	25	25.8	0	5.1	1.2
MeatLstk	34.4	4.6	15.2	0.0	4.9	12.3	0	27.3	23	0.5	0.9	0.6
Extraction	0.0	0	21.1	0.2	0.1	13.6	0	0.2	13.2	0.3	0.1	0
ProcFood	27.4	4.3	57.4	1.6	3.9	43.9	0	11.9	56.1	1.5	2.5	2.2
TextWapp	3.2	4.5	17.1	6.1	6.2	15	6.8	7	15	9.4	5.4	9.1
LightMnfc	0.2	0	15.4	15	1.2	26.4	1.7	0.4	6.5	4	0.7	0.3
HeavyMnfc	0.4	0	14.8	2.8	1.1	14.5	0	0.6	11.4	2.8	0.4	0.5

This study has simulated two scenarios: (i) all bilateral tariff eliminations by all its partners under four different scenarios; and (ii) improvement of trade facilitation by 25% in this region. Here, iceberg trade costs "ams" import-augmenting "technical change" variable has been used to represent trade facilitation. The parameter "*ams* (*i,r,s*)" has been introduced to handle bilateral services' liberalisation as well as other efficiency-enhancing measures that serve to reduce the effective price of goods and services' imports. The introduction of this variable facilitates simulation of efficiency improvements such as customs' automation or e-commerce. When *ams* (*i,r,s*) is shocked by 25%, 25% more products become available to domestic consumers, given the same level of exports from the source country. To ensure that producers still receive the same revenue on their sales, effective import prices (*pms*) fall by 25%. However, we simulate following four different scenarios for potential impact analysis of the Indo-Pacific economic cooperation:

Scenario	Members
Indo-Pacific 1	USA, Japan, India, and Australia FTA
Indo-Pacific 2	Indo-Pacific 1 + South Asia[a] + Southeast Asia[b]
Indo-Pacific 3	CPTPP[c] + India + Korea + China
Indo-Pacific 4	Indo-Pacific 1 + ASEAN + New Zealand + Bangladesh + Sri Lanka + Pakistan + China + Korea + Kenya + Oman + Tanzania + Mozambique + South Africa + Mauritius + Russia + Chile + Mexico + Canada

[a]South Asian market, which consists of Afghanistan, Bangladesh, Bhutan, India, Maldives, Pakistan, Nepal and Sri Lanka, has 1.8 billion population and a total GDP of US$ 2.37 trillion in 2016.

[b]Southeast Asia consists of ten countries: Brunei, Burma, Cambodia, Indonesia, Lao, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. All of these countries are members of the Association of Southeast Asia Nations (ASEAN). Southeast Asia has 622 million population and a total GDP of US$ 2.35 trillion as on 2017.

[c]The TPP 11 (CPTPP) has been signed on 8 March 2018 in Chile, which has become a global mega deal.

3 Analysis of the simulations

The welfare and other macroeconomic effects of the simulations under 'Indo-Pacific 1' are presented in Table 3. The results show that if these four countries (Australia, Japan, India and the USA) remove tariffs, all are expected to experience huge gain in welfare, real GDP and exports. The real GDP could be increased by 0.23% for India, which amounts to US$ 2.69 billion in 2014. Indian exports may increase tremendously, accounted for 2.4% and US$ 5.7 billion, and at the same time import could be increased by 2.3%, which amounts to about US$ 6.8 billion. On the other, illustrated in Table 4, the real GDP of Australia, Japan and the USA could be increased by 0.11, 0.05 and 0.01%, respectively, whereas exports may increase by 1.27, 0.58 and 0.56%, respectively.

The reduction of tariffs and non-tariff measures including improved trade facilitation would reduce import cost of its trading partner(s). The exports prices would fall, which could make imports cheaper for its partners. Therefore, a rise in terms of trade (TOT) is significantly contributing to the welfare gain in the region. The allocative

Table 3 Macroeconomic impact of tariff eliminations under 'Indo-Pacific 1'. Source: Authors' simulation from GTAP version 9

Country	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
New Zealand	− 144.51	− 0.01	− 0.09	− 0.71
Australia	2767.05	0.11	1.27	3.25
China	− 1788.54	− 0.01	− 0.09	− 0.26
Japan	5035.89	0.05	0.58	1.44
Korea	− 447.34	− 0.01	− 0.02	− 0.19
ASEAN	− 683.2	− 0.01	− 0.03	− 0.17
Malaysia	− 202.99	− 0.02	− 0.03	− 0.15
Vietnam	− 92	− 0.04	− 0.03	− 0.2
South Asia	− 117.22	− 0.01	− 0.06	− 0.26
India	2692.39	0.23	2.45	2.34
Canada	− 793.28	0	0.03	− 0.28
USA	3686.21	0.01	0.56	0.58
Latin America	− 695.98	0	0.05	− 0.19
EU25	− 1043.17	0	0.03	− 0.05
Rest of World	− 2998.4	0	0.01	− 0.14

Table 4 Impact of tariff eliminations on sectoral trade under 'Indo-Pacific 1'. Source: Authors' simulation from GTAP version 9

	India		Japan		USA		Australia	
	Import (%)	Export (%)	Import (%)	Export (%)	Import (%)	Export (%)	Import (%)	Export (%)
GrainsCrops	10.54	− 0.81	11.46	8.08	2.17	5.24	7.13	4.76
MeatLstk	16.08	− 2.43	10.85	13.91	2.52	11.65	8.37	18.59
Extraction	− 0.45	4.26	− 0.05	0.56	0.1	0.41	4.03	0.94
ProcFood	2.72	0.6	3.77	5.63	0.85	4.32	2.99	9.02
TextWapp	4.76	15.22	1.02	2.57	1.67	1.67	2.53	1.11
LightMnfc	6.55	1.4	1.93	3.13	0.71	0.33	6.42	− 3.15
HeavyMnfc	3.9	3.09	1.41	− 0.18	0.55	0.45	2.08	1.37
Util_Cons	0.97	− 0.08	1.3	− 2.37	0.39	− 0.6	2.21	− 4.39
TransComm	0.51	− 0.5	0.92	− 0.71	0.32	− 0.33	1.96	− 3.64
OthServices	0.71	− 1.54	0.89	− 1.9	0.28	− 0.48	1.93	− 4.04

efficiency could increase, which will then lead to higher output and production, especially in food grains, textiles and clothing and heavy industry, thereby expanding real GDP volume. As the imports are higher than its exports in all these four countries, importing the capital machinery for exports may positively affect allocative efficiency.

Light manufacturing and textiles and clothing sector are the primary competitive sectors of India. The import tariff of textiles and clothing is about 12.8% of Indian partners. Therefore, elimination of tariff of the textiles and clothing sector could increase exports of this sector significantly. At the product level, India's exports may likely go up in cases of textiles and clothing and heavy manufacturing goods. Export of textiles and clothing could be the highest gainer, which may increase to about 15%. Australia's agricultural exports (crops and grains, processed food and meat) could be increased tremendously.

Table 5 Macroeconomic impact of tariff eliminations and 25% increase in trade facilitation under 'Indo-Pacific 1'. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
New Zealand	− 862.72	− 0.07	− 1.87	0.33
Australia	25,562.62	1.72	5.69	− 0.69
China	− 18,012.7	− 0.16	− 1.5	− 0.41
Japan	75,767.8	0.9	4.19	− 1.01
Korea	− 4992.09	− 0.09	− 1.27	− 0.33
ASEAN	− 6648.9	− 0.09	− 1.48	− 0.52
Malaysia	− 2184.22	− 0.22	− 1.48	− 0.54
Vietnam	− 783.12	− 0.29	− 1.57	− 0.65
South Asia	− 859.92	− 0.08	− 1.57	− 0.76
India	31,429.47	1.87	2.21	− 1.09
Canada	− 9437.72	− 0.08	− 2.23	− 0.28
USA	85,086.96	0.42	0.26	− 1.1
Latin America	− 6668.03	− 0.06	− 1.79	− 0.91
EU25	− 15,625.4	− 0.01	− 1.38	− 1.18
Rest of World	− 31,208	− 0.02	− 1.78	− 0.86

The export of heavy manufacturing sector could be major gainer for the USA. The processed food, meat and light engineering could be major exports' items of Japan.

Some of the trade costs (e.g. the costs of customs' clearance) are not explicitly covered in the GTAP database. How do we then introduce these non-tariff shocks and analyse their likely impact on trade flows? The approach we have taken is to introduce the notion of an "effective price" of commodity i, imported from country r, at domestic prices in destination markets. The technical coefficient "import-augmenting technical change" (*ams*) is unobserved, and equal to one in initial equilibrium. Changes in its value capture the impact of trade facilitation measures on the price of imports from a particular exporter. Thus, an increase in *"ams"* ensures a fall in the effective domestic price of good i exported from country r to country s.

The results presented in Table 5 indicate that India would gain enormously if the country reduces trade costs by 25%. Economic welfare could be increased by US$ 31 billion and real GDP by 1.87%, which is accounted for US$ 23.5 billion. Real GDP of Australia, Japan and the USA may increase by 1.72, 0.9 and 0.42%, respectively. The results indicate that trade-related transaction cost is one of the major trading barriers prohibiting the growth of Indo-Pacific intra-regional trade. One interesting finding emerges that South and Southeast Asian welfare and GDP would fall due to diverting trade from more efficient partners to less-efficient partners due to the free trade deal.

If Southeast Asian (ASEAN) countries could join the Indo-Pacific block, all these member countries under this regional economic cooperation could gain significantly. Indian GDP and growth could benefit the most. Southeast Asian countries will also be benefitted from the free trade deal. However, if the trade facilitation increases by 25% amongst these countries, the potential benefit will be enormous. Table 6 presents the simulations results of the macroeconomic impacts. Real GDP of Australia and Japan

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Table 6 Macroeconomic impact of tariff eliminations under 'Indo-Pacific 2: Indo-Pacific 1 + Rest of South Asia + Rest of ASEAN'. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
New Zealand	− 213.73	− 0.02	− 0.14	− 1.06
Australia	2775.99	0.12	1.44	3.42
China	− 4782.63	− 0.06	− 0.28	− 0.61
Japan	7708.29	0.06	0.78	2.17
Korea	− 1004.13	− 0.02	− 0.07	− 0.43
ASEAN	5031.04	0.17	1.42	2.7
Malaysia	− 314.79	− 0.02	0.2	0.17
Vietnam	78.51	0.02	0.28	0.89
South Asia	1294.74	0.32	6.71	6.75
India	6640.85	0.58	5.13	4.55
Canada	− 966.25	0	0.05	− 0.36
USA	3415.48	0.01	0.95	0.71
Latin America	− 1188.31	− 0.01	0.05	− 0.38
EU25	− 2438.33	0	0.04	− 0.11
Rest of World	− 4902.03	− 0.01	− 0.02	− 0.29

could increase rapidly. The USA could gain from the deal. Economies of Malaysia and Vietnam will be boosted significantly due to increased trade facilitation.

Tremendous potential exists for increasing trade between South and Southeast Asia, which would provide substantial economic benefits to both regions. South and Southeast Asia are large regions in population and economic terms. South Asia has 1.8 billion population and a total GDP of US$ 2.91 trillion, whilst Southeast Asia has 622 million population and a total GDP of US$ 2.8 trillion in 2016 (World Bank 2018a, b). Whilst trade flows between the regions have been increasing substantially over the decade as both regions have embraced more outward-oriented reforms, current trade flows are still far below potential levels.

South Asia's exports to Southeast Asia are only 2.1% of South Asia's GDP, whereas Southeast Asia's exports to South Asia equal 3.2% of Southeast Asia's GDP in 2016 (World Bank 2018a, b). According to the Ease of Doing Business of World Bank, trade facilitation of all South Asian countries is overwhelmingly underdeveloped[8] and most of the East Asian countries also have similar situation except Singapore and Japan[9] (World Bank 2018a, b). Therefore, this mega deal could bring enormous benefit to both South and Southeast Asian countries if it could be able to reduce trade-related transaction cost as shown in Table 7.

If India, South Korea and China could enter the mega deal CPTPP, these three countries will be benefitted enormously. Trade benefit of Vietnam and Malaysia could be highest. Our results are consistence with the findings of Gilbert et al. (2018), Cheong and Tongzon (2013), Li and Whalley (2014), Rahman and Ara (2015), and Ciuriak et al.

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[8] Ease of Doing Business Ranks of all South Asian Countries is over 100 except Bhutan and India.

[9] Singapore's rank on the Ease of Doing Business was one and Malaysian and Thailand ranked 24 and 26, respectively. The rest of ASEAN countries ranked over 50.

Table 7 Macroeconomic impact under Indo-Pacific 2: tariff eliminations and 25% increase in trade facilitation. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
New Zealand	− 1525.68	− 0.13	− 1.15	− 8.43
Australia	32,700.6	2.65	11.2	23.94
China	− 42,474.8	− 0.43	− 2.82	− 6.85
Japan	110,830	1.49	3.2	20.48
Korea	− 11,997.8	− 0.22	− 0.75	− 5.21
ASEAN	80,735.86	5.06	10.85	20.51
Malaysia	35,770.2	11.5	13.37	28.21
Vietnam	15,567.44	13.9	2.19	22.29
South Asia	12,929.77	3.66	14.48	20.31
India	49,425.86	3.26	15.79	16.93
Canada	− 14,326	− 0.12	− 0.46	− 5.93
USA	126,847.5	0.7	8.91	8.58
Latin America	− 12,063.1	− 0.1	0.71	− 3.61
EU25	− 36,569.8	− 0.04	0.56	− 1.32
Rest of World	− 60,021.7	− 0.06	− 0.04	− 3.2

Table 8 Macroeconomic of tariff elimination under 'Indo-Pacific 3'. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
New Zealand	372.46	0.1	1.47	2.68
Australia	4183.47	0.18	2.39	5.37
China	5317.79	0.17	2.89	3.83
Japan	14,149.59	0.06	0.73	3.74
Korea	7635.8	0.38	2.61	5.01
ASEAN	− 3114.31	− 0.05	− 0.37	− 1.13
Malaysia	1720.69	0.36	1.69	3.45
Vietnam	1580.83	2.2	6.72	9.51
South Asia	− 427.58	− 0.04	− 0.16	− 0.83
India	3072.97	0.38	4.84	3.91
Canada	1954.32	0.07	0.64	1.09
USA	− 5869.1	0	− 0.08	− 0.69
Latin America	− 1271.39	− 0.01	0.07	− 0.41
EU25	− 3152.93	− 0.01	0.05	− 0.14
Rest of World	− 7617.07	− 0.02	− 0.08	− 0.48

(2016). Chinese GDP could increase by 0.17%, whereas South Korea and Indian GDP could increase by 0.38% if these three countries join in the CPTPP (Table 8).

The USA will be negatively affected by the deal that is obvious. The other Indo-Pacific countries could be gained as well. The CGE simulations show that the trade facilitation could be more important compared to tariffs' elimination. The trade facilitation could bring enormous gain across the region. Table 9 shows the simulations results, which indicate that the global welfare also could be increased enormously.

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Table 9 Macroeconomic impact of tariff elimination and 25% increase in trade facilitation under Indo-Pacific 3. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
New Zealand	6382.73	3.41	11.06	22.36
Australia	40,844.5	2.74	10.8	28.85
China	140,357.3	3.58	16.03	19.96
Japan	117,916.8	1.52	3.2	23.45
Korea	83,731.05	5.5	11.72	26.69
ASEAN	− 20,919.7	− 0.28	− 3.14	− 8.34
Malaysia	28,306.52	8.89	9.77	21.05
Vietnam	15,659.16	17.8	5.95	24
South Asia	− 1520.01	− 0.19	− 1.3	− 3.22
India	34,130.96	2.44	14.97	13.76
Canada	25,541.9	1.4	3.04	6.4
USA	− 39,889.7	− 0.03	− 1.83	− 4.98
Latin America	− 9862.62	− 0.09	0.18	− 2.75
EU25	− 19,052.4	− 0.05	0.07	− 0.93
Rest of World	− 72,676.3	− 0.12	− 0.31	− 3.4

The USA will face tremendous negative impact due to trade diversion or preference erosion.

Tables 10 and 11 show the macroeconomic scenario under Indo-Pacific 4. If the Asia Pacific countries could join the Indo-Pacific trade deal, gain from the economic cooperation would be enormous under both tariff reduction and improved trade facilitation. The Canada, Mexico, Chile may reduce their welfare gain due to preference erosion. However, improved trade facilitation would offset that and could result in tremendous benefit in the region.

Table 12 provides comparative welfare analysis of the four scenarios. The results show that the overall impact of tariff elimination and trade facilitation is enormous. The welfare gain of tariff elimination under 'Indo-Pacific 1' countries is only US$ 14.1 billion. However, if we could reduce trade-related cost by 25% and with the removal of tariff, the welfare gain would be US$ 217 billion. Under Indo-Pacific scenario 2, the welfare impact is also similar, and the benefits of trade facilitation are enormous from US$ 26 billion to US$ 464 billion of the member countries. However, if India, China, and South Korea join in the CPTPP, the welfare gain would be much higher. Trade–GDP ratio of these countries is higher compared to other members. Therefore, the economic benefit would be higher, and trade diversion benefit would also be higher. Out of the four scenarios, tariff elimination and trade facilitation under Indo-Pacific 4 may generate an additional US$ 1.12 trillion welfare gain for the Indo-Pacific member countries.

4 Concluding remarks

The Indo-Pacific concept has emerged recently. This study investigates the potential economic benefit of Indo-Pacific regional cooperation. We simulate four different scenarios. We not only eliminate tariff, but also simulate if we could reduce the import-related trade costs by 25% in the region and explore the potential economic gain under the regional economic cooperation.

Table 10 Macroeconomic impact of tariff elimination under 'Indo-Pacific 4'. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
Indo-Pacific-1	40,215.92	0.08	4.43	4.76
New Zealand	− 150.53	− 0.01	1.03	0.56
China	10,175.66	0.24	2.49	3.24
Korea	− 417.01	0.1	1.49	1.78
ASEAN	2471.45	0.11	0.95	1.45
Pakistan	281.11	0.19	4.05	3.38
Sri Lanka	122.73	0.2	2.42	4.23
Bangladesh	168.64	0.08	5.24	5.21
Canada	− 2810.68	0.04	0.69	− 0.54
Mexico	− 2373.83	0	0.53	− 0.85
Chile	− 81.72	0	0.24	0.12
EU25	− 10,728.26	− 0.01	0.13	− 0.3
Kenya	− 55.88	0.11	2.77	1.11
Tanzania	5.64	0.15	1.61	0.92
Mozambique	− 5.53	0.03	0.44	0.57
Mauritius	− 18.94	− 0.02	0.14	− 0.35
South Africa	619.89	0.14	2.11	3.17
Oman	− 25.36	0.06	0.77	1.3
Rest of World	− 11,289.22	− 0.02	− 0.08	− 0.8

Table 11 Macroeconomic impact of tariff elimination and 25% increase in trade facilitation under Indo-Pacific 4. Source: Authors' simulation from GTAP version 9

	Welfare effect (US$ million)	Change in real GDP (%)	Change in exports (%)	Change in imports (%)
Indo-Pacific-1	713,565.6	2.73	23.61	29.88
New Zealand	4202.43	2.76	9.68	12.63
China	131,121.1	3.15	11.95	13.73
Korea	38,371.2	3.71	4.55	5.98
ASEAN	61,082.34	4.08	4.87	6.79
Pakistan	3317.69	1.6	2.09	5.52
Sri Lanka	1860.56	4.29	− 4.7	5.59
Bangladesh	1520.84	1.8	8.39	7.08
Canada	98,426.02	5.28	15.59	27.64
Mexico	55,878.04	3.91	11.14	24.26
Chile	4010.65	2.1	5.29	6.45
EU25	− 102,284	− 0.1	1.18	− 3.25
Kenya	938.05	2.71	− 1.08	2.31
Tanzania	223.86	1.77	2.64	− 0.72
Mozambique	96.8	2.46	− 0.27	− 2.69
Mauritius	326.51	4.18	2.82	4.78
South Africa	1019.27	− 0.09	3.29	3.48
Oman	852.91	3.65	2.92	− 1.25
Rest of World	− 147,785	− 0.18	0.39	− 7.83

Table 12 A comparative welfare analysis (US$ billion). Source: Authors' simulation from GTAP version 9

	Only tariff elimination	Tariff elimination plus trade facilitation
Indo-Pacific 1		
World	5.174	120.563
Indo-Pacific members	14.181	217.846
Non-members	− 9.007	− 97.282
Indo-Pacific 2		
World	11.134	285.828
Indo-Pacific members	26.866	464.807
Non-members	− 15.731	− 178.978
Indo-Pacific 3		
World	18.535	328.95
Indo-Pacific members	39.615	486.488
Non-members	− 21.079	− 157.537
Indo-Pacific 4		
World	26.104	866.745
Indo-Pacific members	48.121	1116.814
Non-members	− 22.017	− 250.068

The CGE results illustrate that the quadrilateral alliance between the United States, Japan, Australia, and India shows a positive economic gain. However, if South and Southeast Asia join in the Indo-Pacific, the economic benefit would be enormous. As a large part of Indo-Pacific trade has remained unrealised, the findings of this study also indicate that improved trade facilitation could bring huge gain to this region. The trade transaction cost is one of the major trading barriers prohibiting the growth of Indo-Pacific intra-regional trade. The study reinforces that improvement in infrastructure and connectivity leading to reduce trade transportation costs should be a necessary step in order to realise the Indo-Pacific trade potential. The economic gain under extended CPTPP is also enormous amongst the region. If Korea, China, and India join in the CPTPP, the economic gain of these countries would be enormously high.

The Indo-Pacific could become a powerful regional block if the South and Southeast Asia could be linked through the connectivity, maritime link, improved trade facilitation and other networks that would reduce trade costs. If the vision of the economic corridor gains momentum, it will need to be enhanced by building greater physical infrastructure, more regulatory trade architecture as well as human and digital connectivity.

However, the results from CGE study may be very sensitive to the assumptions and data used. Almost all CGE exercises include a sensitivity analysis to obtain a range of results based on different assumptions and the modelling process. The sectoral or country specific study on Indo-Pacific regional economic cooperation would be further research.

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Appendix

See Table 13.

Table 13 Regional and commodity aggregation of GTAP database. Source: GTAP version 9

SL	Aggregated region	GTAP region	SL	Aggregated commodities	GTAP commodities
1	China	China	1	Grains crops (9 products)	pdr wht gro v_f osd c_b pfb ocr pcr
2	USA	United States of America	2	Meat Lstk (6 products)	ctl oap rmk wol cmt omt
3	EU25	EU 25 Countries	3	Extraction (6 products)	frs fsh coa oil gas omn
4	Canada	Canada	4	ProcFood (5 products)	vol mil pcr sgr ofd
5	New Zealand	New Zealand	5	Text Wapp (2)	tex wap
6	Australia	Australia	6	LightMnfc (7)	lea lum ppp fmp mvh otn omf
7	Japan	Japan	7	HeavyMnfc (7)	p_c crp nmm i_s nfm ele ome
8	ASEAN	ASEAN except Malaysia and Vietnam	8	Util_Cons (4)	ely gdt wtr cns
9	Malaysia	Malaysia	9	Trans Comm (5)	trd otp wtp atp cmn
10	Viet Nam	Vietnam	10	Oth Services (6)	ofi isr obs ros osg dwe
11	South Asia	South Asia except India			
12	India	India			
13	Korea	Korea			
14	Latin America	All Latin America			
15	Rest of the world	Rest of countries in the World of GTAP database			

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