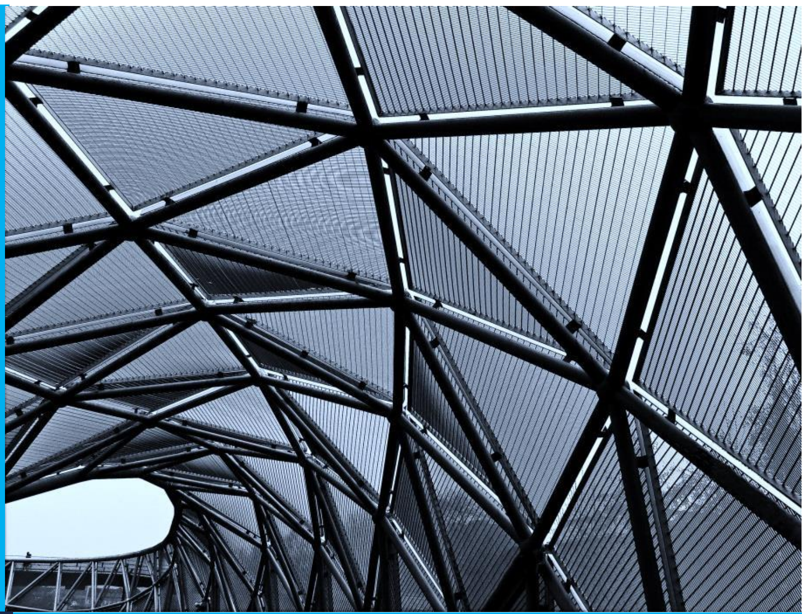
The economic impact of Trans-Pacific partnership:

What have we learned from CGE simulation?



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ASIA-PACIFIC RESEARCH AND TRAINING NETWORK ON TRADE

Working Paper

NO. 157| 2016

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WORKING PAPER

The economic impact of Trans-Pacific partnership:

What have we learned from CGE simulation?

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Please cite this paper as: John Gilbert, Taiji Furusawa and Robert Scollay (2016), The economic impact of Trans-Pacific partnership: What have we learned from CGE simulation?

ARTNeT Working Paper Series No. 157, 2016, Bangkok, ESCAP.

Available at **http://artnet.unescap.org**

[1]The authors would like to thank Shujiro Urata, Nobuhiro Hiwatari and Jonathan Alan for useful comments on earlier drafts. The paper was prepared while Gilbert was a visiting scholar at Hitotsubashi University, and Gilbert is grateful for their hospitality. Gilbert would like to thank the Abe Fellowship program for support of this project. Any errors that remain are the sole responsibility of the author who could be reached at jgilbert@usu.edu. The authors are grateful to Mia Mikic for helpful comments. Thanks also to the ARTNeT Secretariat for technical support in disseminating this paper.

Abstract

The Trans-Pacific-Partnership (TPP) trade agreement, if successfully implemented, will liberalize trade between the US, Japan and ten other Asia-Pacific economies, making it one of the largest regional agreements ever seen. The prospect of a comprehensive trade agreement spanning the Pacific raises a number of important quantitative questions. One of the most widely used techniques for evaluating the economic impact of regional trading agreements is numerical simulation with computable general equilibrium, or CGE, models. There have now been a large number of papers written that use CGE methods to analyze the potential economic impact of the TPP agreement under varying theoretical and policy assumptions. In this paper we provide a synthesis of the key results that have emerged from the literature, and discuss some new simulation results of our own.

Keywords: Asia-Pacific, Regional Trade, TPP, CGE

JEL Classifications: F15, F17, C68

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1. Introduction

Although its ultimate passage still remains uncertain (the recent success of fast-track legislation in the United States (US) and finalization of the agreement articles notwithstanding), the Trans-Pacific- Partnership (TPP) trade agreement, if successfully implemented, will be among the largest and most comprehensive free trade agreements ever seen. Together the 12 TPP member economies (Australia, New Zealand, Japan, Brunei, Malaysia, Singapore, Vietnam, USA, Canada, Mexico, Chile and Peru) generate nearly 40 percent of the value of global production, and over a quarter of world trade, making the grouping substantially larger in economic terms than even the European Union. The proposed agreement would not only liberalize trade barriers on goods and services and free up investment flows between the member economies, but would also introduce measures aimed at trade facilitation through enhanced regulatory coherence, measures to encourage the development of production and supply chains, intellectual property provisions, and, most controversially, provisions for investor-state arbitration.

The prospect of such a far-reaching trade and investment agreement spanning the Pacific raises a number of important quantitative questions. What is the likely magnitude of the economic gains? How dependent are those gains on the details of the agreement? How do the gains compare to other proposed agreements? Are they evenly distributed across member economies and across societies within the members? How will the agreement affect non-members, especially the least developed economies? What are the consequences of expanding the agreement to bring in new member economies? What types of changes might we observe in the pattern of economic activity in the member economies? This list is certainly not exhaustive.

One of the most widely used techniques for evaluating the potential economic implications of large scale changes in trade policy, such as free trade agreements, and thereby providing some insights into the answers to the questions posed above and others like them, is numerical simulation with computable general equilibrium, or CGE, models. While this approach, like any, has its strengths and weaknesses (and certainly its detractors, see, for example, Kehoe, 2003), CGE has proven a useful if imperfect tool for the *ex-ante* analysis of trade policy. CGE models are multi-sectoral, and often multi-regional, are flexible, and logically consistent. Because at their core they are designed to track linkages across an entire economic system, they are particularly well-suited to examining the economy-wide implications of large changes in the economic environment, and/or changes that affect multiple parts of the economic system at the same time, as is certainly the case with regional trade agreements like the TPP. Applications of CGE models to trade policy are numerous. See, for example, Scollay and Gilbert (2000) for a survey of models applied to APEC, Gilbert and Wahl (2002) for the case of Chinese trade reform, Bekkers and Rojas- Romagosa (2016) for the TTIP, and Robinson and Thierfelder (2002) and Lloyd and MacLaren (2004), for more general overviews of CGE simulation of regional trade agreements. Also see the meta-analysis approach of Hess and von Cramon-Taubadel (2008).

There have now been a large number of papers written that use CGE methods to analyze the TPP (over 35 of which we are aware). Hence, a survey of the results that have been obtained is in order. The studies come from a wide variety of sources, and include academic pieces, working papers from policy- oriented think tanks, and publicly released works commissioned by the governments of various economies. The primary objective of this paper is to provide an overview of the scope of the existing studies, and a synthesis of the key results that have emerged from the literature, with an eye to providing information useful to both policymakers looking to evaluate key themes and contextualize results emerging from what is now a substantial body of literature, and to researchers in the area looking both to compare their results to existing work and to identify gaps that new research may gainfully address.

In the process of surveying the existing studies, we also incorporate some new simulation results of our own. In particular, we examine the TPP in comparison to two other major trade agreements: the Regional Comprehensive Economic Partnership (RCEP) and the Free Trade Area of the Asia-Pacific (FTAAP). The former aims to consolidate and deepen trade liberalization among the economies of ASEAN and those economies with which ASEAN already has a plurilateral trade agreement (i.e., Australia, New Zealand, Japan, South Korea, China and India), while the latter is conceived as a free trade agreement among all 21 member economies of APEC. We also consider the implications of excluding ‘sensitive’ products from the TPP agreement, and the implications of possible expansions of the TPP to include countries which have expressed an interest in joining at a future date. Our results are drawn from among the first simulations to utilize the recently released GTAP9 database, with its substantially updated data (to 2011) and improved regional coverage (including the introduction of data for one of the founding TPP member economies – Brunei)[1]. They are also among the first to have tariff and TRQ liberalization scenarios constructed from a detailed examination of the actual agreement text.

[1] See also Nguyen et al. (2015), Petri et al. (2012) and USITC (2016).

The structure of the paper is as follows. In the following section we provide some brief background on the TPP agreement, and a quick overview of the pattern of trade and protection. This introduction is followed by an (also brief) outline of the CGE method, and then a broad overview of the surveyed works. We next consider the results of the models in more detail, organizing our review thematically. Topics addressed include the estimated size and distribution of welfare gains, effects on non-members, expansion of the agreement, and exclusion of 'sensitive' (mostly agricultural) products from the agreement. Our own new simulation results are used throughout to help anchor the discussion. The final section contains concluding comments and suggestions for future work. In the appendix we present a table summarizing the studies, key model features, and results.

2. TPP Background

The TPP is a "mega-regional" FTA between twelve Asia-Pacific countries[2]. Among these countries, representing 36 percent of world GDP, it embodies a level of liberalization and a breadth of coverage of trade and trade-related issues that has so far completely eluded negotiations at the multilateral level.

Regionally, it draws together a number of currents in Asia-Pacific trade and economic integration. At one level it can be interpreted as a simultaneous rationalization and intensification of a substantial part of the "noodle bowl" of overlapping and intersecting free trade agreements (FTAs) that had expanded over the early years of the 21st century to link countries of the region, including many of the twelve members of the TPP, in an uncoordinated and inefficient fashion. As its name indicates, a defining feature of the TPP is its trans-Pacific character, bringing together large and small countries from both sides of the Pacific. This contrasts with the "East Asia-centric" (or, as the members of ASEAN would prefer to characterize it, "ASEAN-centered") approach to region-wide economic integration that has developed since the East Asian economic crisis of 1997-8, and which is now represented by the "mega-regional" initiative known as the Regional Comprehensive Economic Partnership (RCEP). Since 2010 APEC leaders have endorsed the vision of a Free Trade Area of the Asia-Pacific (FTAAP), in principle embracing all 21 members of APEC, and in their 2014 "Beijing Roadmap" the APEC leaders highlighted the TPP and RCEP as key "pathways" to the FTAAP.

[2] Table 1 summarizes some of the key economic characteristics of the TPP member economies and their trading partners, including their economic size, dependence on trade overall and with the TPP group, and current protection levels.

Table 1. Selected Economic Characteristics[a] of the TPP Members[b] and Trading Partners

Country / Region	% of GDP in Global GDP	Trade as % of GDP	% Intra-TPP Exports	% Intra-TPP Imports	Average[c] % Tariff (Applied)	Average[c] % Tariff (Faced)
Australia	1.9	38.8	31.4	37.2	3	2.3
New Zealand	0.2	55.9	43.7	49	1.4	6.9
Japan	8.3	32.2	27.7	27.8	2	4.6
Brunei	0	86.9	53.3	42.4	3.9	0.3
Malaysia	0.4	159.5	36.7	38.7	3.7	2.8
Singapore	0.4	214.9	35.1	33.6	0	2.2
Vietnam	0.2	161.3	41.1	24.4	5.8	5.2
Canada	2.5	53.8	70.1	63.3	1.4	1.1
USA	21.7	29.3	35.8	31.9	1.1	3
Mexico	1.6	57.6	79.4	66.5	1.7	0.5
Chile	0.4	69.6	31.2	34.7	0.8	1
Peru	0.2	52.3	33.2	34.4	1.4	0.5
China	10.2	49.2	42.1	34.3	3.7	4.8
Hong Kong	0.3	150.4	29.7	34.6	0	0.9
Korea	1.7	100.7	30.2	35.3	6.5	4.6
Taiwan	0.6	143	31.4	43.9	1.6	2.9
Rest of South East Asia	0.1	60.9	34.3	21.5	7.2	4.4
Indonesia	1.2	48	39.7	39.8	2.9	4.8
Laos	0	85.8	24.9	10	8	1.2
Philippines	0.3	70.2	39.1	34.5	2	1.8
Thailand	0.5	144.3	38.5	37.7	5.1	3.5
India	2.6	48	26.9	19.2	6	3.5
Brazil / Argentina	4.2	23.8	23.6	26.2	6.4	3.8
Rest of South America	1.9	54.9	45	38.7	5.8	2
Western Europe	26.3	79.9	13.6	12.3	0.6	1.5
Russia	3	51.8	11.6	11.3	7.1	0.8

Source: GTAP 9 Database

[a] All data are as at 2011.

[b] TPP members are Australia, New Zealand, Japan, Brunei, Malaysia, Singapore, Vietnam, Canada, USA, Mexico, Chile and Peru.

[c] Trade weighted average.

In the early years of the 21st century, when the "East Asia-centric" approach appeared to have eclipsed the "trans-Pacific" approach to region-wide integration, four small Asia-Pacific countries, Singapore, Chile, New Zealand and Brunei-Darussalam, formed the Trans-Pacific Strategic Economic Partnership (TPSEP), or "P4" trade agreement with the explicit aim of keeping alive a potential route to eventual trans-Pacific region-wide integration. The decisive moment in the genesis of the TPP came in 2008, when the US identified the TPSEP as an expedient entry point for the trade element of its so-called "pivot to Asia." A decision by the US to participate in extending the TPSEP was soon transformed into agreement to launch the TPP initiative. In 2010 TPP negotiations were launched by seven countries – the US, Australia, Peru and the original "P4" members, with Vietnam participating as an observer. Malaysia joined soon after, and Vietnam quickly decided on full participation.

A high level of ambition for the TPP was set by these original nine participants. The TPP was to be a "high quality, twenty-first century" agreement, providing for comprehensive liberalization of trade in goods, trade in services and investment, extensive trade facilitation measures, and a wide range of provisions on cross-cutting and behind the border issues, designed among other things to recognize the increasing importance of cross-border production networks and global value chains. Among the latter, provisions on intellectual property, access to medicines, state-owned enterprises, and investor-state dispute settlement proved particularly contentious in negotiations.

Further decisive steps in influencing the eventual characteristics of the TPP were the inclusion as participants of Canada and Mexico in 2011 and Japan in 2013, the latter after a ferocious three-year domestic debate, primarily over the implications of the TPP for Japanese agriculture. The inclusion of these three countries, respectively the third-, tenth- and thirteenth-largest economies in the world, dramatically increased the size of the trade flows that would be affected by the TPP, and hence its overall economic significance. The inclusion of Canada and Mexico ensured that NAFTA-related issues, including both unfinished NAFTA business and potential preference erosion, would have a significant influence on negotiations. The economic significance to each other of the US and Japan so greatly outweighed the significance to each of them of the other TPP participants that a process of bilateral negotiation between US and Japan was quickly established as setting the parameters within which the plenary negotiations on a number of issues would be conducted among the full set of participants. In particular, Japan was able to leverage this situation to secure a degree of exclusion of agricultural products from the agreement that could not be easily reconciled with the objective of comprehensive liberalization set by the original TPP participants.

After over five years of negotiations the TPP agreement was finally concluded in October 2015. The agreement contains some 30 chapters, covering the full range of issues set out in the original negotiating objectives. Trade in services and investment are liberalized on a "negative list" basis.

In relation to trade in goods, the principal focus of this paper, the objective of comprehensive liberalization has been met in all sectors except agriculture. For some products the transition periods for phased elimination are extremely long. For example, phasing out of US duties on some autos and auto parts will be spread over 25 or 30 years, and there are also "snap-back" provisions that will allow tariffs to be re-imposed under certain circumstances. Apparel exports from Vietnam are subject to periods of varying length for the phasing out of tariffs, and only limited exemptions have been provided from application of the "yarn forward" rule.

In agriculture, treatment of 'sensitive' products often involves the opening of additional, often minimal or modest tariff rate quotas (TRQs), with the out-of-quota tariffs remaining at MFN levels while in-quota tariffs are set at zero or at reduced but non-zero levels. In some cases administration of the TRQs is designed to minimize or limit links between imports and domestic consumer markets. Sugar, milk and dairy products remain heavily restricted by several TPP members, while rice and wheat are major agricultural commodities that remain heavily restricted by Japan in particular. Tariffs on Japanese imports of many beef products are reduced over time from 38.5 percent to 9 percent, but not eliminated. A range of other agricultural products remain restricted to varying degrees by a number of TPP members. Where tariffs are eliminated or reduced the transition periods are often lengthy - over 20 years in some cases - and the phasing timetables often complex and back-loaded.

3. A Primer on CGE Analysis

Many readers will be familiar with the key ideas underlying CGE modeling, but for those new to the area we provide a quick overview in this section, largely for the purpose of setting out the terminology clearly for the review that follows. General equilibrium is the branch of economics concerned with the simultaneous determination of prices and quantities in multiple inter-connected markets. CGE (some- times also called applied general equilibrium or AGE) models are numerical simulations built on general equilibrium principles, and are designed with the objective of turning general equilibrium theory into a practical tool of policy analysis.

All CGE studies consist of three basic components: (i) a theoretical description of an economic system, (ii) a set of data describing the basic characteristics of the economic system at some point in time, and (iii) a set of shocks describing the assumed changes in policy that will occur within the system. We consider each aspect in turn.

The theory underlying CGE models is distinguished from other common approaches to modeling the effect of trade policy changes by a number of features. In contrast to partial equilibrium modeling, CGE is a multi-sectoral approach. Hence, it provides information on an entire economic system and the interactions among the markets within that system. In contrast to other multi-sectoral approaches, such as input-output models, the behavior of agents or decision-makers within CGE models (consumers, producers, governments and so on) is formulated in terms of the constrained optimization problems that those agents face[3]. CGE models will describe the behavior of households as following utility maximization subject to a budget constraint. Similarly, firms are profit maximizing, subject to the constraints imposed by technology and market structure. The CGE modeler must choose, and explicitly set out, a description of the behavior of all agents in the model. In addition, the modeler must explicitly choose where to draw the line between what is explained by the logic inside the model and what lies outside of the model, called the closure, and thereby must explicitly define the direction of economic causality.

A very important characteristic of the way in which constraints are defined in CGE models is that accounting requirements are enforced across the economic system, in terms of both quantity and value flows. This imposes an important logical consistency on the overall model structure (CGE models adhere strictly to the basic economic maxim that there are no free lunches). Hence, for example, the total labor supplied must equal the total labor used in an economic activity (plus perhaps any unemployment). Similarly, the total quantity produced in an industry in a period must equal the total consumed in the current period by some economic agent (at home or abroad) plus any held as investment for future periods, in both quantity and value terms. The modeler is free to choose (subject to the observed data) the ways in which resources may be disposed, and the mechanisms through which this occurs, but is not free to violate basic laws of physics or accounting.

The notion of investment for future periods leads us to mention the treatment of time in CGE models. Most CGE models are static. They are used to compare equilibria at two points

[3] We can think of input-output modeling as a special case of CGE, with highly restrictive assumptions on the production technology, preferences and market structure.

(pre- and post-shock), without (directly) considering the path between the two. Time is implicitly introduced through changes in the closure, representing different adjustment time horizons. For example, a short-run simulation may treat capital as sector-specific, a medium-run simulation may allow capital to be mobile across sectors but available in a fixed total supply, and a long-run simulation may allow the capital stock to adjust to maintain steady-state real returns to capital (see Harrison et al., 1997). Recursive dynamic models add an adjustment path for endowments, populations and technology, with the capital stock endogenously determined based on past investment. Agent behavior remains essentially static, however. Truly dynamic models explicitly incorporate rational inter-temporal behavior. These models are highly complex and there are no examples applied to the TPP of which we are aware.

Finally in terms of the underlying theory, it is important to note that CGE models can and often do have characteristics much more complex than those found in the textbook general equilibrium models that lie at their core. Since the models are numerical, they are not constrained by concerns of elegance and tractability in the same way as theoretical models of international trade are. In addition to being larger and having more agents, CGE models usually feature multiple distortions in the form of taxes and/or quantitative restrictions. Almost all models incorporate what is termed the Armington assumption, or horizontal product differentiation by country as a mechanism for handling intra-industry trade in the data. This implies that even in competitive models, all economies will have some degree of market power. Moreover, although perfectly competitive models remain common, imperfect competition of various forms is also frequently seen. Some recent models have also adopted elements from heterogeneous-firm trade theory, as we will discuss. The CGE method is in principle quite flexible, and can be adapted to fit the characteristics of the problem at hand.

The data used in CGE modeling is of two basic types. The first is a description of the value flows between all economic agents in the model. This data will describe the pattern of consumption, production, factor and intermediate use, and international trade at a point in time, the base year. Embedded within the value flow data will be information on the magnitudes of distortions to the economic system (in the form of tax wedges on economic activities). Almost all CGE models will have a rich set of data on tariffs, export support, domestic support, and consumption taxes. The data is typically organized in a social accounting matrix. The most common source of this type of data for multi-regional CGE models is a secondary one, the GTAP database, which has in turn been constructed from a large set of primary sources (individual country input-output tables, UN trade data, etc.) in a consistent way (see Dimaranan et al., 2015). The most recent release of this data is

GTAP9, which has a base year of 2011. Many of the papers discussed in this survey use the GTAP8 (or 8.1) release, which has a base year of 2007. In some cases the database may be projected forward to a new base year. In this case, and also in recursive dynamic models, data on the paths of key variables over time (projected productivity, capital and labor growth) are also used. A common source of such data is the GTAPDyn project.

The second type of data used in CGE models is behavioral. This data will describe how the agents respond to changes in their environment, and typically takes the form of a set of elasticities. This data includes descriptions of household demand (income and price elasticities), production (elasticities of substitution across primary factors and intermediates), factor use (elasticities of transformation across factor uses), and trade (Armington elasticities governing the degree of substitutability between domestic and foreign goods in the same product category). The main source of this type of data is again the GTAP database, which contains parameter estimates compiled from the existing literature.

Finally, shocks are generally chosen by the modeler to replicate as closely as possible the policy changes in question. In trade liberalization studies this will certainly include changes to tariff levels and perhaps export support. They may also include changes to other variables, such as transportation productivity, or output productivity, intended to capture the impact of measures such as trade facilitation, or assumed technological spillovers from trade. The shock structure is sometimes referred to as the simulation or experimental design, the latter perhaps somewhat misleadingly given the deterministic character of the CGE technique.

The CGE model itself is a computer program in which the theory is used to first replicate the original equilibrium data (calibration), and then to show how the equilibrium data would change with the impo- sition of the shocks, given the theory. Some useful introductions to the structure of typical CGE models include Hosoe et al. (2010) and Gilbert and Tower (2013). An excellent overview of recent developments in the area is Dixon and Jorgenson (2013). The aforementioned survey papers are a useful starting point for getting a feel for the scope of CGE applications to trade policy.

4. Overview of the Modeling Approaches

Papers addressing the economic impact of the TPP using CGE methods have adopted a range of theoretical structures and data, and have used a number of different simulation design strategies. By far the most common theoretical structure used is the GTAP model described in Hertel (1997), which is used in its base form in around half of the studies we surveyed, and in a modified form in several more. GTAP is a multi-regional model that is in widespread use, hence we dispense with a detailed description. In brief, it is a static, perfectly competitive, Armington global trade model.

While the GTAP model provides a common foundation, there is quite a lot of variation in terms of applications within this group. For example, while most studies use neoclassical closures, Kawasaki (2014) and Whittaker et al. (2013) use steady state closures that capture capital accumulation effects. Similarly, Narayanan and Sharma (2016) adopt a closure which allows for unemployment of labor. Several papers also modify the underlying theory of GTAP. The modifications range from the relatively minor, as in Whittaker et al. (2013), who allow for regional variation in key parameters, and Cabinet Secretariat (2015) and USITC (2016), which both introduce an elastic response of the total labor supply to real wages, to the more substantive changes in Akgul et al. (2015), who introduce firm heterogeneity to the GTAP model in an interesting proof of concept. There are also examples of linking GTAP results to other models, as in Ganesh-Kumar and Chatterjee (2014), who use the World Bank's POVCAL tool in conjunction with CGE simulation to assess poverty impacts.

Ciuriak and Xiao (2014) also use a modified version of the GTAP model, introducing recursive dynamics and a treatment of FDI. The model approach is similar to that adopted in the GTAPDyn model described in Ianchovichina and McDougall (2001), and utilized in several studies of the TPP (Cheong and Tongzon, 2013, Itakura and Lee, 2012, Lee and Itakura, 2013, and Lee and Itakura, 2014, Strutt et al., 2015).4 USITC (2016) also uses a recursive dynamic version of GTAP. The PEP model used by Cororaton and Orden (2015)[4], the MIRAGE model used in Disdier et al. (2016), and the model employed by Li (2014), are other examples of applications of recursive dynamic models with a competitive Armington structure.

In other innovations, Li and Whalley (2014) also employ an Armington-type model, but introduce money and generalized trade costs to the modeling framework (see also Li et al., 2014). In a well-known series of studies (Petri et al., 2012, Petri, 2013, Petri et al., 2013 and Petri et al., 2014, Petri and Plummer, 2016 and Lakatos et al., 2016), the modeling framework of Zhai (2008) is adopted. This model is also a recursive dynamic, Armington model, but it also introduces monopolistic competition into manufactures production, and allows for firm heterogeneity. This means that the model is able to capture potential trade changes at both the intensive and extensive margin.

[4] The results of Cheong and Tongzon (2013) are further elaborated on in Cheong (2013).

The base data source for almost all of the studies is the GTAP dataset. For computational purposes, the data is generally aggregated. The level of regional and commodity detail ranges from 'toy' models with 3 regions × 2 commodities (Akgul et al., 2015) to models with 27 regions (Li, 2014) and up to 57 commodities (Ciuriak and Xiao, 2014), with most in the range of 20-25 regions and commodities. The regional aggregations are focused on the Asia-Pacific for obvious reasons, and the commodity aggregation often emphasizes agriculture. A few of the earliest studies were based on GTAP7 data, which has a base year of 2004 (Areerat et al., 2012, Itakura and Lee, 2012, and Oduncu et al., 2014), while most of the remainder use either the GTAP8 data or the GTAP8.1 data (an interim update), with a base year of 2007. The work of Nguyen et al. (2015), Petri and Plummer (2016) (see also the extended discussion of the simulations in Lakatos et al., 2016), Cabinet Secretariat (2015), and USITC (2016), along with this paper, use the more recent GTAP9 database, which has a base year of 2011.

Despite the consistency in the primary data source (a reflection of the massive data requirements of CGE modeling) as in the theory side of the models, we do see quite a bit of variation in terms of modifications made to the base data. Several of the static models update the data to a more recent base year (Kawasaki, 2014, USITC, 2016) or project the equilibrium forward to the presumed time of liberalization (e.g., 2020 in the case of Whittaker et al., 2013, and 2025 for Burfisher et al., 2014). The recursive dynamic studies, by design, all develop baselines going out as far as 2030 (Itakura and Lee, 2012 and Petri and Plummer, 2016) and even 2047 (USITC, 2016). A number of studies incorporate into the baseline information on other FTAs that have already been agreed upon (e.g., Cheong and Tongzon, 2013, Disdier et al., 2016, Narayanan and Sharma, 2016, Petri et al., 2012, Petri and Plummer, 2016). Several studies incorporate information on NTBs from various sources into the base data (Cororaton and Orden, 2015, Disdier et al., 2016, Itakura and Lee, 2012, Lee and Itakura, 2013, Lee and Itakura, 2014, Li and Whalley, 2014, Petri et al., 2012, Cabinet Secretariat, 2015, Petri and Plummer, 2016 and USITC, 2016). Other more unusual data adjustments include modifications to certain behavioral parameters in Japanese agriculture in Whittaker et al. (2013), and a split of the data to account for SEZs in China and Mexico in Li (2014).

One of the most difficult aspects of modeling the impact of the TPP is that the degree of trade liberalization has only very recently (October 2015) become known with any certainty. Hence, we see a variety of shock assumptions. The focus of most the studies is squarely on trade reform. By far the most common simulation is a removal of all intra-TPP tariffs across the 12 TPP members (some early studies, such as Areerat et al., 2012, Suzuki, 2012, Takamasu and Xi, 2012, Li and Whalley, 2014, and Petri et al., 2012, which were designed before the TPP expanded to include Canada, Mexico and/or Japan, include only a subset of TPP members). While perhaps not very realistic, this is a useful benchmark. Other studies consider limited liberalization scenarios. Cororaton and Orden (2015) assume tariffs are reduced by 90 percent, Durongkaveroj et al. (2014) considers a case where agricultural tariffs are cut by only 50 percent. Both Ciuriak and Xiao (2014) and Petri et al. (2012) (and its extensions) design best guess scenarios based on the contents of other agreements (such as the Korea-US agreement). These studies also make adjustments for under-utilization of tariff preferences. Petri et al. (2012) also considers a scenario where sensitive sectors are excluded. A few other studies consider liberalization only in a subset of sectors. Burfisher et al. (2014) consider agriculture and agrifood products, while Lu (2015) focuses on textiles and apparel reform. Only the very recently released studies of Cabinet Secretariat (2015), Petri and Plummer (2016) and USITC (2016), along with this paper, have tried to match the actual agreement.

Several papers make additional assumptions about NTB cuts (see for example Burfisher et al., 2014, Ciuriak and Xiao, 2014, Cororaton and Orden, 2015, Nguyen et al., 2015, Strutt et al., 2015, Cabinet Secretariat (2015), and Disdier et al., 2016, among others). NTB shocks are designed as removal of tariff equivalents and/or shocks to import augmenting technological change, and range from cuts of 20 percent to complete removal. In some cases the removal is assumed to spillover to non-member countries (Petri and Plummer, 2016). Burfisher et al. (2014) explicitly model TRQs in agriculture and their removal, as do USITC (2016). Some studies also introduce productivity shocks in Japanese agriculture into the simulations (Whittaker et al., 2013, and Lee and Itakura, 2014)[5].

4.1. Our Simulations

We conclude this section by describing the modeling approach we have used in the new simulations reported in this paper. As in a number of other studies, we have adopted a modified version of the GTAP model. Following Whittaker et al. (2013), we make two minor adjustments to the economic theory of the model as described by Hertel (1997), allowing both the degree of mobility of land across agricultural uses and the degree of substitutability between domestic and foreign versions of the same product (the Armington elasticity) to vary by country. The closures we use are typical medium and long run (i.e., capital mobile across sectors but in fixed total supply, and a steady state closure).

[5] In addition to the TPP, studies have compared the trade reform under TPP to a number of other trade liberalization scenarios, including extensions to include other countries (most commonly Korea and China), and other trade agreements such as TTIP, RCEP and the FTAAP. We discuss these further in the sections below.

The data that we have employed is the GTAP9 database, with a base year of 2011. Given the computational demands of CGE, we have aggregated the country data to a total of 27 regions, individually identifying TPP members and potential members, along with major trading partners grouped geographically. We have aggregated to 32 sectors, with some detail on agricultural/food products reflecting the controversial role they are playing in the negotiations[6]. We have also made some adjustments to the behavioral data following Whittaker et al. (2013). In particular, we have adjusted the mobility of land in Japan downward to reflect the view that agricultural land use is not as flexible in Japan as in other countries. We have also reduced the Armington elasticity in Japan for some products (notably rice, but also some other agricultural commodities) to reflect the view that domestic versions of these products are viewed by Japanese consumers as less substitutable for foreign versions than in other countries.

We consider a total of six scenarios. In the first, we simulate the effect of the TPP, incorporating the tariff and TRQ provisions that have been agreed. Now that the details of the agreement are known, we have a clearer view of the extent of the actual exclusions or exemptions to trade liberalization that will occur under the TPP than in most existing studies. Few if any products are completely excluded, but there are a wide range of exemptions allowed to various economies. Some of the broad patterns in the exemptions are as follows:

1. Almost all the exclusions and exceptions are in agriculture and food (HS Chapters 1-24). Mexico and Vietnam retain some restrictions on motor vehicles.

2. As noted earlier, a common approach to increasing market access for agricultural products is the opening of tariff rate quotas (TRQ), some of which are country-specific while others are made available on a TPP-wide basis. TRQs are typically small. In some cases they can appear large relative to the heavily restricted level of imports but are nevertheless small relative to the domestic consumption of the importing country. In-quota tariffs are set at zero or reduced levels, while out-of quota tariffs typically remain at MFN levels.

3. In other cases tariffs on sensitive agricultural products remain at MFN levels, or are reduced but not eliminated, as in the case of imports of beef from TPP members by Japan, noted earlier. Other import-restricting interventions are also often left intact.

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[6] The aggregation category details can be seen in the accompanying tables.

4. In some cases market access provisions discriminates between TPP members seemingly on the basis of their degree of competitiveness, with tariffs largely maintained on imports from the most competitive suppliers but removed on imports from other TPP members. In other cases discrimination appears to be based on reciprocity considerations. Some TPP-wide TRQs are for tariff lines where imports are dominated by a single TPP exporting country.

5. The most-widely excluded product category is sugar, which is fully or almost fully excluded by 5 TPP members (US, Japan, Mexico, Chile, and Vietnam), and partly excluded by a sixth (Peru).

6. Milk and dairy products are heavily excluded by 4 TPP members (Japan, Canada, Mexico, and Peru), while Chile maintains extensive exclusions against a single TPP partner, seemingly based on reciprocity issues. In addition to some heavy remaining tariff restrictions the US also has extensive TRQ arrangements for some milk and dairy products, which typically either expand indefinitely into the future or become "unlimited" after very lengthy transition periods[7].

7. Japan has by far the most extensive and most significant exclusions and exceptions, affecting over 300 tariff lines. In addition to sugar and dairy products, rice, wheat and some other grains are heavily excluded, and substantial restrictions remain on meats and a wide range of processed food products, especially those containing sugar or dairy products.

8. Poultry products are heavily excluded by Canada, while Peru maintains substantial restrictions on rice and some processed food products.

9. Malaysia and Vietnam retain a relatively narrow range of exclusions and exceptions on other agricultural and processed food products.

10. Four members (Australia, Brunei, New Zealand and Singapore) retain no exclusions or exceptions.

The tariff reductions and TRQ expansions we use in our simulations were constructed from a detailed analysis of the TPP agreement text and schedules, and then mapped onto the GTAP database. The TRQs expansions are modeled as the equivalent tariff cuts that

[7] US country-specific TRQs for Canada in milk and dairy are all "capped" (presumably reciprocation for Canada's very limited market opening in that sector).

generate the indicated import expansion (as in Strutt et al., 2015). For comparison purposes we also consider the complete removal of tariff barriers among the 12 member economies, leaving tariffs applied to non-members intact. We then consider two expansions of the TPP, with a scenario introducing 'probables' followed by 'possibles'[8]. Finally, as a point of comparison, we consider the implementation of the RCEP and FTAAP, again modeled as the complete removal of tariff barriers among the member countries.

5. Results and Implications

5.1. How large are the potential gains?

We begin with a basic question, just how large are the estimated total welfare impacts of trade liberalization under the TPP? We start by considering our own estimates of the economic welfare effects of the liberalization measures agreed in the TPP, as summarized in the preceding section, presented in Table 2. We put the total aggregate gains to TPP member economies from tariff liberalization and TRQ expansions in the range of $15 billion in the medium run, and just over $38 billion in the long run. These are measured using the equivalent variation in household income, and can be interpreted as the permanent annual increase in regional household income at constant prices. Note that these types of gains are sometimes referred to as 'one-off' gains, but this is a misnomer. A better term would be 'once and for all' gains – like permanent increases in income[9]. Approximately $7 billion and $5 billion of the total gains come from movement of the terms of trade against non-TPP countries, in the medium and long run, respectively. Using the steady-state closure generates an estimate of roughly $18 billion in capital accumulation gains in the long run. The remainder of the effect is composed of gains in allocative efficiency (i.e., improvements in resource allocation).

How do these results compare with the results of the other studies? There is in fact quite a large range in the literature. At the low end, Rahman and Ara (2015) provide an estimate of only $11 billion, while Areerat et al. (2012) estimate $14 billion. At the high end of the range, Petri et al. (2012) estimate $285 billion, and Kawasaki (2014) provides an upper bound figure of $449 billion. The most recent study by Petri and Plummer (2016) puts the gain at $465 billion. Most of the studies' estimates fall in the $50-150 billion range.

[8] For the curious, we have adopted the terminology of probables vs possibles from the tradition in rugby union football, where it refers to a game where incumbent national team members face off against up and coming rivals.

[9] One way to approximate the total gains is to calculate the discounted value of the stream of annual gains. Using this method Petri and Plummer (2016) put the total gains (assuming entry into force in 2017) at between $3 and $9 trillion. Using the same discount rates the corresponding numbers from our long run estimates would be $0.6 to $1.6 trillion.

Differences in results can be related back primarily to differences in the model structures, and, most importantly, to differences in the simulation designs, in particular the ranges/sizes of the assumed shocks. In terms of model structure, some model features allow the simulations to capture a broader range of source of gains. In general, models that incorporate imperfect competition in some form, such as Petri et al. (2012) and its follow ups, generate significantly larger welfare estimates, ceteris paribus[10]. Indeed, Scollay and Gilbert (2000) and Gilbert and Wahl (2002) both note that incorporating imperfect competition into CGE models seems to roughly double the estimated welfare gains relative to perfectly competitive models. Similarly, models that capture some aspects of the effects of trade reform on capital accumulation, either through the use of dynamics (Ciuriak and Xiao, 2014, Cheong and Tongzon, 2013, Itakura and Lee, 2012, and others), or through the adoption of a steady state closure (Whittaker et al., 2013, Kawasaki, 2014), also tend to generate larger predicted gains, ceteris paribus. We see this pattern clearly in our own results, where the estimates under the steady state closure are around 2.5 times larger than under a neoclassical factor market closure.

We see the effect of simulation design manifest in various ways. Some of the earliest studies consider only a subset of the eventual 12 TPP member economies (Areerat et al., 2012, for example, do not include Canada or Mexico in any of their simulations). This obviously tends to push the magnitude of the overall welfare estimates downward, as potential welfare gains from a regional trading agreement are well-known to be increasing in the number of members.

More importantly, the welfare gains in aggregate are generally increasing (at an exponential rate) in the size of the tariff cuts. Hence, studies that consider more limited tariff cuts scenarios either in terms of depth (such as Ciuriak and Xiao, 2014, and Cororaton and Orden, 2015) or breadth of coverage (such as Burfisher et al., 2014, Durongkaveroj et al., 2014, or the sensitive sector scenarios of Petri et al., 2012), or as in Petri et al. (2012) preference utilization, generate lower welfare estimates all else constant. Indeed the estimates provided by Petri et al. (2012) with sensitive products excluded (in the case of Japan, rice, grains and other agricultural products) are roughly half those reported with the sensitive products included. Conversely, those studies that incorporate information on NTB reductions in addition to tariff cuts, not surprisingly generate larger estimates. The study of Ciuriak and Xiao (2014) provides a very nice example as it decomposes the estimated welfare gains by category of liberalization. Only one quarter of the estimated welfare gain in their best guess

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[10] Empirical models based on heterogeneous firm trade theory and the gravity model have generated mixed results with respect to the size of the estimates of the gains from trade reform relative to standard models. See Arkolakis et al. (2012) and Melitz and Redding (2015) for competing views.

Table 2. Estimated medium and long run welfare effects of TPP liberalization with tariff elimination or reductions and TRQ expansions as agreed

Country / Region	Medium Run			Long Run			
	% GDP[a]	EV[b]	TOT[c]	% GDP	EV	TOT	Capital[d]
Australia	-0.01	-91	-135	0.08	1,089	-38	685
New Zealand	0.07	120	107	0.2	322	101	148
Japan	0.14	8,295	4,678	0.31	18,031	4,274	6,941
Brunei	0.64	107	8	1.83	306	2	173
Malaysia	0.24	689	-462	1.57	4,534	-1,415	3,839
Singapore	0.22	590	692	0.5	1,383	649	738
Vietnam	2.39	3,233	1,880	3.67	4,976	1,182	1,666
Canada	0.06	1,016	199	0.15	2,750	140	1,232
USA	0	715	611	0.02	2,786	952	1,255
Mexico	-0.02	-208	-427	0.13	1,532	-517	1,499
Chile	0.05	128	124	0.12	303	132	144
Peru	-0.01	-24	-36	0.02	35	-27	40
China	-0.06	-4,141	-2,227	-0.05	-3,892	-2,234	156
Hong Kong	-0.04	-111	-105	-0.04	-101	-63	-31
Korea	-0.06	-698	-536	-0.08	-964	-429	-309
Taiwan	-0.07	-323	-235	-0.07	-343	-199	-57
Rest of South East Asia	-0.15	-103	-64	-0.15	-107	-44	-25
Indonesia	-0.05	-457	-362	-0.02	-202	-251	111
Laos	-0.03	-2	-1	0.07	6	3	2
Philippines	-0.09	-205	-157	-0.04	-79	-154	109
Thailand	-0.34	-1,161	-931	-0.39	-1,351	-725	-345
India	-0.03	-632	-330	-0.04	-800	-359	-125
Brazil / Argentina	-0.02	-464	-372	-0.02	-595	-284	-159
Rest of South America	-0.02	-269	-180	-0.04	-487	-101	-252
Western Europe	-0.01	-2,265	-1,485	-0.02	-3,108	-1,300	-742
Russia	0	37	-1	0.02	354	202	29
Rest of World	-0.01	-468	-298	0	6	475	-305
TPP Members		14,569	7,240		38,046	5,435	18,360
TPP Non-Members		-11,263			-11,663		
World		3,307			26,384		

[a] Equivalent variation as a percentage of baseline (2011) GDP.

[b] Equivalent variation measured in $US2011 millions.

[c] Terms of trade component of EV, measured in $US2011 millions.

[d] Capital accumulation component of EV, measured in $US2011 millions.

scenario (approximately $75 billion) is attributable to tariff liberalization[11].

There are other more subtle effects at work with respect to simulation design too. For example, in general, the higher the degree of aggregation, especially on the commodity side, the lower the estimated welfare gains. This is because aggregation tends to smooth out the peaks across distortions, but the welfare costs of interventions increase exponentially with the size of the distortions. Hence, aggregation, while a simulation necessity, tends to bias welfare estimates downward.

With such a wide range of estimates, it is obviously difficult to pin down how large the welfare gains are really likely to be. So what is the bottom line? On the one hand, there are a couple of major reasons to think the typical CGE study is overstating the effects of trade reform. They both relate to simulation design. First, there is what is sometimes called the 'overestimation' problem (see Cheong and Tongzon, 2013). The economies of the Asia-Pacific region have been at the forefront of the global proliferation of regional trading agreements. As a result there are numerous overlapping agreements that have been recently negotiated among the TPP members and between TPP members and other economies. While agreements that are in place at the time of the base year will be accounted for, those that were agreed (or will be implemented) at a later date are generally not unless the modeler explicitly attempts to do so. While a few do (Cheong and Tongzon, 2013, Ciuriak and Xiao, 2014, Itakura and Lee, 2012, Petri et al., 2012) most do not. Even in those that do make adjustments, it is difficult to account for the myriad of agreements, and so only a selected few are figured into the calculations. On the one hand, this is not so much a problem with the size of the estimated welfare gain per se, but rather with the attribution of the gain to the TPP. The estimated gains are 'correct' but are a mix of the TPP and other agreements. To an extent this doesn't matter if our objective is to understand overall efficiency gains from the totality of trade reform initiatives. It is, however, important not to double count. Hence, for example, it would be erroneous to simply add together separate estimates of the gains from two overlapping agreements to obtain the total estimated gains of both.

Second, as we have noted, many studies of the TPP (and other agreements) make overly ambitious assumptions about the degree of trade liberalization that is going to occur. For example, it is common to assume that all tariffs are eliminated. The reality in the TPP case is now known to be different, with exclusions in a number of sensitive sectors. This is

[11] USITC (2016) has a similar breakdown for the US only. In their estimates approximately 55 percent of the gain to the US from the TPP is from merchandise trade reform, 35 percent from services trade reform, and 10 percent from FDI reforms.

important since the sectors that are most sensitive are often the most protected, and are therefore those in which there are the largest potential economic efficiency gains *if* liberalization can be achieved.

To get an idea of how much the results can be overstated, consider the results of our full liberalization scenario presented in Table 3. Compared with the results from our simulation of the TPP as concluded in Table 2, the total estimated gains from complete tariff reform in the TPP are over 50 percent higher in both the long and short run. This difference can be interpreted as what is "left on the table" by the deviations from full liberalization in the actual agreement. Note also that the difference is largely seen in allocative efficiency effects (and the associated accumulation in the long run), since terms of trade movements are similar in both scenarios. The large difference suggests that the carve-outs have come at a significant welfare cost to the region.

As we noted above, other simulation results confirm that the gains from the TPP are likely considerably lower with sensitive products excluded. Given the challenging nature of agriculture in the TPP negotiations, it is perhaps not surprising that a number of studies have focused attention on this area (Burfisher et al., 2014; Disdier et al., 2016; Lee and Itakura, 2014; Whittaker et al., 2013). Two of these studies focus specifically on the case of Japan (Lee and Itakura, 2014 and Whittaker et al., 2013), the former allowing for rice exemptions. A few other studies, while not focused on agriculture, also consider simulations in which agriculture is excluded (e.g., Durongkaveroj et al., 2014). Not all of these studies report welfare results, but those that do show substantial welfare costs from excluding agriculture from the TPP.

Petri et al. (2012) consider a scenario where the TPP is implemented with each country being granted an exemption in their three most sensitive sectors. For Japan, these sectors are rice, wheat and other agriculture, while for the US the sectors were apparel and footwear, textiles, and other agriculture. In these sensitive sectors the assumed tariff cuts are reduced by 2/3. The results are striking – the estimated total welfare gain falls from $110 billion to $78 billion. They conclude that Japan's entry to the TPP is beneficial in the aggregate, but not if it requires concessions that diminish the quality of the agreement.

The latest results from Petri and Plummer (2016), like ours based on the actual agreement, provide some more useful insights. While the overall welfare gains are actually larger than in the earlier study (Petri et al., 2012), the authors very carefully lay out the sources of the differences. They show that much of the increase is explained by changes in the baseline to 2030 from 2025, and updated data on NTBs. The addition of an assumption that the NTB liberalization spills over multilaterally also pushes the estimated welfare gain upward considerably. On the other hand, their estimates of the effect of NTB reform on economic welfare based on the actual agreement, are revised downward significantly.

While overstatement of the degree of reform is clearly important, there remain several compelling reasons to think that the economic welfare estimates that come out of CGE studies in general are lower bounds on the actual economic effects of whatever scenario is being considered. First, most CGE studies continue to use competitive, static models, with relatively high levels of aggregation. These assumptions limit the size of the effects that can be observed. As we noted above, those studies that do move beyond this framework tend to generate higher estimates of welfare gains from the TPP, although as Petri et al. (2012) state, this comes at the expense of increased parametric uncertainty. Secondly, some of the effects of trade reform are hard to quantify. Trade reform may spur increases in productivity that may dwarf the effects of resource allocation. But little is known about the magnitude, and CGE modelers tend to be conservative. Perhaps most importantly, the existing CGE studies have tended to focus on tariff liberalization in merchandise. This is an important part of the TPP, but by no means the only part. It is likely that the gains from liberalization of services, and other aspects of the TPP, such as trade facilitation and improvements in regulatory consistency, would have large economic efficiency effects[12]. Unfortunately, they remain difficult to quantify. On balance, while there is much uncertainty, it is probably safe to say that even the estimates at the higher end are probably lower bounds on the true potential welfares gains from the TPP.

[12] On the importance of trade facilitation, Anderson and van Wincoop (2004) give a famous headline estimate of 170% average developed economy trade costs, only 8% of which reflects the direct effects of tariff and non-tariff barriers.

Table 3. Estimated medium and long run welfare effects of the TPP with full tariff liberalization

Country / Region	Medium Run			Long Run			
	% GDP[a]	EV[b]	TOT[c]	% GDP	EV	TOT	Capital[d]
Australia	0	53	24	0.1	1,330	171	713
New Zealand	0.47	774	731	0.73	1198	711	318
Japan	0.18	10,360	3,371	0.48	28,125	2,504	12,753
Brunei	0.65	108	10	1.86	310	5	174
Malaysia	0.25	715	-439	1.58	4,577	-1,376	3,837
Singapore	0.22	600	711	0.52	1,416	670	753
Vietnam	2.34	3,171	1,884	3.65	4,945	1,184	1,691
Canada	0.16	2,769	-1264	0.4	7,109	-1512	3,161
USA	0.02	3728	3053	0.04	6,940	3507	1,995
Mexico	-0.03	-293	-602	0.13	1,471	-681	1,504
Chile	0.11	268	274	0.21	527	285	214
Peru	-0.01	-24	-35	0.02	39	-20	39
China	-0.06	-4,342	-2,357	-0.06	-4,055	-2,335	117
Hong Kong	-0.03	-79	-70	-0.01	-27	-30	9
Korea	-0.07	-785	-576	-0.09	-1142	-458	-394
Taiwan	-0.07	-320	-237	-0.07	-313	-191	-47
Rest of South East Asia	-0.14	-100	-61	-0.15	-101	-40	-24
Indonesia	-0.05	-460	-354	-0.02	-192	-217	96
Laos	-0.01	-1	0	0.1	8	4	3
Philippines	-0.09	-211	-168	-0.03	-59	-163	130
Thailand	-0.37	-1,287	-1046	-0.41	-1,434	-834	-316
India	-0.04	-661	-333	-0.05	-919	-384	-182
Brazil / Argentina	-0.02	-527	-424	-0.02	-675	-318	-186
Rest of South America	-0.03	-332	-213	-0.05	-605	-104	-322
Western Europe	-0.01	-2,668	-1,718	-0.02	-3,803	-1,542	-944
Russia	0.01	180	84	0.03	682	363	82
Rest of World	-0.01	-567	-290	0	-41	770	-508
TPP Members		22,227	7,719		57,985	5,448	27,153
TPP Non-Members		-12,160			-12,675		
World		10,067			45,310		

[a] Equivalent variation as a percentage of baseline (2011) GDP.

[b] Equivalent variation measured in $US2011 millions.

[c] Terms of trade component of EV, measured in $US2011 millions.

[d] Capital accumulation component of EV, measured in $US2011 millions.

5.2. Distribution of the Gains

Of course, not all members of the TPP are likely to benefit equally from the agreement, and CGE is a useful tool for helping us to assess such regional variations. We again focus the discussion by starting with our results from Table 2, which provides the equivalent variation by country, broken into terms of trade movements and capital accumulation effects. Since the members of the TPP vary considerably in terms of economic size, we provide some context for the equivalent variation numbers by expressing them as a percentage of baseline GDP.

In absolute terms, the largest gains in our estimates are to the larger TPP economies. Most notable is the case of Japan, where the estimated welfare gain of over $8 billion in the medium run is more than double the next largest gain (just over $3 billion for Vietnam). The pattern holds in the long run also, where the estimated gains to Japan at $18 billion are roughly four times the next closest country (again Vietnam). Gains to the US are modest, around $3 billion in the long run[13]. While not all of the TPP members are estimated to have positive welfare effects from TPP tariff liberalization in our simulations, any negative outcomes are small. The model predicts very small negative effects for Australia, Mexico and Peru in the medium run, although the signs reverse in the long run.

When viewed relative to GDP, the pattern is quite different from that in the absolute levels. The biggest winners now tend to be the smallest countries. By far the largest proportional gains are estimated to accrue to Vietnam, at 2.4 and 3.7 percent of GDP in the medium and long-run, respectively. Vietnam is followed by Brunei, and, in the long-run, Malaysia. Among the developed economies, the largest gainer in proportional terms is Singapore, with an estimated gain of just under 0.5 percent of GDP.

It is interesting to consider the regional effects of the carve outs by comparing Tables 2 and 3. We see that just four TPP members Japan, US, Canada and NZ account for 98 percent of the reduction in the estimated total welfare gains. Japan has by far the largest reduction in EV in absolute terms, amounting to over a third of its welfare gains under full liberalization. This reveals that a large part of the economic gains to Japan from the TPP are associated with its own agricultural trade liberalization. Excluding these products substantially cuts into the economic benefits. The erosion of welfare gains caused by agricultural carve-outs is proportionately even greater for Canada, amounting to over 60 percent of potential gains from full liberalization in both the medium and long run.

[13] USITC (2016) focuses on the effect of the TPP on the US, putting the total real income gain in the region of $57 billion at 2032, or 0.23 percent of baseline GDP.

Petri et al. (2012) also note that most of the economic damage from exemptions manifests in the economies employing them, and suggest that allowing Japan to make more gradual or modest reductions in its sensitive sectors would not be very costly for its partners. As a counter-example to this suggestion, relative to GDP by far the largest reduction in welfare resulting from the carve-outs in the TPP is recorded for New Zealand. These reductions are overwhelmingly due to terms of trade losses, reflecting the effect on New Zealand exports of the market access restriction on agricultural imports retained by other TPP members, notably by Japan and Canada[14]. There may also be concerns over the precedent for further liberalization in the region. Most of the TPP members as well as other Asia-Pacific economies have some sectors that are sensitive, and generalizing the practice of carve-outs for these sectors may dramatically diminish the eventual prospects for welfare-enhancing reform under an eventual FTAAP, for example. As Petri et al. (2012) note, "allowing exemptions invites rent-seeking and becomes difficult to contain."

The reduction in welfare for the US from the carve-outs is similar to that for Canada in absolute terms. Welfare gains for the US are eliminated in the medium run scenario, and halved in the long run scenario. As with Japan, there are reductions in allocative efficiency, reflecting the extent of agricultural protection retained by the US, but in the US case there are also larger terms of trade losses, presumably reflecting both the market access restrictions on US agricultural exports retained by other TPP members (including Japan and Canada) and probably some degree of preference erosion in NAFTA markets.

Although the estimates of the total welfare gains of the TPP vary considerably as we have seen, the pattern in the regional distribution of the welfare gains is remarkably consistent across all of the CGE studies that have been completed so far. Most studies predict all TPP members will experience positive welfare gains, or at worst negligible change in economic welfare. There is strong consensus that the largest gains in absolute terms will accrue to Japan, and that the largest proportional gains will accrue to Vietnam[15]. As Petri et al. (2014) note, the TPP has a tendency to be most beneficial to those countries that do not already have a free trade agreement with the US. In fact, we see this result in every study, despite considerable variation in model structure and simulation design (see Areerat et al., 2012, Itakura and Lee, 2012, Petri et al., 2012, and Petri and Plummer, 2016, for examples).

[14] Strutt et al. (2015) focus on the impact of the TPP on New Zealand, estimating gains in the region of $0.4 to $1.8 billion, with the higher figures assuming cuts to NTBs.

[15] Interestingly, Petri and Plummer (2016) have the largest absolute gains accruing to the US, followed closely by Japan. This result is driven by the assumption of multilateral spillover on NTB reform, which seems to benefit the US dispropor- tionately in the simulations. The study by the Japanese Cabinet Secretariat (2015) predicts much larger gains to Japan, around 2.6% in terms of real GDP. That study assumes a strong labor supply response in the Japanese economy, as well as introducing a productivity/trade linkage.

Hence, while there is considerable uncertainty over the total magnitude of economic gains, there is much less uncertainty over their regional distribution.

Why is that? Economic theory gives us considerable guidance on which countries are expected to gain the most from an agreement like the TPP. The distribution of benefits will depend critically on an economy's own initial protection structure (which affects the size of potential gains in allocative efficiency, with more protected economies having more to gain); on the size of trade in the economy's GDP, with more trade dependent economies larger beneficiaries of trade liberalization in relative terms; on the market access restrictions they face in other TPP economies (which will affect the scope of potential expansions); and finally on the strength of their initial trade ties with other TPP member economies, which will impact the ability of each economy to take advantage of expanding market opportunities. These factors are economic characteristics largely reflected in the data of a CGE model, which is basically common across the studies of the TPP, rather than in the theory and shock structure, which varies a lot more. This explains the consistency.

We see confirmation of the importance of the factors described above in the patterns observable in the sources of the welfare gains and how these differ across the various TPP members. New Zealand, for example, is very open and very trade dependent, and has welfare gains that are comprised almost entirely of terms of trade effects in other words market access. Consistent with this, its welfare gains are significantly reduced by the retention of market access restrictions by TPP partners. For Japan, by contrast, the majority of the gains are not through positive movements in the terms of trade, but rather from improvements in allocative efficiency, indicating that the primary source of the potential gains for Japan is in fact its own tariff reform: a significant proportion of these gains are foregone by limitations on that reform. For Vietnam, as we see from Table 1, there is a combination of factors including relatively high initial protection of its own, high dependence on trade within the region, and high protection faced in certain critical exports sectors, such as textiles, footwear and wearing apparel, where it has a strong comparative advantage[16]. Hence, we observe large relative gains in both efficiency and the terms of trade. As a final note, it is interesting that Mexico actually suffers a decline in its terms of trade in our simulations, although the gains in allocative efficiency, and in the long run, capital accumulation, are enough to outweigh those negative effects. This is likely a consequence of a loss of relative preferences within NAFTA as the US market opens to other TPP members. This pattern is

[16] Petri et al. (2012), which allows for imperfect competition, also note powerful scale effects in Vietnam's principal production clusters. The study by Nguyen et al. (2015), which uses simulations with both a general equilibrium model (GTAP) and a partial equilibrium one (GSIM), focuses on Vietnam and confirms the general pattern. The latter also emphasizes the role of increased investment in the economy.

exacerbated for Mexico in those studies that factor in the free trade agreement between Japan and Mexico, which entered into force in 2005, and its associated preferences, which will also be eroded by the opening of the Japanese market to other TPP members (i.e., Petri et al., 2012). We discuss this concept of preference erosion further in the next section. Our simulations also show negative term of trade effects for Malaysia, which may be due to the erosion of its preferences in the markets of other ASEAN TPP participants, as the TPP opens these markets to North and Latin American members.

5.3. Effects on Non-members

Evaluating the effect of a new regional trading agreement on non-member economies has been a major concern of a number of the studies, and is again a question to which CGE simulation is particularly well-suited. Of particular concern is the impact on small developing economies which are likely to be excluded from not only the TPP but also other major trade agreements. In terms of countries within Asia, Rahman and Ara (2015) consider the impact on Nepal and Bangladesh, Cororaton and Orden (2015) the Philippines, and Durongkaveroj et al. (2014) Thailand. The impact on India is examined by Ganesh-Kumar and Chatterjee (2014) and Narayanan and Sharma (2016), while a number of studies have considered impacts on China (Li and Yao, 2014; Lu, 2015). In terms of other countries, Turkey is considered by Oduncu et al. (2014), and the impact on Brazil is examined in Thorensten and Ferraz (2014).

As a general matter, effects on other countries manifest through two closely related mechanisms. The first is termed the ‘trade diversion’ effect, the second is the ‘preference erosion’ effect. Both operate through changes in the pattern of trade in response to the differentials introduced to the protection pattern by preferential liberalization. Trade diversion is where the newly introduced tariff preference causes a switch in the source of imports from a non-member source to a member source. From the perspective of the non-member economy, there will be a loss of market share, reflected in welfare terms by a decline in the terms of trade.

Preference erosion is where a newly introduced tariff preference cause a shift in imports away from a partner in a pre-existing agreement to a source in the new (or expanded) agreement. A simple example may illustrate the distinction. When the US signs the TPP, we might anticipate trade diversion to impact India, a current trading partner, but not a member of an existing agreement with the US, and preference erosion to impact Mexico, a current member of NAFTA (indeed, the above simulation results are suggestive of exactly that). From the perspective of the existing partner, preference erosion will again be reflected in a decline in market share, and therefore the terms of trade[17].

In terms of our simulation results, we first note that the overall effect on non-member economies is negative (Table 2). This is because most of the effect on those countries will be felt through the terms of trade, reflecting the mechanisms described above. Allocative efficiency changes will occur too, as global prices change the flow of goods and resources across existing distortions in non-member countries, but these effects are generally of second-order magnitude. Welfare effects resulting from terms of trade changes are zero sum, an overall gain in the terms of trade to TPP members, as we observe in Table 2 and discussed previously, must be reflected in a terms of trade decline for non-members. This is a pattern typically seen in evaluations of preferential agreements, reflecting the trade diversion effect. It is not universal, however, and depends on the assumed modality of trade reform. Under some versions of the so-called 'open regionalism' model, where unilateral liberalization is encouraged, we are less likely to observe significant harmful welfare effects on non-member economies. It is also interesting to note that the total 'world' welfare effect of the TPP is positive. This means that the TPP increases allocative efficiency at the global level. Again, this by no means a guaranteed characteristic of a preferential agreement, but is a common outcome in CGE simulations.

So which particular countries are likely to be hurt most by the TPP? The above discussion suggests we might want to look at two groups in particular. The first is members of preferential trading agreements with TPP members that are not themselves part of the TPP, and least developed economies, both of which would be likely to be impacted by preference erosion. The second is large, efficient export economies excluded from the agreement, which would be subject to diversion of trade.

There are many countries identified in our analysis that have existing free trade agreements with TPP members but are not themselves a part of the TPP. Notable among these are China and the members of ASEAN excepting Malaysia, Brunei, Singapore and Vietnam. Also, Korea has free trade agreements with Australia, the US, Chile, Peru, New Zealand and Singapore, as well as with Malaysia, Brunei and Vietnam through its ASEAN agreement, and Canada (as of January 2015). There are agreements between Japan and Thailand, Indonesia, the Philippines and India. Australia's agreement partners include China and Thailand, and also the other ASEAN countries not participating in the TPP. New Zealand has agreements with China, Taiwan and Hong Kong, as well as the other ASEAN

[17] Where the two effects differ is their impact on the importing economy. Trade diversion can have negative welfare implications (reflected in a decline in tariff revenues), although it has a positive effect on the members of the agreement as a whole, through favorable movement of the terms of trade. By contrast, preference erosion is in effect working in the opposite direction.

countries not participating in the TPP. Mexico has an agreement with the European Union. This list is not exhaustive (and is constantly growing as new agreements proliferate). While the agreements are known to vary in terms of coverage, quality and utilization (see Kawai and Wignaraja, 2011), overall, the existing agreements would tend to suggest we should expect the most negatively affected economies to be the members of ASEAN that are not part of the TPP, along with Korea and China, which are likely to suffer from both preference erosion and trade diversion effects.

This expectation is borne out in our simulation results, and in the other studies surveyed. In Table 2, we observe large economic losses predicted for Korea, China and the members of ASEAN, most notably Thailand, in all cases driven largely by adverse movements in the terms of trade as we would expect. In absolute terms the largest loss is to China, at around $4 billion in both the short and long run. This is a small proportion of Chinese GDP, however (only 0.06 percent). China is followed by Western Europe, with estimated losses of approximately $3 billion. This is only 0.02 percent of the region's GDP, however. The proportional impact on Thailand is much greater than other countries, at around -0.4 percent of GDP in both the short and long run. Indeed, Thailand seems to be the economy most at risk from the TPP in its current form.

How do these results compare to the literature? Again, while the magnitudes of the effects vary, the sign pattern is very consistent across all of the studies we have surveyed. There is general agreement that the economies most hurt in absolute terms will be China, Western Europe, and Korea, and in relative terms Thailand. The consistency of the results can again be traced back to common data characteristics, as described in the preceding section.

So what economic characteristics seem to be driving the observed patterns? Some useful inferences can be drawn from the studies focusing on effects on specific countries. The Durongkaveroj et al. (2014) study into the nature of the impact on Thailand estimates a fall in Thailand's GDP as a result of the TPP of approximately 0.6 percent. The impact is substantially reduced if agricultural trade reform in the TPP is limited (to 0.4 percent with a 50 percent cut in intra-TPP agricultural tariffs, and 0.3 percent if agriculture is excluded entirely). This suggests that the primary cause of welfare losses in Thailand is increased discrimination in food markets in the region. This is supported by a comparison of the results for Thailand in Tables 2 and 3. The agricultural carve-outs in the agreement actually help Thailand modestly relative to full liberalization, reflecting reduced discrimination against its agricultural exports[18].

In the case of China, the study by Lu (2015) focuses on attention on the role of textiles liberalization, emphasizing the result that the TPP, while having a small welfare impact on China relative to GDP, will have a substantial impact on China's exports in the textiles/apparel category. They estimate a fall in export value of roughly $2 billion, a figure that is worsened with Japan's entry into the agreement.

For India, Ganesh-Kumar and Chatterjee (2014) and Narayanan and Sharma (2016) both find small impacts. The former uses POVCAL in conjunction with the CGE simulation, and identifies small increases in poverty and income inequality in India as a result of the agreement. The effects of the TTIP agreement on India are larger. In both studies the effects on India come about largely through changes in textiles trade, as with China. The relatively small magnitude of the economic effects in the case of India presumably reflects its relatively limited trade ties to the region (as we see in Table 1 only around a quarter of India's exports and a fifth of its imports are destined top/sourced from the TPP countries). Rahman and Ara (2015) also note modest welfare declines in South Asia, driven by falls in agricultural and textile exports.

Negative effects of the TPP vis-a-vis non-members may be offset by other agreements. For example, the impact on Western Europe may be partially canceled out by a successful implementation of TTIP and other agreements that are being negotiated between the economies of Asia and the European Union (most notably those involving ASEAN and Japan). Similarly, the proliferation of agreements between TPP member states and other non-TPP member states will ameliorate negative effects on non-members (although the rise of numerous overlapping and not always consistent preferential agreements raises a host of other potential concerns, see Menon, 2014, for discussion.)

5.4. Expanding the Membership

Non-members may also counteract negative effects of the TPP by joining the group, a course of action that several of the economies that the simulation results have indicated will be hurt by the TPP have already signaled. Indeed, mitigating negative effects of trade agreements by seeking membership is a key mechanism underlying the notion of 'competitive liberalization' (see Bergsten, 1996).

[18] Note that the majority of the loss to Thailand in our simulations comes from adverse movements in the terms of trade, as expected. There is quite a large allocative efficiency loss also, however. This seems to be driven by movements a decrease in motor vehicle imports across a large tariff barrier.

As we noted in section 2, the TPP membership has already undergone a number of membership expansions since its rather humble beginnings as the P4. The current position of the TPP is that there will be no new members until the agreement enters into force, which is unlikely to occur before late in 2017, so that new memberships are not imminent. Nonetheless, a number of other countries have expressed a direct intent to join the TPP, and still others have expressed informal interest in the group[19]. Hence, many studies have considered the implications of possible future TPP expansion, often in conjunction with simulations investigating the impact of the current agreement on non-members.

The most common scenarios considered in the literature so far are expansion of the TPP agreement to include Korea (Areerat et al., 2012; Disdier et al., 2016; Itakura and Lee, 2012; Lee and Itakura, 2013; Lee and Itakura, 2014; Narayanan and Sharma, 2016; Petri et al., 2012; Takamasu and Xi, 2012; Petri, 2013; Petri et al., 2013; and Petri et al., 2014), in various configurations, and China (Areerat et al., 2012; Disdier et al., 2016; Li and Whalley, 2014; Li, 2014; Li and Yao, 2014; Narayanan and Sharma, 2016; Takamasu and Xi, 2012; Thorensten and Ferraz, 2014; and Petri et al., 2014). Other countries that have been considered as possible future members in the literature include the Philippines (Cororaton and Orden, 2015; Lee and Itakura, 2014; Petri et al., 2013; and Petri et al., 2014), Thailand (Durongkaveroj et al., 2014; Lee and Itakura (2014); Petri et al., 2013; and Petri et al., 2014), Indonesia (Lee and Itakura, 2014; and Petri et al., 2014), Taiwain (Takamasu and Xi, 2012), India (Disdier et al., 2016; and Narayanan and Sharma, 2016), and the economies of South Asia (Rahman and Ara, 2015)[20].

We divide our own expansion scenarios into two steps. In the first we add to the existing TPP members the most 'probable' new member – Korea, which has officially announced an interest in joining the TPP. We follow by adding a group of 'possibles'. These are a group of countries where there have been media reports of potential interest in the future, but as yet no 'official' moves toward joining the TPP. This group consists of China, Indonesia and

[19] At present the situation can be summarized as follows. Korea is widely seen as the likely "first cab off the rank." In terms of the rest of East Asia, China conducted an intense study internally in 2013-14 on the implications of joining the TPP, decided to defer any decision until further reforms have been undertaken. While it may possibly consider joining in 2017/18, the US attitude could be problematic. Taiwan has definitely indicated interest, but there is a widespread (though not universal) view that it is impossible for Taiwan to join until China does. Hong Kong would also likely join with China, but is unlikely to do so otherwise. In terms of South East Asia, the Philippines has expressed interest but has some constitutional difficulties. Thailand announced an intention to join the TPP, but enthusiasm for accession seems to have declined since the coup, both inside and outside Thailand. Most recently, President Widodo of Indonesia announced the intention to join TPP to President Obama during his visit to Washington. This was apparently a surprise back in Jakarta and there are observers both inside and outside Jakarta who doubt his ability to muster the necessary political support. Finally, outside of APEC, Colombia and Costa Rica (non-APEC members of the Pacific Alliance) have expressed a desire to join TPP, but the understanding is that TPP membership is limited to APEC members for the time being.

[20] Note that there is considerable cross-over between those studies examining the impact of the TPP on non-members and those considering expansion of the TPP, as we might expect.

Taiwan. Ultimately, the group of countries seeking to join the TPP may of course be larger still, if it becomes seen as a viable mechanism for reaching an FTAAP. The scenarios assume expansion of tariff preferences to new members on the same basis as for existing members, but new members liberalize fully.

The estimated aggregate welfare impacts are presented in Table 4. We have included only the long- run impacts, so the numbers are comparable to columns 4 through 7 in Table 2[21]. As a general matter, the larger the regional trade agreement, the greater the potential economic benefits to its members, so we expect the overall welfare gains to be increase as more members are added. Expanding the TPP to include Korea is indeed estimated have a substantial impact on overall gains, which are estimated to rise to over $100 billion in the long run, well over double the estimated long-run impact of the TPP without Korea included. Most of the difference is in welfare gains to Korea itself, the gain (relative to being excluded from the TPP) being close to $54 billion (4 percent of GDP). This result is confirmed by the existing studies, which consistently show large benefits accruing to Korea from TPP membership. In our simulations the gain is dominated by capital accumulation and allocative efficiency effects. This suggests that while Korea would be among the largest gainers from an expanded TPP in both relative and absolute terms, like Japan, much of the gain is dependent on its own liberalization. Hence, the impact would be substantially diminished if sensitive sectors were to be excluded, as could be the case.

As a free trade agreement expands its membership, existing members generally gain as the potential for trade diversion is reduced. There is the potential for some countries to lose from preference erosion, however. According to our simulation results, expansion of the TPP to include Korea has a positive impact on estimated net economic welfare for all of the 12 current TPP members. While the effects are small in most cases, the estimated effect on Australia is quite substantial[22]. The impact on non-members is generally negative, with the largest impact in relative terms on Thailand.

Expansion to include the 'possibles' has an even more dramatic effect on the size of the estimated total long-run welfare gains to TPP members. As we see in Table 4, the

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[21] Since these are comparative static simulations, the difference in the dollar value figures for any pair of scenarios can be interpreted as the additional impact the liberalization under the second scenario, assuming that the first scenario has already been implemented.

[22] This is almost certainly an example of the 'overestimation' problem discussed previously. Since Australia has recently signed agreements with Korea and China, we should interpret the effect on Australia as the joint impact. Expanding the TPP to include Korea and China should be beneficial to Australia only to the extent that it results in a higher degree of liberalization of bilateral trade. New Zealand has also recently signed an agreement with Korea. Similarly, although China and Korea concluded an FTA in late 2014, bringing these two countries into the TPP would benefit them both to the extent of the much higher liberalization involved in the TPP, in addition to the benefits related to their trade with existing TPP members.

estimated impact is nearly doubled relative to the inclusion of Korea, and five times that of the TPP12, at over $190 billion. Once again, a large proportion of the gains accrue to the new members themselves. The largest estimated gain is to China, at $39 billion relative to the TPP+Korea scenario, or around 0.6 percent of baseline GDP. As with Japan and Korea, this seems to be driven primarily by the effects of China's own liberalization, and would likely be cut substantially by exemptions. The corresponding figures for Taiwan and Indonesia are approximately $7 billion (1.5 percent of baseline GDP) and $4 billion (0.4 percent), respectively.

Adding China to the agreement strongly benefits Japan, Singapore, and Australia. It is also interesting to note that the inclusion of China increases the total estimated benefits of the TPP for the US substantially. The work of Li and Whalley (2014) and Li et al. (2014) suggests that inclusion of China in the agreement may also result in a slight improvement in the politically sensitive trade imbalance.

However, including China would likely have a strong negative welfare effect on Vietnam. Although the estimated overall benefits to Vietnam from the TPP remain substantial, the expansion cuts the estimated welfare gains by around $3 billion (just over 2 percent of baseline GDP). What we are seeing here is a particularly severe case of preference erosion. Vietnam and China are both large suppliers of textiles, and Vietnam benefits from the reduced competition in an agreement without China. China's entry to the TPP removes that benefit. This is a pattern that has been noted in a number of other studies (see Li, 2014, and Li and Yao, 2014)[23].

Similar results to those involving Korea and China are seen in the other expansion studies. Cororaton and Orden (2015) estimate gains of roughly 1.7 percent of GDP for the Philippines from joining the TPP, relative to being excluded. This includes an assumed benefit from expanded FDI into the Philippines worth 0.2 percent of GDP, in addition to tariff and NTB reform. Gains accrue to other TPP members except Mexico and Peru. They argue that the potential benefits to the Philippines are limited by a number of domestic factors, most notably a large infrastructure gap. Durongkaveroj et al. (2014) shows that the benefits to Thailand from joining the TPP are substantial, as it is able to avoid significant trade diversion. They also show, however, that the benefits are strongly dependent on agricultural trade reform being included in the TPP.

[23] It is not universal, however, and may be somewhat closure dependent. Narayanan and Sharma (2016) do not find a negative impact on Vietnam from China's entry. The main difference between this study and others that the closure allows for unemployment.

While the Philippines and Thailand have a strong incentive to join the TPP to avoid trade diversion effects, the same is not true for India. Narayanan and Sharma (2016) find relatively small impacts on the Indian economy from the TPP, as we noted in the previous section. The flipside of this is that there are also relatively small gains to India from joining an expanded TPP. They estimate gains of around $13 billion from agreement with both Korea and China, around 1/5 of the gains to China and 1/10 of those to Korea. They conclude that there would be little for India to gain from joining the TPP in the future, in particular given the likely political sensitivity over the adverse effects on agriculture that the simulations predict.

5.5. Comparisons to Other Proposed Asia-Pacific "Mega-Regionals"

Given the level of attention now focused on proposals around the globe for "mega-regional" agreements, many of which are overlapping in terms of membership, it is not surprising that comparing the TPP with other proposed "mega-regionals," especially with the RCEP and the FTAAP in the Asia-Pacific region, has been another significant focus of the CGE literature. A number of comparisons to RCEP have been made (Cheong and Tongzon, 2013; Itakura and Lee, 2012; Kawasaki, 2014; Lee and Itakura, 2013; Lee and Itakura, 2014; Petri, 2013; Rahman and Ara, 2015), in addition to comparisons to the FTAAP (Itakura and Lee, 2012; Kawasaki, 2014; Lee and Itakura, 2013; Lee and Itakura, 2014; Petri et al., 2012; Petri, 2013). Itakura and Lee (2012) and Petri et al. (2012) also consider the East Asian Free Trade Area[24].

The results of our own simulations of the possible welfare impact of the RCEP and the FTAAP are presented in Table 5. These are long-run estimates, assuming full liberalization in both cases. As such, they can be most directly compared with the corresponding values presented in Tables 3.

[24] The EAFTA was first proposed in 1999 as a free trade agreement among the members of the then newly-formed ASEAN Plus 3 Group, which included China, Japan and Korea, but excluded Australia, New Zealand and India. The latter three countries were included in a parallel proposal for the CEPEA (Comprehensive Economic Partnership for East Asia), which emerged in 2005. The proposed RCEP effectively supersedes both the EAFTA and the CEPEA.

Table 4. Estimated Long Run Welfare Effects of TPP Expansion

Country / Region	Probables[a]				Possibles[b]			
	% GDP[c]	EV[d]	TOT[e]	Capital[f]	% GDP	EV	TOT	Capital
Australia	0.24	3,297	907	1,254	0.37	5,149	1,689	1,808
New Zealand	0.36	587	216	247	0.46	759	218	350
Japan	0.39	23,299	6,412	8,561	0.79	46,518	15,386	16,808
Brunei	2.57	429	71	220	2.84	474	77	245
Malaysia	1.69	4,884	-1,706	4,196	1.81	5,238	-2,433	4,781
Singapore	0.58	1,597	784	816	1.11	3,047	1,587	1,494
Vietnam	5.01	6,796	2,217	1,987	2.91	3,939	-499	2,230
Canada	0.16	2,869	249	1,230	0.23	4,010	-55	1,961
USA	0.03	5,407	3,078	1,481	0.06	9,118	647	4,993
Mexico	0.22	2,523	-870	2,180	0.58	6,737	-1,899	5,681
Chile	0.18	461	213	203	0.19	470	45	296
Peru	0.06	102	31	48	0.05	88	-91	61
China	-0.08	-5,708	-4,296	324	0.46	33,740	-2,962	14,011
Hong Kong	0.07	177	45	128	-0.41	-1,027	-607	-401
Korea	4.17	50,153	-7,330	39,033	5.46	65,653	-5,729	48,275
Taiwan	-0.16	-750	-505	-139	1.29	6,006	2,734	2,875
Rest of South East Asia	-0.1	-66	-16	-14	-1.02	-709	-274	-203
Indonesia	-0.02	-163	-167	94	0.41	3,428	12	2,356
Laos	0.04	3	2	1	-0.3	-25	-11	-3
Philippines	-0.03	-63	-222	234	-0.43	-953	-606	-133
Thailand	-0.55	-1,916	-893	-613	-1.41	-4,870	-2,025	-1,936
India	-0.09	-1,619	-816	-123	-0.23	-4,381	-2,269	-443
Brazil / Argentina	-0.03	-911	-383	-298	-0.07	-2,033	-1,018	-552
Rest of South America	-0.03	-343	119	-315	-0.16	-2,068	-403	-1,050
Western Europe	-0.04	-7,246	-2,863	-2,007	-0.1	-18,555	-8,282	-4,659
Russia	0.11	2,301	1,365	273	0.13	2,760	1,414	138
Rest of World	0.08	4,945	4,241	318	0.09	6,168	5,138	351
FTA Members[g]		102,403	4,272	61,456		194,373	8,724	108,226
FTA Non-Members		-11,360				-25,694		
World		91,043				168,680		

a Probables includes current TPP members plus Korea.
b Possibles includes probables plus China, Taiwan, and Indonesia.
c Equivalent variation as a percentage of baseline (2011) GDP.
d Equivalent variation measured in $US2011 millions.
e Terms of trade component of EV, measured in $US2011 millions.
f Capital accumulation component of EV, measured in $US2011 millions.
g Including probables and possibles, respectively.

Consider RCEP first. The key difference between RCEP and TPP is that the former includes China, Korea, India, and the remainder of ASEAN, while excluding the economies in the Americas, i.e., it has a much stronger Asian focus. Comparing the results with Table 3, we see that RCEP is estimated to generate larger aggregate gains than the TPP, both for its members and the world as a whole, conditional on full liberalization of tariff barriers. The RCEP negotiations are still ongoing, but it is already clear that the degree of liberalization being targeted is substantially less than that embodied in the completed TPP agreement[25]. India in particular is reported to have consistently sought to limit the level of liberalization in RCEP. However insufficient information has emerged from the negotiations to enable predictions of the eventual outcome to be made with any confidence. The discussion here therefore relates only to a fully liberalizing RCEP.

Relative to the TPP, a fully liberalizing RCEP generates significantly larger welfare gains for several economies, in particular Australia and Japan, and of course China, Korea and the remaining members of ASEAN, who are not part of the TPP but are part of RCEP[26]. Australia and Japan thus seem to benefit from less competition from the Americas. In the case of the former, this may well be a chimera, to the extent that it is due to preferential access in some sensitive products (such as rice) that may not be part of an actual RCEP agreement. On the other hand, the North and South American members of the TPP are, perhaps not surprisingly, worse off under the RCEP scenario, as is Vietnam, the latter due in part to the inclusion of China, which as we have seen generates more competition for Vietnam in the textiles sector.

Given the membership of the RCEP, it is perhaps useful to compare it to an expanded TPP agreement including China and Korea. If we consider the results of the RCEP scenario relative to the 'possibles' scenario in Table 4, we can see the importance of the trans-Pacific dimension of the TPP more clearly, since we don't mix the effects of excluding the Americas with the effects of expanding the TPP to include two major economies. In this comparison all of the Asian members of the TPP except Australia and Singapore are actually worse off under the RCEP scenario than under the expanded TPP scenario.

[25] A month after the 10th round of RCEP negotiations, the Heads of State of RCEP participating nations acknowledged that the end of 2015 deadline for conclusion of the RCEP agreement would not be met, and looked "forward to the conclusion of the RCEP negotiations in 2016."

[26] The RCEP is modeled here independently of the TPP. Particularly given the degree of overlap between the memberships of the TPP and RCEP, conclusion of the TPP implies some modification of the welfare gains potentially available from the RCEP.

Table 5. Estimated long run welfare effects of RCEP and FTAAP trade liberalization

Country / Region	RCEP				FTAAP			
	% GDP[a]	EV[b]	TOT[c]	Capital[d]	% GDP	EV	TOT	Capital
Australia	0.55	7,680	3,669	2,154	0.4	5,525	2,201	1,827
New Zealand	0.63	1,037	481	357	1.03	1,689	873	532
Japan	0.84	49,740	15,302	19,258	1.09	64,334	15,398	25,873
Brunei	2.68	448	68	233	2.93	490	80	255
Malaysia	1.69	4,893	-955	3,882	2.46	7,115	-2,224	5,675
Singapore	1.64	4,482	2,338	2,201	1.52	4,161	2,159	2,120
Vietnam	1.39	1,886	-596	1,454	3.27	4,436	-551	2,482
Canada	-0.01	-168	-98	-124	0.52	9,201	-1,520	4,116
USA	-0.05	-7,818	-4,567	-1,234	0.09	14,199	2,955	6,081
Mexico	0.03	378	14	117	0.64	7,478	-2,101	6,339
Chile	-0.04	-92	-51	-87	0.29	732	201	390
Peru	0.04	70	44	12	0.04	64	-98	57
China	0.16	11,822	-2,643	5,431	0.5	36,313	661	14,640
Hong Kong	-0.24	-586	-342	-241	0.49	1,224	603	624
Korea	4.14	49,754	-3,463	39,280	5.82	69,972	-4,823	50,379
Taiwan	-0.78	-3,630	-2,634	-950	1.39	6,459	2,987	3,128
Rest of South East Asia	-0.21	-147	-58	-28	-1.01	-699	-253	-201
Indonesia	0.37	3,128	1,905	603	0.51	4,354	257	2,984
Laos	0.97	80	-40	109	-0.3	-25	-4	-2
Philippines	0.19	433	-210	508	0.97	2,167	-667	2,408
Thailand	1.24	4,283	-2,887	5,160	1.46	5,053	-3,751	6,465
India	0.38	7,236	-4,488	6,670	-0.3	-5,546	-2,577	-748
Brazil / Argentina	-0.04	-1,101	-612	-338	-0.09	-2,858	-1,415	-738
Rest of South America	0.01	117	179	-18	-0.18	-2,418	-514	-1,160
Western Europe	-0.08	-14,534	-6,460	-3,786	-0.16	-29,345	-12,709	-7,283
Russia	0.12	2,509	1,209	64	0.82	17,629	-709	8,689
Rest of World	0.08	5,140	4,671	-57	0.05	3,253	5,289	-1,406
FTA Members[e,f]		146,902	8,481			262,594	11,931	
FTA Non-Members		-19,863				-37,638		
World		127,039				224,955		

a Equivalent variation as a percentage of baseline (2011) GDP.
b Equivalent variation measured in $US2011 millions.
c Terms of trade component of EV, measured in $US2011 millions.
d Capital accumulation component of EV, measured in $US2011 millions.
e RCEP members are Australia, New Zealand, Japan, China, Korea, Brunei, Malaysia, Singapore, Vietnam, Indonesia, Philippines, Thailand, Laos and India.
f FTAAP members are Australia, New Zealand, Japan, Brunei, Malaysia, Singapore, Vietnam, Canada, USA, Mexico, Chile, Peru, China, Hong Kong, Korea, Taiwan, Indonesia, Philippines, Thailand, and Russia

Notably, the two economies that are not worse off are the two economies that signed FTAs with the US early (the agreement with Singapore coming into force in 2004, and the agreement with Australia one year later). So their losses are from preference erosion, and in the case of Australia, increased competition in agricultural export markets. Inclusion of the US is very important to a number of economies, including Japan (approximately 20 percent increase in the gain over RCEP), and especially China (60 percent) and Vietnam (over 100 percent). The simulations also indicate it is important for Korea, but this is overstated given that the Korea-US free trade agreement came into force in 2012 (i.e., one year after our base period).

Petri et al. (2014) observe similar patterns in their comparison of the TPP and RCEP. They note that the TPP favors countries that do not have a free trade agreement with the US (i.e., Japan and Vietnam), while RCEP tends to favor the large East Asian economies (China, Japan and Korea). They also note, however, that the result is very much dependent on assuming effective coverage of the agreement among those three economies[27]. Cheong and Tongzon (2013) are similarly cautious, noting that the RCEP proposal may be too ambitious at this time. Rahman and Ara (2015) emphasize the potential for significant negative impacts on the smaller economies of South Asia. Itakura and Lee (2012) and Lee and Itakura (2014) consider the TPP and RCEP (the EAFTA in the case of the former paper) as part of a sequence of scenarios culminating in the FTAAP, and thus focus on questions surrounding the pathway. They refer to the two pathways as the TPP-track and the Asian-track. Their key conclusion is that a larger number of countries are expected to realize welfare gains under the Asia-track than under the TPP-track. However, given the uncertainty about the establishment of an Asia-wide FTA, they conclude that the TPP-track is an attractive option for most countries in the Asia-Pacific region.

The FTAAP has been promoted by APEC leaders as the potential result of convergence between the TPP and RCEP, and there is now a significant literature exploring the potential for such convergence. An awkward complication yet to be resolved in these discussions is that while the FTAAP is promoted within APEC as an APEC initiative the RCEP includes four participants that are not members of APEC (India, Cambodia, Laos and Myanmar). Analytically it is thus easier to model the FTAAP as an expansion of the TPP to include the remaining members of APEC, and our simulation of the FTAAP follows this approach. This can be viewed as broadly consistent with a US view (see Cheong and Tongzon, 2013) but not with an Asian view of the situation, and also begs the question of the degree of

[27] Proposals and negotiations for a separate "CJK" (China-Japan-Korea) free trade agreement have followed a somewhat tortuous path since 2011. Conclusion of a bilateral free trade agreement between China and Korea in late 2014 appeared to trigger renewed interest in proceeding also with the CJK free trade agreement, negotiations for which are reported to have recently resumed.

comprehensiveness that can be realistically expected in the FTAAP[28].

The FTAAP would obviously be a much larger agreement than the TPP, and consequently would result in much larger overall economic gains, assuming that the FTAAP would be comprehensive. Our estimates put the total welfare gains to FTAAP members at over 4.5 times those of the TPP. Other studies (Kawasaki, 2014; Lee and Itakura, 2014; Petri et al., 2012) also indicate gains that are orders of magnitude larger. Relative to the TPP plus Korea and China, the impact of the FTAAP is more modest in aggregate terms, but has important implications for some of the ASEAN economies that may be left out of a TPP agreement. The estimated benefit to Thailand of completing the FTAAP, relative to a TPP agreement from which it is excluded, would be on the order of 3 percent of GDP, for example.

While the studies considered thus far have mostly been concerned with alternative forms of Asia-Pacific regionalism, another branch of the literature looks at the potential effect of competing and overlapping agreements outside the region. In particular, Lee and Itakura (2013) has considered the TPP in relation to the TTIP (the Trans-Atlantic Trade and Investment Partnership linking the US and the EU), as have Disdier et al. (2016), Ganesh-Kumar and Chatterjee (2014) Thorensten and Ferraz (2014), and Rahman and Ara (2015). Lee and Itakura (2013) and Ganesh-Kumar and Chatterjee (2014) also consider the possibility of an EU-ASEAN agreement. The studies indicate relatively modest gains to the US and ASEAN economies from agreements with the EU, a result attributed to relatively low trade barriers, and, in the case of ASEAN relatively weak trade ties with the EU (Lee and Itakura, 2013). Disdier et al. (2016) find relatively little interaction between the TTIP and the TPP. Impacts on other countries in the region are also small in these studies, again reflecting limited trade ties between the EU and many economies in Asia, and hence limited potential for trade diversion effects. This conclusion may be modified for countries with stronger trade ties to either the EU or the US. Ganesh-Kumar and Chatterjee (2014) find somewhat stronger effects of the TTIP than the TPP on India, for example, and Thorensten and Ferraz (2014) suggest that it would be in Brazil's interest to seek a Brazil-US agreement once TTIP and a Brazil-EU agreement are completed.

[28] 28These and other issues related to the potential evolution towards, and eventual shape of the FTAAP are currently being analyzed by APEC members in a "collective strategic study" being undertaken as part of the "Beijing Roadmap" mentioned earlier. A possible target date of 2025 for completion of the FTAAP has been mentioned. While the FTAAP is being explored wholly within the APEC process and among APEC members, the "Beijing Roadmap" envisages that it would be negotiated and implemented outside the APEC process.

5.6. Changes in Production Structure

While most of our discussion has focused on welfare impacts, these are certainly not the only area of concern to policymakers, and are only one of the areas onto which CGE simulation may shed light. Indeed, underlying the sensitivity of agriculture that we discussed in the preceding section is likely concern that trade reform will lead to substantial reductions in agricultural output and employment, and of course incomes. Hence, we draw our survey to a close with a brief look at some of the production effects.

In Table 6 we have presented the estimated long-run effects of trade reform agreed under the TPP on the structure of production in the TPP member economies.[29] The figures are for the actual liberalization scenario, and represent the estimated percentage change in the production quantity by sector.

In general, the estimated production effects are relatively small. We observe more structural change on average in the smaller economies, like Brunei and Vietnam, than in the larger economies like Japan and the US. On the manufacturing side the modest production shifts reflect relatively low initial protection levels. There are some large changes predicted, however. Production of textiles/apparel is estimated to increase by nearly 30 percent in Malaysia and nearly 50 percent in Vietnam. There is also some international rationalization of motor vehicle and transportation equipment production toward Japan, Singapore and Malaysia.

On the agricultural side, the limited adjustments reflect the severity of the TPP agreement carve- outs. A comparison of the results in Table 5 with the production effects of full liberalization among TPP members reveals similar effects in manufactures, but substantially reduced movements in agriculture, especially in Japan[30]. There is a clear link between the sensitivity of sectors and the estimated changes in the pattern of production. In Japan, for example, under full liberalization, there are projected output declines of greater than 10 percent in a number of agricultural products, including rice, wheat, dairy, other agriculture, and in meat products. Indeed, many of the early Japanese studies emphasized just this fact (Kagatsume and Tawa, 2012, Suzuki, 2012, Takamasu and Xi, 2012). The carve-outs eliminate most of this movement.

[29] While we have not presented the results here, the medium-term effects are quite similar. The long-run impact adds capital accumulation to the mix, which results in some Rybczynski-type resource reallocation, but the major shifts in the production pattern seem to be driven by the price effects.

[30] A copy of the table for production effects under full liberalization is available from the authors.

Of course, Japan is not alone in facing significant potential production adjustments in agriculture under a full liberalization scenario: there are also large declines in dairy output in Canada, which are largely eliminated by the carve-outs. There can also be significant implications for production patterns even for countries with a strong comparative advantage in agriculture. In New Zealand, for example, under full liberalization reductions are predicted in agricultural production levels across the board except in dairy, as resources are reallocated to take advantage of new market opportunities, while these adjustments are either absent or much less pronounced in the carve-out scenario shown in Table 6. In the US, there would be significantly higher rice production under full liberalization.

Could the particular sensitivities of Japanese agriculture have been addressed in less damaging ways? Lee and Itakura (2014) argue that domestic agricultural policy reforms in Japan would be required to avoid sharp reductions in output of agricultural and food products resulting from the TPP and other region-wide FTAs. They consider a scenario where such reforms result in a 1 percent per annum productivity increase in Japanese agriculture from 2016 to 2025, concurrent with the implementation of the TPP. This is sufficient to largely eliminate substantial negative production effects, and perhaps even result in a competitive livestock and meat sector. Whittaker et al. (2013) reach a similar conclusion based on a similar set of experiments, and argue that other studies may be overstating the effect of trade reform on Japanese agricultural production. The key question is whether or not such productivity gains are likely to be realized: they conclude that full inclusion of the agricultural sector in TPP liberalization should trigger the reforms needed for the productivity gains to be realized[31]. Ultimately, there is probably no getting around the fact that there is a significant trade-off for Japan, and some other TPP members, between aggregate welfare gains from trade liberalization, and maintaining existing levels and patterns of agricultural production.

[31] Lee and Itakura (2014) note the plans to phase out rice production controls and consolidate agricultural land, and other policy reforms, are expected to improve agricultural productivity, but it remains unclear how much reform will actually occur, and how much improved productivity will result. Japan has announced sharply increased financial support to their protected agricultural sectors since the TPP was signed.

Table 6. Estimated output effects of TPP in the long-run (percent change in production volume)

Column1	Australia	New Zealand	Japan	Brunei	Malaysia	Singapore	Viet Nam	Canada	USA	Mexico	Chile	Peru
Paddy rice	0.4	0.6	-0.2	1.1	-6.6	-0.3	0.8	2.1	-0.4	0.2	0.3	0
Wheat	-0.4	0.4	-4	1.8	4.3	3.6	1.5	-0.4	0.1	0.4	-0.9	-0.3
Vegetables and fruit	0.4	-0.9	-2.4	0.3	0.7	0.8	-1.6	15.2	0	-0.3	-1.1	0.1
Oil seeds	0.3	-0.3	-0.7	2	1.2	1.1	-3.2	-2.2	-0.3	14.6	-0.4	0.1
Sugar cane and beet	1.7	-0.4	0.1	1.5	3.5	0.3	0.1	0.7	-0.1	-0.2	0.7	0.1
Plat base fibers/wool	-0.4	-0.6	-0.3	2.9	5.5	-0.3	20.3	0.1	-0.8	-0.2	-0.8	-4
Other crops	-0.5	0.3	-1.1	-14.8	-30.5	-0.9	-6.6	-0.4	5.8	-0.3	-1.9	0.5
Cattle	5.2	1.7	-5.9	1.7	6.1	0.7	2.9	0.8	0.4	0.2	-0.8	-0.1
Other agriculture	-0.5	-0.8	-12.5	0.9	5.7	0.3	1.6	7.1	2.5	3.8	9.2	-0.2
Milk	1.6	1.3	-2	2.6	12.4	0.6	-3.7	-2.5	0.2	-0.5	0.7	0.2
Forestry	0.3	0.1	-0.3	-2.1	2.7	0.6	-6.6	0.2	0	0.2	-0.3	0.1
Fisheries	0.3	0.2	0.2	0.7	0.9	0.3	0.7	0.3	0.2	0.2	0.2	0
Coal, oil and gas	0.3	0	-0.5	0.9	0.1	0.3	-0.9	0	0	0.1	0	0.2
Cattle meat	7.4	2.1	-6.6	1.4	5.7	0.5	1.1	1.2	0.3	-0.4	-0.9	-0.4
Other meat	-0.4	-1.2	-16.2	11.8	0.7	-0.2	-17.5	23.9	3.8	8.1	11.5	-0.4
Vegetable oils	1.6	0.8	0.5	14	1	1.7	-6	-1	0.6	-0.5	-0.3	0.2
Dairy	2.3	1.6	-1.2	67.9	12.4	-1.9	-4.6	-3	0.3	-0.6	0.3	0.3
Processed rice	0.4	-0.6	-0.1	0.1	-7.8	0.1	1.2	0.5	0.3	0	-0.2	0
Sugar	1.1	-0.8	0.1	9.4	2.7	2.3	0.1	0.6	-0.1	-0.3	0.3	0.1
Other food products	0.9	0	0.4	-21.9	8.8	12.7	-2.2	0.8	0.6	-0.1	0.6	0.1
Textiles	0.6	1	3.2	9.8	29.8	7.4	47.5	-1.5	-1.4	-2.2	-0.5	-0.3
Lumber	0.2	2.2	-0.8	0.6	4.1	5	-8.3	0.2	0	0.3	-0.7	-0.1
Paper	0.3	0.1	0.2	1.7	1.1	7.6	-1.4	0.1	0.1	0.2	-0.3	-0.1
Chemicals	0.3	0.3	0.5	1.2	5.1	2.7	-0.3	-0.1	0	0.2	-0.1	0
Metals	-0.1	-0.6	1.3	1.7	1.5	-4.2	-1.5	-0.3	0	0.2	0	0.4
Fabricated metals	0.1	-0.3	0.3	1.5	4.8	4.4	-4.1	-0.1	0	0.3	-0.1	0
Motor vehicles	-10.4	-7.3	3.9	-11.6	2.2	6.2	-0.8	-0.4	-0.2	0.4	-0.5	-0.7
Other transport equipment	0.5	0.6	-0.8	4.5	6.9	0.8	-3	0.2	0	0.5	-0.5	0.2
Electrical equipment	0.5	-0.7	-0.9	-5.6	2.6	-0.4	-4.2	-0.3	0	0.8	-0.6	-0.7
Other machinery	0.7	-1	-0.7	1.6	7.1	0.3	-3.7	-0.2	0	0.5	-0.6	0
Other manufactures	0.4	-0.2	0.7	6.1	1.4	3.8	1.1	0	0.2	-0.3	-0.5	-0.2
Services	0.1	0.1	0.3	1.8	2.2	0.1	4.5	0.1	0	0.2	0.1	0.1

6. Some Concluding Comments

As a simulation technique, the results of any CGE study are entirely dependent on the set of assumptions that went into the modeling process. The results of CGE simulation exercises are subject to multiple uncertainties. Nonetheless, where similar patterns emerge from a large number of modeling exercises with different underlying assumptions, we gain confidence in the robustness of those patterns. Even where results diverge, we can relate the differences back to the underlying assumptions and gain an improved understanding of how different economic factors matter and why. We conclude with a few notes on what we have learned from the simulations so far, and thoughts on the work that remains.

While a wide variety of model structures and simulation assumptions have been adopted in the literature to date, several consistent results do indeed emerge. First, the studies consistently show that the total potential economic benefits from trade liberalization under the TPP are quite large, especially in the long run, and if NTBs are successfully minimized.

We also know from the simulations that most members are likely to benefit from the TPP in the aggregate. However, the gains are not even. The studies consistently show that the largest gains in absolute value are accrue to Japan. When measured relative to economic size, the largest gains are consistently estimated to accrue to Vietnam and Malaysia. The pattern can be attributed to initial tariff levels (maintained and faced), the importance of trade in GDP, and strength of initial trade ties with TPP members.

Effects of the TPP on non-members are likely to be relatively mild in general. Non-members are hurt, through the processes of trade diversion and preference erosion. This is almost inevitable. But there are only a few cases where the effects are large relative to GDP. The most notable examples are small countries with strong trade ties to TPP members, especially Thailand and the Philippines. These countries would have a strong incentive to seek entry into the TPP in the future, or promote its eventual expansion to a FTAAP. While an expansion of the TPP membership is not imminent, the simulations indicate it could have a substantial impact. In particular, expanding the agreement to include China and Korea would dramatically increase the benefits (perhaps double or more), although some current TPP members, such as Vietnam, would be hurt by preference erosion in textiles/apparel.

The TPP is one of several overlapping “mega-regional” agreements proposed in the region, and is seen by some as a possible pathway to an Asia-Pacific Free Trade Agreement (FTAAP). In general, the much broader liberalization under the FTAAP would be predicted to generate gains an order of magnitude larger than the TPP, if an agreement could be reached of similar quality. CGE simulation has shown, however, that this is dependent in large part on successful trade reform among and between the major East Asian economies – Japan, Korea and China.

Finally, does the exclusion of sensitive sectors matter? The simulations indicate that the answer is in the affirmative, and perhaps quite a lot. In agriculture, liberalization for some products, notably rice and some dairy imports by Japan, sugar and some dairy imports by the US, and dairy and poultry imports by Canada, is largely limited to the provision of some additional quotas. Restricting agricultural trade dramatically cuts the estimated gains from the TPP, and could be particularly harmful to Japanese households, as well as penalizing exporters in members such as New Zealand and the US.

While a lot of work has been done using CGE methods to help us understand the economic impact of the TPP, much remains to be done. Although a substantial amount has been accomplished, there are many areas where CGE simulation can continue to make useful contributions to both the policy debates and to our understanding of the potential future economic outcomes.

One immediate area for further analysis will be re-simulating the impacts of exclusions now that the scope of trade liberalization is better understood following the October release of the agreement. This work is ongoing. Also, the work that has been completed so far has tended to focus on tariff cuts in goods, with only a few studies attempting to look at trade costs more broadly. Moreover, the TPP is a broad agreement and we are just beginning to come to grips with how it is going to affect services and investment. CGE simulation can definitely contribute to our understanding of these issues. Considerable work could also be done extending CGE models to areas that are of importance to policy but often sidelined by standard CGE modeling, such as the effect of trade reform on imbalances, as in the approach of Li and Whalley (2014) and Li et al. (2014).

Finally, almost all of the work that has been completed so far is at the global level of modeling, even when the questions of interest involve specific member economies. There is much more that could be done at the national level for the member countries by combining work with global models with more detailed national CGE models (as in Kagatsume and Tawa, 2012), or other modeling approaches. Nguyen et al. (2015) is a good example of the potential utility of the latter. This enables us to build more detailed pictures of expected changes in economic structure in TPP member economies, and to address questions that are somewhat beyond the scope of most global trade models, such as detailed sectoral impacts, regional impacts, or the effect of the reforms on household income distribution.

Table 7. Summary of CGE Studies of the TPP

Study	Model Details	Simulation Details	Selected Results
This study	GTAP, GTAP9 data (2011 base year), 27 regions × 32 commodities, modifications to agricultural elasticities in Japan, steady state closure.	TPP as full and partial tariff liberalization (following actual agreement), TRQ expansions, expansion to possible new members, comparison with RCEP and FTAAP.	Welfare gains in region od $14 to $40 billion, substantial reduction in welfare relative to complete liberalization.
Akgul et al. (2015)	Modification of GTAP with firm heterogeneity introduced. GTAP8 data (2007 base year), 3 regions × 2 commodities.	Elimination of Japanese tariffs on US exports.	Significant increase in variety and quantity of US exports to Japan as a result of a decrease in the export productivity threshold.
Areerat et al. (2012)	GTAP, GTAP7 data (2004 base year), 17 regions × 15 sectors, with focus on agricultural products.	TPP among seven members (Australia, Chile, Peru, New Zealand, USA, Singapore and Vietnam), plus Japan, Korea and China separately and in groups. All tariffs to zero.	Overall gains from TPP around $14 billion (including Japan). Inclusion of Japan very important to US gains. Some significant production shifts, especially in agriculture.
Burfisher et al. (2014)	GTAP, GTAP8.1 data (2007 base year), 12 regions × 29 commodities with heavy focus on agriculture.	Baseline projection to 2025, then elimination of all agricultural tariffs and TRQs on intra-TPP trade.	Small macroeconomic gains for most countries, but a large increase in agricultural trade (around $8.5 billion in total), driven by import expansion in Japan in rice and beef.
Cabinet Secretariat (2015)	GTAP, GTAP9 data (2011 base year) with 12 regions and 27 sectors identified. A positive feedback from openness to productivity and an elastic labor supply are built into the model.	TPP with tariff reduction is based on the actual agreement. NTBs are assumed to be lowered such that the difference in the Logistic Performance Index (LPI, World Bank) between Singapore and each of other member countries is halved.	Increase in Japan's real GDP by 2.6%. Labor supply and capital stock increase by 1.3% and 2.9%, respectively.

Study	Model Details	Simulation Details	Selected Results
Cheong and Tongzon (2013)	GTAPDyn, GTAP8 data (2007 base year), 18 regions × 5 commodities. Tariff rates adjusted for existing agreements.	Baseline path to 2027, then elimination of all tariffs among TPP members. RCEP with and without Japan/China.	Small gains as measured by nominal GDP, with a few exceptions (NZ, Malaysia). Gains under RCEP much larger. Both cause net damage to global economy.
Ciuriak and Xiao (2014)	Modified GTAP, recursive dynamic with services and FDI. GTAP8 data (2007 base year), 18 regions × 57 commodities	Baseline path to 2035, full liberalization among TPP members, and a 'best guess' scenario. Adjustments made for preference under-utilization, NTBs, and services/FDI reform.	Total welfare gains $74-166 billion, driven mostly by NTB reductions and services liberalization.
Cororaton and Orden (2015)	PEP model, competitive Armington model with recursive dynamics. GTAP8 data (2007 base year), 20 regions x 15 commodities. Adjustments to NTBs.	Baseline to 2024, TPP scenario 90% tariff reduction, 20% NTB reduction, extension to include Philippines.	Welfare gains range from 0.05% of GDP (USA) to 2.7% (Vietnam), rising slightly with inclusion of Philippines. Philippines, Thailand and Indonesia most hurt by exclusion.
Disdier et al. (2016)	MIRAGE, competitive Armington model with recursive dynamics, GTAP8.1 data (2007 base year), 24 regions × 31 commodities. Adjustments to both tariffs and NTBs	Baseline to 2025, TPP scenario full tariff reduction, expansion to NTMs and other economies incl. China and India, with and without TTIP.	Welfare gains small. Expansion of US agrifood trade at expense of other countries, relatively little interaction between TTIP and TPP, TTIP outcomes somewhat sensitive to NTB assumption in TPP.
Durongkaveroj et al. (2014)	GTAP, GTAP8 data (2007 base year), aggregation not stated. No adjustments	TPP among 12 members, full tariff liberalization, then with 0-50% reduction in agriculture. Expansion to Thailand.	Small GDP gains to Thailand from joining. Hurt by staying out, especially if agricultural reform successful.
Ganesh-Kumar and Chatterjee (2014)	GTAP, GTAP8.1 data (2007 base year), 13 regions × 10 commodities. POVCAL used to assess poverty impacts on India.	TPP among 12 members, full liberalization including export subsidies, TTIP and EU-ASEAN on same basis.	India hurt by all of the agreements, especially through changes in textiles trade. Effects small, more in TTIP than TPP. Poverty and inequality worsens.

Study	Model Details	Simulation Details	Selected Results
Itakura and Lee (2012)	GTAPDyn, GTAP7.1 data (2004 base year), 22 regions × 29 commodities. Adjustments made for NTB equivalents in services.	Baseline to 2030, formation of FTAAP via TPP track (including Korea), or via expansion ASEAN through EAFTA and CEPEA. Tariffs reduced to zero, NTBs in services reduced by 25%.	Welfare gains from 0.4% of GDP (USA) to 5.5% (Vietnam). Larger gains under FTAAP, and for East and Southeast Asia from taking 'Asian' path rather than 'TPP' path. No significant differences in output responses.
Kagatsume and Tawa (2012)	Monash-MRF model (multi-region competitive Armington model with recursive dynamics), based on 2005 Japanese inter-regional IO table. 8 Japanese regions x 7 sectors.	TPP as elimination of all tariffs, unilateral tariff reduction in 2012.	Agricultural production falls from the benchmark case of continuous annual growth of 2% by between 0.3 and 2.2%. The impacts vary across different regions of Japan
Kawasaki (2014)	GTAP, GTAP8.1 data (2007 base year), 31 regions × 29 commodities, macroeconomic data projected to 2010, steady state closure.	Baseline projection to 2010, then simulations of RCEP, TPP and FTAAP. All tariffs to zero, and with NTBs modeled via import-augmenting technical change.	Total welfare gains $94-449 billion, driven mostly by assumed productivity gains in import technology. Large absolute gains to US under NTB assumption. Still larger gains under both RCEP and FTAAP.
Lee and Itakura (2013)	GTAPDyn, GTAP8 data (2007 base year), 22 regions × 32 commodities. Adjustments made for NTB equivalents in services.	Baseline to 2030, formation of FTAAP via TPP track or via RCEP track and both. Extension to include Korea, Thailand, Indonesia and Philippines in TPP on path. Tariffs reduced to zero, NTBs in services reduced by 25%, 20% improvement in import technology.	Welfare gains ranging from 0.2% of GDP (USA) to 2.1% (Vietnam). Expansion generates strong benefits, especially for Thailand. Larger gains under FTAAP. Some preference erosion effects when TTIP included.

Study	Model Details	Simulation Details	Selected Results
Lee and Itakura (2014)	GTAPDyn, GTAP8.1 data (2007 base year), 22 regions × 32 commodities. Adjustments made for NTB equivalents in services.	Baseline to 2030, formation of FTAAP via TPP (with Korea) track or via RCEP track. Extension to include Thailand, Indonesia and Philippines in TPP on path. Tariffs reduced to zero except on rice, NTBs in services reduced by 20%, 20% improvement in import technology. Productivity increases in Japanese agriculture of 1% per annum.	Slightly smaller welfare gains than in Lee and Itakura (2013) for Japan, and Thailand in the extended scenario. Improvements in productivity modestly increase welfare gain to Japan, but result in much lower agricultural production contractions.
Li et al. (2014)	Armington model with money and generalized trade costs, 13 regions × 2 sectors (traded and non-traded). 2011 base year.	TPP with China and various other agreements involving China (including RCEP and CJK) all as elimination of all tariffs among members, and elimination of tariffs plus NTBs cut by 25% and 50%.	Small welfare gains from TPP tariff reform, with most benefits to China. Substantially larger and more evenly distributed across members in relative terms when NTBs considered. Slight improvement in US trade imbalance with TPP including China.
Li and Whalley (2014)	Armington model with money and generalized trade costs, 11 regions x 2 sectors (traded and non-traded). 2011 base year.	TPP (not including Japan) as elimination of only tariffs, tariffs plus 50% cut in NTBs, and elimination of all trade costs, with and without China.	Very small welfare gains from tariff elimination (highest 0.2% of GDP for Australia/New Zealand). Dramatically larger if NTBs cut or eliminated (up to 4% of GDP for ASEAN member of TPP). Adding China benefits most other TPP members.
Li (2014)	Armington model with recursive dynamics, GTAP8 data (2007 base year), 27 regions (including SEZs in China and Mexico) x 41 commodities.	Baseline to 2018, TPP with and without China, complete elimination of all tariffs.	Real income gains in region of 0.3% (Australia/New Zealand) to 9% (Vietnam). Introduction of China expands benefits to most countries. Exception is Vietnam (but still largest gainer among TPP members).

Study	Model Details	Simulation Details	Selected Results
Li and Yao (2014)	GTAP, GTAP8 data (2007 base year), 8 regions × 41 commodities.	TPP as elimination of all tariffs, with and without China.	China joining the TPP has small benefits for China and TPP members (measured in terms of real GDP), excluding Vietnam.
Lu (2015)	GTAP, GTAP8 data (2007 base year), 10 regions × 3 commodities (textiles, apparel and others).	TPP as elimination of tariffs in textiles and apparel only. Participation by Canada/Mexico and Japan separated.	TPP results in a significant decline in textiles/apparel exports of China ($1.9 billion), especially with the inclusion of Japan.
Narayanan and Sharma (2016)	GTAP, GTAP8.1 data (2007 base year) projected to 2011 including tariff adjustments, 16 regions × 18 commodities. Closure allows for unemployment of labor.	TPP as elimination of all tariffs, plus expansion to include Korea, China and India (in steps).	Total welfare gain of $150 billion, dominated by Japan and US, expanding to $475 billion with China and Korea. India is hurt, and would benefit marginally from inclusion, but adverse effects on agriculture may limit appeal.
Nguyen et al. (2015)	GTAP, GTAP9 data (2011 base year), 23 regions × 22 sectors, with focus on livestock products. Adjustments made for NTB equivalents in services. Study also includes partial equilibrium modeling (GSIM) focused on livestock.	TPP as complete removal of tariffs, plus scenarios with 7% reductions in service NTBs and additional adjustments for trade facilitation (intra-TPP and assumed to spillover to multilaterally).	Largest proportional welfare gains from TPP to Vietnam ($5.6 to 7.4 billion). TPP is superior to RCEP in terms of gains to Vietnam. Large gains in investment. Exports to TPP countries expand significantly in the apparel, textiles leather and footwear, sectors. Contraction of the livestock sector.
Oduncu et al. (2014)	GTAP, GTAP7 data (2004 base year), aggregation not specified.	TPP as full removal of tariffs, plus various concomitant trade cost reduction scenarios. FTAAP on same basis.	TPP reduces export value of Turkey by 0.1 to 0.5%, impact of FTAAP 3-6 times larger.

Study	Model Details	Simulation Details	Selected Results
Petri et al. (2012)	Recursive dynamic Armington model with monopolistic competition in manufactures and private services, and firm heterogeneity. GTAP8 data (2007 base year), 24 regions × 18 sectors.	Baseline to 2025, including existing agreements. TPP9 then expansion to TPP13, FTAAP via TPP and EAFTA, TPP with sensitive products excluded. Simulations include tariffs and NTBs, with cuts based on 'best guess' and adjusted for tariff utilization rates, and costs of meeting ROOs.	Welfare (EV) gains of $130 billon (including Korea). Largest gains to Japan (absolute) and Vietnam (relative). Larger gains from completing move to FTAAP. Rises in exports in region of $300 billion. Significant reduction in benefits if sensitive products excluded.
Petri (2013)	See Petri et al. (2012).	TPP12, extension to Korea, RCEP and FTAAP. Baseline and cuts to tariffs and NTBs estimated based on previous agreements as in Petri et al. (2012).	Total welfare gain of $285 billion. Extension to Korea adds $90 billion. Gains from RCEP and FTAAP considerably larger, especially for Asia. RCEP gains dependent on China-India-Japan-Korea component. Trade diversion minimal.
Petri and Plummer (2016)	See Petri et al. (2012) for model structure. Data is updated to GTAP9 (base year 2011), with 29 regions × 19 sectors.	Baseline to 2030, including existing agreements. TPP scenario based on actual agreement. Includes tariffs cuts, adjustments for NTBs (more conservative than Petri et al., 2012), tariff utilization rates under FTAs, and costs of meeting ROOs. NTB cuts are assumed to spillover to non-members.	Total gains from TPP in range of $312 to $525 billion, with $465 the base projection (deviation from 2030 real income). Largest absolute gains to the US, with substantial gains to Japan, Malaysia and Vietnam. Some increase in US job churn.
Petri et al. (2013)	See Petri et al. (2012).	Extension of TPP to include Japan and Korea, then extension to include Indonesia, Korea, Philippines and Thailand (TPP16). Baseline and cuts to tariffs and NTBs estimated based on previous agreements as in Petri et al. (2012).	Adding Japan to TPP causes preference erosion for Mexico. Adding Korea benefits all members. Gains from TPP16 accrue mostly to emerging ASEAN economies.

Study	Model Details	Simulation Details	Selected Results
Petri et al. (2014)	See Petri et al. (2012).	Extension of TPP to include China, Indonesia, Korea, Philippines and Thailand. Baseline and cuts to tariffs and NTBs estimated based on previous agreements as in Petri et al. (2012).	Expansion to include China dramatically expands benefits of TPP (to over $2 trillion in income gains) under assumption of high quality agreement. Absolute gains dominated by China.
Rahman and Ara (2015)	GTAP, GTAP8 data (2007 base year), 17 regions × 10 commodities.	TTIP, RCEP, TPP, expansion of TPP to include South Asia, all as elimination of tariffs.	Total welfare gains around $11 billion. Moderate welfare losses to South Asian economies, driven by agriculture and textiles.
Strutt et al. (2015)	GTAPDyn, GTAP8.1 data (2007 base year), 21 regions × 31 commodities.	Baseline to 2030, accounting for existing agreements. Assumed TPP tariff reductions, with variation across countries in terms of depth, phase-in and exclusions of sensitive products. Expansion of TRQs in dairy (as tariff equivalents). Separate scenario with trade facilitation, services liberalization and NTBs modeled as import augmenting technical change.	Welfare gains to NZ ranging from $371 million (tariffs only) to $1.8 billion (tariffs plus NTBs). Growth in exports between 0.4 and 2.2 percent, mostly in meats and processed foods. Expansion of dairy smaller despite strong comparative advantage due to limited liberalization.
Suzuki (2012)	GTAP, GTAP7.1 data (2004 base year), 13 regions × 25 commodities.	TPP (excluding Canada) with all tariffs are eliminated, with sensitive sectors of Japan excluded, and with sensitive sectors of all TPP members excluded.	In the first scenario, Japan's rice imports increase dramatically, its rice production falls by 68%. GDP of Australia and New Zealand fall if sensitive sectors are excluded from tariff elimination.
Takamasu and Xi (2012)	GTAP, GTAP7 data (2004 base year), 13 regions × 14 commodities.	TPP (excluding Mexico and Canada), expansion to include China, expansion to include China, Korea, Taiwan and the remaining ASEAN economies.	Japan's GDP modestly increases by 0.3-0.4%. Devastating effects on the agricultural sector in Japan (rice production, for example, falls by 64.5-83.7%.).

Study	Model Details	Simulation Details	Selected Results
Thorensten and Ferraz (2014)	GTAP, GTAP8 data (2007 base year), 57 commodities. Regional aggregation not specified.	TTIP and TPP, expansion to include China. Full tariff reform, full tariff reform plus 50% NTB cuts.	Estimated falls in Brazilian exports ranging from 0.4% (tariffs only, no China), to 5% (tariffs and NTBs, including China).
USITC (2016)	GTAP model with recursive dynamics. GTAP9 data (base year 2011), projected to 2017 (incl. updated tariff data), 19 regions × 56 sectors. Modest labor supply responses to real wages introduced. Additional simulations using GTAP-FDI model (26 regions × 59 sectors).	Baseline to 2047. TPP scenario based on actual agreement (tariff reductions as per schedule, TRQ expansions with some exceptions, services as removal of AVEs). Potential FDI effects modeled through productivity shocks using GTAP-FDI.	Real income gains to US of $57 billion by 2032 (0.23 % of GDP). Largest component merchandise trade, then services. Expansion of total exports by 1% (approx. 19% to new partners). Small expansion of overall employment. Output expansions in agriculture and services. Some contractions in manufacturing.
Whittaker et al. (2013)	GTAP, GTAP8 data (2007 base year), data projected to 2020, 26 regions × 31 commodities, modifications to agricultural elasticities in Japan, steady state closure.	Baseline projection to 2020. TPP as elimination of all tariffs, plus productivity shocks to selected agricultural sectors in Japan.	Tariff reform reduces Japanese agricultural and food processing output (esp. rice, meat and dairy). Modest productivity gains can mitigate, and even lead to increased production/exports in niche markets.

7. References

Akgul, Z., N.B. Villoria and T.W. Hertel (2014) "Introducing Firm Heterogeneity into the GTAP Model with an Illustration in the Context of the Trans-Pacific Partnership Agreement" Mimeo, Department of Agricultural Economics, Purdue University.

Anderson, J.E. and E. van Wincoop (2004) "Trade Costs" *Journal of Economic Literature* 42: 691-751.

Arkolakis, C., A. Costinaut and A. Rodŕiguez-Clare (2012) "New Trade Models, Same Old Gains?" *American Economic Review* 102(1):94-130.

Areerat, T., H. Kameyama, S. Ito and K. Yamauchi (2012) "Trans Pacific Strategic Economic Partnership With Japan, South Korea and China Integrate: General Equilibrium Approach" *American Journal of Economics and Business Administration* 4(1): 40–6.

Bekkers, E. and H. Rojas-Romagosa (2016) "Quantitative Trade Models and the Economic Assessment of TTIP" (mimeo, CPB Netherlands Bureau for Economic Policy Analysis).

Bergsten, C.F. (1996) "Competitive Liberalization and Global Free Trade: A Vision for the Early 21st Century" Working Paper 96-15, Peterson Institute for International Economics.

Burfisher, M.E., J. Dyck, B. Meade, L. Mitchell, J. Wainio, S. Zahniser, S. Arita and J. Beckman (2014) "Agriculture in the Trans-Pacific Partnership" ERS Report Number 176.

Cabinet Secretariat, Japan (2015) "Study of the Economic Impacts of the TPP"

Cheong, I. (2013) "Negotiations for the Trans-Pacific Partnership Agreement: Evaluation and Implications for East Asian Regionalism" ADBI Working Paper 428.

Cheong, J. and S. Takayama (2013) "Who Gains the Most in Preferential Trading Agreements?" Working Paper, University of Queensland.

Cheong, I. and J. Tongzon (2013) "Comparing the Economic Impact of the Trans-Pacific Partnership and the Regional Comprehensive Economic Partnership" *Asian Economic Papers* 12(2): 144–64.

Ciuriak, D. and J. Xiao (2014) “The Trans-Pacific Partnership: Evaluating the ”Landing Zone” for Negotiations” Working Paper, Ciuriak Consulting.

Cororaton, C.B. and D. Orden (2015) “Potential Economic Effects on the Philippines of the Trans-Pacific Partnership” GII Working Paper 2014–1.

Disdier, A.C., C. Emlinger and J. Foure (2016) “Interdependencies between Atlantic and Pacific agreements: Evidence from Agri-Food Sectors” *Economic Modelling* 55: 241–53.

Dixon, P.B. and D. Jorgenson (2013) *Handbook of Computable General Equilibrium Modeling, Volume 1A* (North Holland, Oxford).

Durongkaveroj, W., C. Roongsaprangsee and T. Janthok (2014) “Competitiveness, Impacts and Possible Choices of Thailand in the Framework of TPP” Working Paper, Fiscal Policy Research Institute.

Ganesh-Kumar, A. and T. Chatterjee (2014) “Mega External Preferential Trade Agreements and their Impacts on the Indian Economy” Discussion Paper, CUTS.

Gilbert, J. and E. Tower (2010) *Introduction to Numerical Simulation for Trade Theory and Policy* (World Scientific, Singapore).

Gilbert, J. and T. Wahl (2002) “Applied General Equilibrium Assessments of Trade Liberalization in China” *World Economy* 25: 697–731.

Harrison, G.W., T.F. Rutherford and D.G. Tarr (1997) “Quantifying the Uruguay Round” *Economic Journal* 107: 1405–30.

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

Hess, S. and S. von Cramon-Taubadel (2008) “A Meta-Analysis of General and Partial Equilibrium Simulations of Trade Liberalisation under the Doha Development Agenda” *World Economy* 31(6): 804–40.

Hosoe, N., K. Gasawa and H. Hashimoto (2010) *Textbook of General Equilibrium Modelling: Programming and Simulations* (Palgrave, New York).

Ianchovichina, E. and R. McDougall (2001) “Theoretical Structure of Dynamic GTAP” GTAP Technical Paper 17.

Itakura, K. and H. Lee (2012) “Welfare Changes and Sectoral Adjustments of Asia-Pacific Countries Under Alternative Sequencings of Free Trade Agreements” *Global Journal of Economics* 1(2): 1250012.

Kagatsume, M. and M. Tawa (2012)“Business Activities by Japanese Food and Agricultural Companies and Trans-Pacific Partnership Negotiation on Japanese Agriculture: An Approach by the Regional Dy- namic Computable General Equilibrium Model” *Seibutsu Shigen Keizai Kenkyu* 127–165 (in Japanese).

Kawai, M. and G. Wignaraja (2011) *Asia’s Free Trade Agreements: How is Business Responding?* (Ed- ward Elgar: Cheltenham).

Kawasaki, K. (2014) “The Relative Significance of EPAs in Asia-Pacific” RIETI Discussion Paper Series 14-E-009.

Kehoe, T.J. (2003) “An Evaluation of the Performance of Applied General Equilibrium Models of the Impact of NAFTA” Federal Reserve Bank of Minneapolis Research Department Staff Report 320.

Lakatos, C., M. Maliszewska, F. Ohnsorge, P.A. Petri and M.G. Plummer (2016) “Potential Macroeco- nomic Implications of the Trans-Pacific Partnership” World Bank Global Economic Prospects, Chapter 4.

Lee, H. and K. Itakura (2013) “What Might be a Desirable FTA Path towards Global Free Trade for Asia-Pacific Countries?” Working Paper, Osaka University.

Lee, H. and K. Itakura (2014) “TPP, RCEP, and Japans Agricultural Policy Reforms” Working Paper, Osaka University.

Li, C., J. Wang and J. Whalley (2014) “Numerical General Equilibrium Analysis of China’s Impacts from Possible Mega Trade Deals” mimeo, Institute of World Economics and Politics, Chinese Academy of Social Sciences.

Li, C. and J. Whalley (2014) “China and the Trans-Pacific Partnership: A Numerical Simulation Assess- ment of the Effects Involved” *World Economy* 37(2): 169–92.

Li, X. (2014) “A General Equilibrium Analysis of the TPP Free Trade Agreement With and Without China” *Journal of Applied Economic Research* 8(2): 115–36.

Li, X. and Y. Yao (2014) “Asia-Pacific Integration Within a Broader Trans-Pacific Partnership Agree- ment” *China Economic Journal* 7(2):221-36.

Lloyd, P.J. and D. MacLaren (2004) “Gains and Losses from Regional Trading Agreements: A Survey” *Economic Record* 80: 445–97.

Lu, S. (2015) “Impact of the Trans-Pacific Partnership on China’s Textiles and Apparel Exports: A Quantitative Analysis” *International Trade Journal* 29(1): 19–38.

Melitz, M.J. and S.J. Redding (2015) “New Trade Models, Ne Welfare Implications” *American Economic Review* 105(3):1105–46.

Menon, J. (2014) “From Spaghetti Bowl to Jigsaw Puzzle? Addressing the Disarray in the World Trade System” ADB Working Paper Series on Regional Economic Integration Number 140.

Narayanan, B. and S.K. Sharma (2016) “An Analysis of Tariff Reductions in the Trans-Pacific Partnership (TPP): Implications for Indian Economy” *Journal of Applied Economic Research* 10(1): 1–34.

Nguyen, D.C., T.T.H. Nguyen, K. Itakura, T.L.N, Nguyen, T.T. Nguyen (2015) “The Impacts of TPP and AEC on the Vietnamese Economy: Macroeconomic Aspects and the Livestock Sector” Report of the Vietnam Institute for Economic and Policy Research.

Oduncu, A., M. Mavus, and D. Güneş (2014) “The Possible Effects of Trans-Pacific Partnership on Turkish Economy” *MPRA Paper No. 52917*

Petri, P.A. (2013) “The New Landscape of Trade Policy and Korea’s Choices” *Journal of East Asian Economic Integration* 17(4): 333–59.

Petri, P.A. and M.G. Plummer (2016) “The Economic Effects of the Trans-Pacific Partnership: New Estimates” Peterson Institute for International Economics, Working Paper 16-2.

Petri, P.A., M.G. Plummer and F. Zhai (2013) “Adding Japan and Korea to the TPP” *Asia Pacific Trade Working Paper 2013–5.*

Petri, P.A., M.G. Plummer and F. Zhai (2012) "The Trans-Pacific Partnership and Asia-Pacific Inte- gration: A Quantitative Assessment" *Policy Analysis in International Economics No. 98* (Peterson Institute for International Economics).

Petri, P.A., M.G. Plummer and F. Zhai (2014) "The TPP, China and FTAAP: The Case for Convergence" Chapter 6 in T. Guoqiang and P.A. Petri (eds) *New Directions in Asia-Pacific Economic Integration* (East-West Center).

Rahman, M.M. and L.A. Ara (2015) "TPP, TTIP and RCEP: Implications for South Asian Economies" *South Asia Economic Journal* 16(1): 27–45.

Robichaud, V., A. Lemelin, H. Maisonnave and B. Decaluwe (2011) "The PEP Standard Multi-Region, Recursive Dynamic World Model" PEP Global Model.

Robinson, S. and K. Thierfelder (2002) "Trade Liberalisation and Regional Integration: The Search for Large Numbers" *Australian Journal of Agricultural and Resource Economics* 46: 585–604.

Scollay, R. and J. Gilbert (2000) "Measuring the Gains from APEC Trade Liberalisation: An Overview of CGE Assessments" *World Economy* 23: 175–93.

Strutt, A., P. Minor and A. Rae (2015) "A Dynamic Computable General Equilibrium Analysis of the Trans-Pacific Partnership Agreement: Potential Impacts on the New Zealand Economy" Report prepared for the New Zealand Ministry of Foreign Affairs and Trade.

Suzuki, N. (2012) "Reconsideration of Various Estimates Regarding the Effects of the TPP" Research paper prepared for the Japan Central Union of Agricultural Co-operatives (in Japanese).

Takamasu, A. and J. Xi (2012) "The Effects of the TPP on Agricultural Production in Japan and China: A Computer Simulation Analysis Using the GTAP Model" *Kansai Daigaku Shakaigakubu Kiyou* 1–32 (in Japanese).

Thorensten, V. and L. Ferraz (2014) "The Impacts of TTIP and TPP on Brazil" *Escola de Economia de Sao Paulo*.

USITC (2016) "Trans-Pacific Partnership Agreement: Likely Impact on the US Economy and on Specific Industry Sectors" Publication Number 4607.

Whittaker, H., R. Scollay and J. Gilbert (2013) “TPP and the Future of Food Policy in Japan” New Zealand Asia Institute Working Paper 13–01.

Zhai, F. (2008) “Armington Meets Melitz: Introducing Firm Heterogeneity in a Global CGE Model of Trade” *Journal of Economic Integration* 23(3): 575–604.

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