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China and the TPP: A Numerical Simulation Assessment of the Effects Involved

Abstract

The Trans-Pacific Partnership (TPP) is a new negotiation on cross border liberalization of goods and service flows going beyond WTO disciplines and focused on issues such as regulation and border controls. This paper uses numerical simulation methods to assess the potential effects of a TPP agreement on China and also China's inclusion or exclusion on other countries. We use a numerical 11-country global general equilibrium model with trade costs and inside money. Trade costs are calculated using a method based on gravity equations. TPP barriers potentially removable are trade costs less tariffs. Simulation results reveal that China will be slightly hurt by TPP initiatives in welfare when China is out, but the total production and export will be increased. Other non-TPP countries will be mostly hurt in welfare but member countries will mostly gain. If China takes part in TPP, she will significantly gain and increase other TPP countries' gain as well. The comparison of TPP effects and global free trade effects show that the positive effects of global free trade are stronger than TPP effects. Japan's joining TPP would be beneficial to both herself and most of other TPP countries, but which negative effects on China's welfare when out of TPP will increase further.

Keywords: Trans-Pacific Partnership; General Equilibrium; Numerical Simulation; Trade Cost

JEL Classification: F53, F47, C68

1. Introduction

The Trans-Pacific Partnership (TPP) is originally a proposed nine-country Asia-Pacific free trade arrangement now being negotiated among the United States (US), Australia, Brunei, Chile, Malaysia, New Zealand, Peru, Singapore and Vietnam. The aim is to go beyond WTO liberalization and focus on issues of regulation and border controls. As such it differs from tariff based liberalization in there being no revenues involved with the border measures. They also compound with conventional tariffs. The intuition, therefore, is that larger gains may accrue to the importing countries compared to previously studied liberalization. The negotiating partners have agreed that this proposed "living agreement" cover new trade topics and include new members that are willing to adopt the proposed agreement's higher standards. To that end, Canada and Mexico entered the TPP in 2012, and Japan will become a formal member in August 2013.

As a big country in the Asia-Pacific area, China has not taken part in the TPP initiative. Here we analyze how China's participation or non-participation in a TPP arrangement could potentially affect both China and some other main participating and non-participating countries if this proposal resulted in a true free trade agreement (FTA) among participants. The answer to this question is important for policy making and related research, and depends critically both on the size of barriers involved and their negotiability.

Present literature on TPP is limited and is mostly analytical, such as Williams (2012), James (2010), Lewis (2011), and Ezell and Atkinson (2011). Although a lot of earlier researches has numerically explored the effects of regional free trade agreement, see the survey by Lloyd and MacLaren (2004). Few numerical methods have been used to capture potential TPP effects for other countries and the whole world, except Petri *et al* (2011), Itakura and Lee (2012), Kawai and Wignaraja (2008). Our point of departure is to use numerical general equilibrium simulation methods to explore TPP effects on both China and other countries. The analytical novelty of the paper relative to present literature lies in two points. The first is we divide trade costs into tariff and non-tariff barriers and calculate trade costs between countries empirically with gravity model methodology. This can comprehensively explore the FTA effects and is a better the TPP that emphasize on non-tariff liberalization, until now nearly no literature has paid attention to this approach. The second is we use an inside money structure to form an endogenous trade imbalance model and which is more consistent with reality given China's large imbalances in trade.

We use an 11-country Armington type global general equilibrium model. Each country produces two-goods (Tradable goods and Non-tradable goods) and has two-factors (capital and labor). The model captures trade costs and uses a monetary structure of inside money both so as to also endogenously determine trade imbalance effects from the trade initiative and also allow calibration to a base case capturing China's large trade surplus. We use a trade cost calculation method that recognizes limitations of data by using an estimation treatment that follows Wong (2012) and Novy (2008). We capture endogenously determined trade imbalances by incorporating both current consumption and expected future incremental consumption from saving into the model using an analytical structure attributed to Patinkin (1956), also adopted in Archibald and Lipsey (1960), and used more recently in Whalley *et al* (2011) and Li and Whalley (2012). We

calibrate the model to 2011 data and use counterfactual simulations to explore TPP effects.

Our simulation results show, not surprisingly, that the TPP initiative will hurt China in welfare if China does not participate, but these effects are relatively small under the present TPP proposal, and China's export and total production will increase because of increased outside demand. China's welfare loss is because of a decline in consumption induced by increased exports and decreased imports. China will gain significantly when she participates in TPP. Most TPP member countries will gain in nearly all aspects including welfare, production and trade. Other non-TPP member countries will be mostly hurt in welfare as well, but some of these countries' production will increase. We also compare TPP effects to global free trade effects in the model, and find they are different. Firstly, global free trade benefits nearly all countries in welfare with trade cost evaluation, but TPP benefits mostly member countries and some of other countries; second, global free trade positive effects are considerably higher than TPP free trade effects. The comparison of TPP effects under trade cost barrier and tariff barrier reveals the same results which indicates that our simulation results with trade cost modeling are reliable. We have also simulated the effects of Japan joining the TPP in the near future, and find that this would be beneficial for Japan, TPP member countries and some of the non-TPP countries, but the negative effect on China's welfare would increase if China is out of TPP. At last, sensitivity analysis to elasticities and upper bound money suggest that our simulation results are robust.

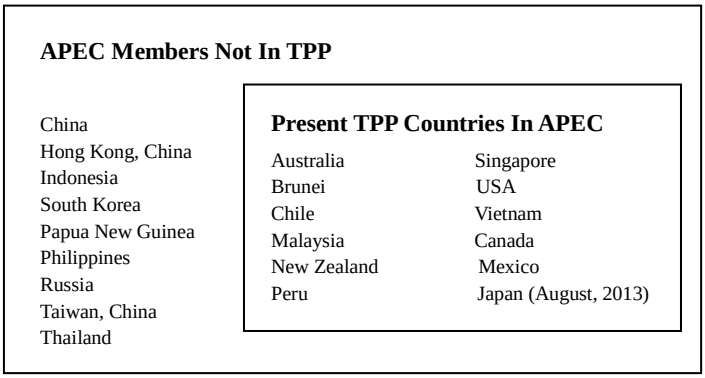
The research in this paper is especially relevant on policy side. Firstly, the TPP effects on China and some other main countries are a prominent topic and have great policy importance. Secondly, these results give estimates as to how big the effects are, which are valuable to research and policy making.

The remaining parts of the paper are organized as follows: Part 2 introduces the TPP initiative and its development; Part 3 is the global general equilibrium model specification; Part 4 is our calculation of trade costs and TPP barriers change; Part 5 presents data and reports parameters from calibration; Part 6 reports simulation results for six different scenarios. The last part offers conclusions and remarks.

2. The TPP Initiative and Its Development

The Trans-Pacific Partnership (TPP), also known as the Trans-Pacific Strategic Economic Partnership Agreement (TPPA), is a multilateral free trade agreement (FTA) that aims to further liberalize the economies of the Asia-Pacific region. Current negotiating partners include Australia, Brunei, Chile, Malaysia, New Zealand, Peru, Singapore, the United States, Vietnam, Canada and Mexico, a total of eleven countries, and Japan could become a full negotiating partner in August 2013. Although all original and negotiating parties are members of the Asia-Pacific Economic Cooperation (APEC), the TPP is not an APEC initiative. However, it is considered to be a step towards the proposed Free Trade Area of the Asia Pacific (FTAAP), an APEC initiative. The country member relationships between TPP and APEC are shown in Figure 1.

Fig.1 Country Members of TPP and APEC



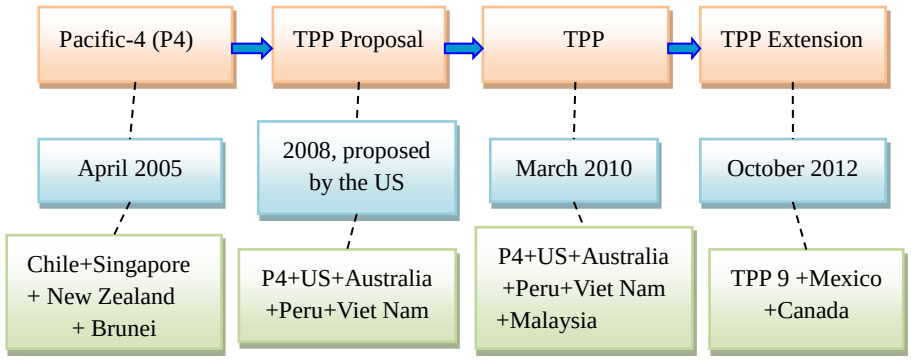
Source: Compiled by authors.

The history of TPP can be traced back to the Pacific Three Closer Economic Partnership (P3-CEP). Its negotiation was launched on the sidelines of the 2002 APEC Leaders' Meeting in Los Cabos, Mexico, by Chilean President Ricardo Lagos and Prime Ministers Goh Chok Tong of Singapore and Helen Clark of New Zealand. Brunei first took part as a full negotiating party in the fifth round of talks in April 2005, after which the trade bloc became known as the Pacific-4 (P4). The objective of the original agreement was to eliminate 90% of all tariffs between member countries by January 1, 2006, and reduce all trade tariffs to zero by 2015. It was also to be a comprehensive agreement covering all the main components of a free trade agreement, including trade in goods, rules of origin, trade remedies, sanitary and phytosanitary measures, technical barriers to trade, trade in services, intellectual property, government procurement and competition policy (Wikipedia, 2013).

After the P4 negotiations finished in 2005, its parties agreed to begin negotiating on financial services and investment which were not covered by the original agreement within two years of its entry into force. When these negotiations began in March 2008, the US joined the group pending a decision on whether to participate in a comprehensive negotiation for an expanded TPP agreement. In September 2008, the US announced it would participate fully in the negotiations, and Australia, Peru, and Viet Nam also joined (NZMFAT, 2012).

In November 2009, US President Obama affirmed that the US would engage with TPP countries. Negotiations for an expanded agreement began in March 2010. During the third round in Brunei in October 2010, Malaysia joined the negotiations. In June 2012, it was announced that Canada and Mexico would join TPP negotiations. Mexico's interest in joining was initially met with concern among TPP negotiators about its customs policies. Canada and Mexico formally became TPP negotiating participants in October 2012, following completion of the domestic consultation periods of the other nine members (Figure 2).

Fig. 2 The History of TPP



Source: Compiled by authors.

Japan joined as an observer in the TPP discussions that took place 13–14 November 2010, on the sidelines of the APEC summit in Yokohama. Japan declared its intent to join the TPP negotiations on 13 March 2013 and an official announcement was made on 15 March 2013. The TPP formally invited Japan to enter negotiations in April, and Japan could become a full negotiating partner in August 2013 (Wikipedia, 2013).

After the formation of TPP, since 2010 18 formal rounds of negotiations have been held. We report information on these rounds of negotiation in Table 1. The objective of the TPP negotiations remains to develop an FTA agreement which will be able to adapt and incorporate current issues, concerns and interests of members. Working groups have been established in the following areas: market access, technical barriers to trade, sanitary and phytosanitary measures, rules of origin, customs cooperation, investment, services, financial services, telecommunications, e-commerce, business mobility, government procurement, competition policy, intellectual property, labor, environment, capacity building, trade remedies, and legal and institutional issues. A unique departure from other FTAs is the group's additional focus on cross-cutting "horizontal issues" such as regional integration, regulatory coherence, competitiveness, development and small and medium enterprises (SMEs).

Table 1: 18 Rounds of TPP Negotitions

Round No.	Time	Place	Round No.	Time	Place
round 1	Mar. 15-18, 2010	Melbourne, Australia	round 10	Dec. 5-9, 2011	Kuala Lumpur, Malaysia
round 2	June 14-18, 2010	San Francisco, US	round 11	Mar. 1-9, 2012	Melbourne, Australia
round 3	Oct. 4-9, 2010	Darussalam, Brunei	round 12	May 8-18, 2012	Dallas, USA
round 4	Dec. 6-10, 2010	Auckland, New Zealand	round 13	July 2-10, 2012	San Diego, USA
round 5	Feb. 14-18, 2011	Santiago, Chile	round 14	Sep.6-15, 2012	Leesburg, USA
round 6	Mar. 24-Apr. 1, 2011	Singapore	round 15	Dec.3-12, 2012	Auckland, New Zealand
round 7	June 20-24, 2011	Ho Chi Minh, Viet Nam	round 16	March 4-13, 2013	Singapore
round 8	Sep. 6-15, 2011	Chicago, US	round 17	May 15-24, 2013	Lima, Peru
round 9	Oct. 19-28, 2011	Lima, Peru	Round 18	July 15-24, 2013	Kota Kinabalu, Malaysia

Source: compiled by authors.

TPP member countries are home to more than 500 million people; one fifth of APEC's population. With Japan's entry, The 12 participating economies, will account for nearly 40 percent

of global GDP and about one-third of all world trade[1]. This regional FTA could have significant impacts on the global economy.

3. Model Specification

To assess the potential impacts of TPP both on China and other countries, we use a general equilibrium model with both international trade in goods and trade costs. Our global general equilibrium model has 11 countries and each country produce two goods with two factors. These 11 countries are China, the US, the EU, Japan, Korea, Canada, Mexico, AN (Australia plus New Zealand), CP (Chile plus Peru), BMSV (Brunei, Malaysia, Singapore plus Vietnam) and the rest of the world (ROW)[2]. The two goods are tradable goods and non-tradable goods and are treated as heterogeneous across countries. The two factors in each country are labor and capital, which are intersectorally mobile but internationally immobile.

To this we add monetary structure using inside money following Whalley *et al* (2011) and Li and Whalley (2012). This allows for the endogenous determination of changes in trade imbalances for trade in goods following a TPP initiative, which are offset through inter-temporal trade across countries in money; and also allows for a calibration to a base case where China has a large trade surplus. This monetary structure builds on Azariadis (1993) where there is extensive discussion of simple overlapping generation models with inside money. Here, in addition, interactions between monetary structure and commodity trade are needed, and hence motivates models with simultaneous inter-temporal and inter-commodity structure.

In our general equilibrium model with monetary structure, we assume there are two goods in each period and allow inter-commodity trade to co-exist within the period along with trade in debt in the form of inside money. We use a single period model where either claims on future consumption (money holding) or future consumption liabilities (money issuance) enter the utility function as incremental future consumption from current period savings. This is the formulation of inside money used by Patinkin (1956, 1971) and Archibald and Lipsey (1960). This can also be used in a multi-country model structure with trade in both goods and inside money.

For the consumption and production function, we take a CES form as Li and Whalley (2012); the detailed structures are shown in Figure 3. For the inside money, we assume a representative consumer in country i with income as I_i. The budget constraint for this consumer's consumption is

$$P_i^T X_i^T + pc_i^{NT} X_i^{NT} + pc_i^Y Y_i = I_i \quad (1)$$

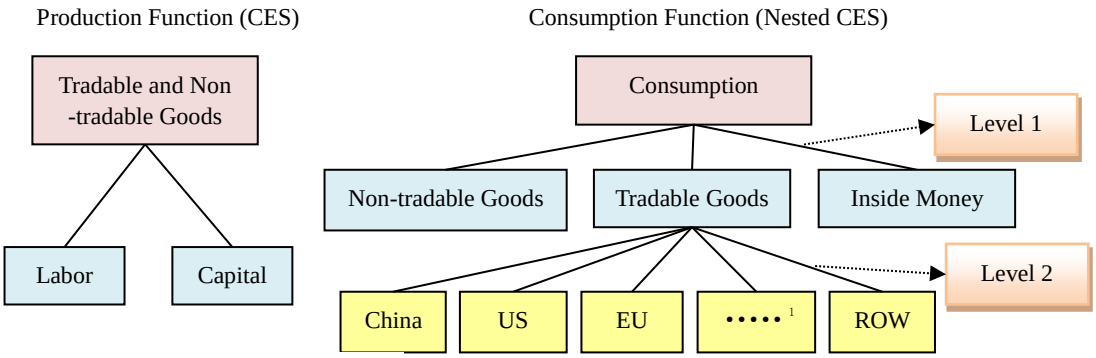
[1] These data are calculated by authors with World Bank world development index (WDI) data.

[2] These countries include all TPP member countries, potential member countries and some main non-member countries.

Here, Y_i represents both inside money (debt) held by country i, and also country $i's$ trade imbalance. $Y_i > 0$ implies a trade surplus (or positive claims on future consumption); $Y_i < 0$ implies a trade deficit or future consumption liabilities (effectively money issuance), and $Y_i = 0$ implies trade balance.

In the above equation, X_i^{NT} denotes the consumption of non-tradable goods in country i, X_i^T denotes the consumption of composite Armington tradable goods in country i. P_i^T, pc_i^{NT} and pc_i^Y are separately consumption prices of composite tradable goods, non-tradable goods and inside money in country i.

Fig. 3 Structure of Production and Consumption Functions



[1] denotes other countries in model
Source: Compiled by authors.

For trade deficit countries, utility will decrease in inside money since they are issuers. In order to capture this, given that $Y_i < 0$ for these countries, we use an upper bound Y^0 in the utility function in a term $[Y^0 + Y_i]$ following Whalley *et al* (2011) and assume that Y^0 is large enough to ensure that $Y^0 + Y_i > 0$. We use the transformation $y_i = Y^0 + Y_i$ to solve the optimization problem.

Equilibrium in the model then characterized by market clearing prices for goods and factors, a zero profit condition must also be satisfied in each industry in each country, and global trade (or money) clearance.

We introduce trade costs for trade between countries. Trade costs include not only import tariffs but also other non-tariff barriers such as transportation costs, language barriers, institutional barriers and etc. We divide trade costs into two parts in our model; import tariffs and non-tariff

trade costs. We denote the import tariff in country i as t_i, and non-tariff trade costs as N_{ij} (ad volume tariff-equivalent non-tariff trade costs for country i imported from country j). This yields the following relation of consumption prices and production prices in country i for country $j's$ exports.

$$pc_{ij}^T = (1 + t_i + N_{ij}) p_j^T \tag{2}$$

where p_j^T denotes production price of tradable goods in country j, pc_{ij}^T is country $i's$ consumption price of tradable goods produced in country j. Import tariffs will generate revenues R_i, which are given by

$$R_i = \sum_{j, i \neq j} p_j^T x_{ij}^T t_i \tag{3}$$

where x_{ij}^T is country $i's$ consumption of country $j's$ tradable goods. For non-tariff trade costs, they are different from the import tariff: they cannot collect revenue, and importers need to use actual resources to cover the costs involved. In the numerical model, we assume that the resource costs involved in overcoming all other non-tariff barriers are denominated in terms of domestic non-tradable goods. We incorporate this resource using feature through use of non-tradable goods equal in value terms to the cost of the barrier. We thus assume reduced non-tariff trade costs (including transportation cost) will thus occur under trade liberalization as an increase in non-tradable goods consumption NR_i by the representative consumer in importing countries. The representative consumer's income in country i is thus given by

$$w_i^K \overline{K_i} + w_i^L \overline{L_i} + R_i = I_i \tag{4}$$

Where $\overline{K_i}$ and $\overline{L_i}$ are separately capital and labor endowment in country i, w_i^k and w_i^L are factor prices of capital and labor. Then the demand-supply equality involving non-tradable goods becomes

$$Q_i^{NT} = \frac{NR_i}{p_i^{NT}} + X_i^{NT} \tag{5}$$

Where Q_i^{NT} is the total production of non-tradable goods by country i, p_i^{NT} denotes production price of non-tradable goods i, and

$$NR_i = \sum_{j, i \neq j} p_j^T x_{ij}^T N_{ij} \tag{6}$$

The TPP FTA will thus reduce both import tariffs and non-tariff trade costs between member countries which will influence the whole world. Using the general equilibrium model above, we can calibrate it to a base case data set and then simulate and explore TPP effects.

4. Trade Cost Calculations

We report our calculations of trade costs in this part which provide trade cost estimates for use in our general equilibrium model. The methodology we use is from Novy (2008) and Wong (2012). We calculate and report ad valorem tariff-equivalent trade costs between countries for China, the US, the EU, China, Japan, Korea, Canada, Mexico, AN, CP, BMSV, and ROW in 2011.

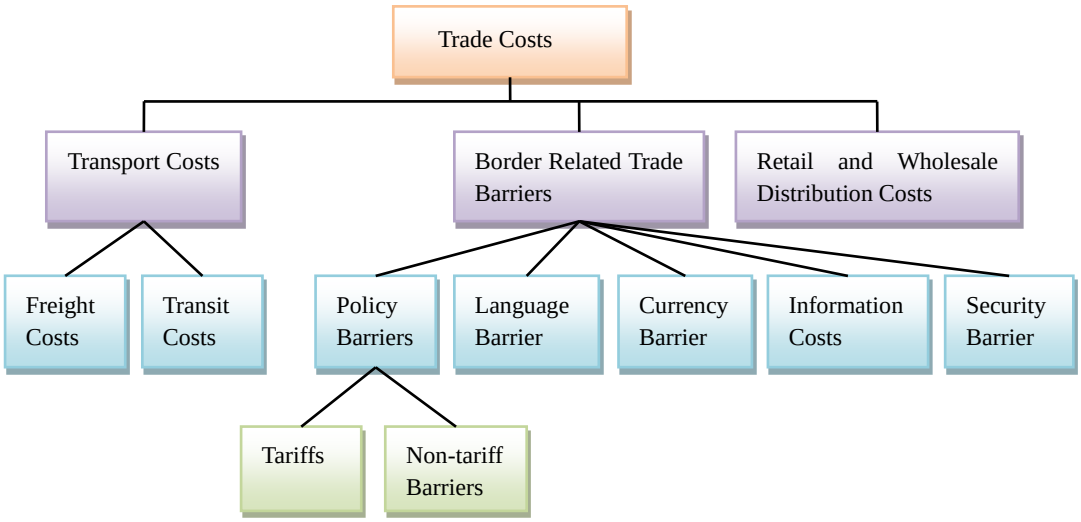
4.1 Trade Costs Definition

A broad definition of trade costs includes policy barriers (Tariffs and Non-tariff barriers), transportation costs (freight and time costs) as well as communication and other information costs, enforcement costs, foreign exchange costs, legal and regulatory costs and local distribution costs. Figure 4 reports the structure of representative trade costs used by Anderson and Wincoop (2004) to illustrate conceptually what is involved.

Trade costs are reported in terms of their ad valorem tax equivalent. They are large, even aside from trade policy barriers and even between apparently highly integrated economies. The tax equivalent of representative trade costs for rich countries is about 170% and this includes all transport, border-related and local distribution costs from foreign producer to final user in the domestic country (Anderson and Wincoop, 2004).

Trade costs also have large welfare implications. Current policy related costs are often more than 10% of national income (Anderson and Wincoop, 2002). Obstfeld and Rogoff (2000) commented that all the major puzzles of international macroeconomics hinge on trade costs. Other studies estimate that for each 1% reduction of trade transaction costs world income could increase by 30 to 40 billion USD (APEC, 2002; OECD, 2003; De, 2006).

Fig. 4 Representative Trade Costs



Source: Anderson and Wincoop (2004) and De (2006).

4.2 Methodology

Here, we have calculated trade costs for prospective TPP participants, China, the EU and other non-participants following the approaches in Novy (2008) and Wong (2012). Their method is to take the ratio of bilateral trade flows over local trade, scaled to some parameter values, and then use a measure that capture all barriers. Some papers have argued that this measure is consistent with the gravity equation and robust across a variety of trade models (Novy, 2008; Wong, 2012).

The gravity equation is one of the most robust empirical relationships in economics which relates trade between two country to their economic size, bilateral trade barriers, costs of production in exporter countries, and how remote the importer is from the rest of the world (Wong, 2012). Some recent studies have provided the micro foundations for the gravity equation, for example Anderson and Wincoop (2003), Eaton and Kortum (2002) and Chaney (2008).

The measure of trade barriers used here is based on the gravity equation derived from Chaney's (2008) model of heterogeneous firms with bilateral fixed costs of exporting. Trade barriers can take two forms in the model, a variable trade barrier τ_{ir} and a fixed cost of exporting F_{ir}. The variable trade barrier τ_{ir} is an iceberg cost. In order to deliver one unit of good to i from r, $\tau_{ir} > 1$ unit of good has to be delivered. The gravity equation supported by this model is:

$$X_{ir} = \frac{Y_i \times Y_r}{Y} \left(\frac{w_r \tau_{ir}}{\theta_i}\right)^{-\gamma} F_{ir}^{-\left(\frac{\gamma}{\sigma-1}-1\right)} \qquad (7)$$

Where X_{ir} is import of country i from country r. Y_i, Y_r and Y are the economic sizes of both countries and the total world, w_r is labor costs, τ_{ir} is variable trade costs and F_{ir} is the fixed cost of exporting. The Pareto parameter γ governs the distribution of firm productivities. σ is the elasticity of substitution in preferences. θ_i is a remoteness measure for the importing country which captures trade diversion effects. The mechanism is that the further away i is from the rest of the world, the more likely that r could export more to i due to less competition from third party countries in the importer country. This has a similar interpretation to the multilateral resistance term in Anderson and Wincoop (2003).

We can relate data on trade flows to unobservable trade barriers by taking ratios of bilateral trade flows of two regions over local purchases of each of two countries:

$$\frac{X_{ir}X_{ri}}{X_{ii}X_{rr}} = \left(\frac{\tau_{ri}\tau_{ir}}{\tau_{ii}\tau_{rr}}\right)^{-\gamma}\left(\frac{F_{ri}F_{ir}}{F_{ii}F_{rr}}\right)^{-\left(\frac{\gamma}{\sigma-1}-1\right)} \tag{8}$$

This equation reveals the relationship between observable trade data and unobservable trade barriers and eliminates the need to worry about the omission of unspecified or unobserved trade barriers. If the fixed costs of exporting are not bilaterally differentiated ($F_{ri} = F_r$) or is they are constant across locations ($F_{ri} = F$), the fixed costs drop out of this measure and the measured trade costs would simply be interpreted as variable trade costs, as in models without fixed export costs such as Eaton and Kortum (2002) and Anderson and Wincoop (2003).

For simplicity of exposition, we normalize own trade costs to 1, i.e. $\tau_{ii} = 1$ and $F_{ii} = 1$. Defining the geometric average of trade costs between the country pair i and r as

$$t_{ir} = \left(\frac{X_{ir}X_{ri}}{X_{ii}X_{rr}}\right)^{-\frac{1}{2\gamma}} \tag{9}$$

we then get a measure of the average bilateral trade barrier between country i and r:

$$t_{ir} = \left(\frac{X_{ii}X_{rr}}{X_{ir}X_{ri}}\right)^{\frac{1}{2\gamma}} = (\tau_{ir}\tau_{ri})^{\frac{1}{2}}(F_{ri}F_{ir})^{\frac{1}{2}\left(\frac{1}{\sigma-1}-\frac{1}{\gamma}\right)} \tag{10}$$

Data for this equation is relatively easy to obtain, and so we have a comprehensive measure of trade barriers, and the ad valorem tariff-equivalent bilateral average trade cost between country i and r can be written as

$$\bar{t}_{ir} = t_{ir} - 1 = \left(\frac{X_{ii}X_{rr}}{X_{ir}X_{ri}}\right)^{\frac{1}{2\gamma}} - 1 \tag{11}$$

Using the trade costs equation above, we can calculate actual trade costs between countries in our general equilibrium model, which are needed in building a benchmark data set for use in calibration and simulation.

4.3 Data and Results of Calculations

We need to calculate trade costs between each country pair for China, the US, the EU, Japan, Korea, Canada, Mexico, AN, CP, BMSV and ROW. AN, CP, BMSV denotes the summation of some countries. For the ROW, we use world total minus other countries in model to yield the data we use in calculations.

Table 2: Ad Valorem Tariff-Equivalent Trade Costs Between Countries in 2011 (Unit: %)

Country	US	EU	China	Japan	Korea	Canada	Mexico	AN	CP	BMSV	ROW
US	0	0.253	0.265	0.344	0.293	0.051	0.042	0.225	0.411	0.468	0.632
EU	0.253	0	0.268	0.423	0.319	0.408	0.391	0.262	0.484	0.462	0.649
China	0.265	0.268	0	0.252	0.171	0.427	0.412	0.175	0.414	0.335	0.436
Japan	0.344	0.423	0.252	0	0.247	0.515	0.541	0.267	0.597	0.334	0.538
Korea	0.293	0.319	0.171	0.247	0	0.461	0.383	0.177	0.439	0.264	0.439
Canada	0.051	0.408	0.427	0.515	0.461	0	0.312	0.424	0.55	0.793	0.888
Mexico	0.042	0.391	0.412	0.541	0.383	0.312	0	0.433	0.486	0.739	0.956
AN	0.225	0.262	0.175	0.267	0.177	0.424	0.433	0	0.741	0.217	0.638
CP	0.411	0.484	0.414	0.597	0.439	0.55	0.486	0.741	0	0.976	0.987
BMSV	0.468	0.462	0.335	0.334	0.264	0.793	0.739	0.217	0.976	0	0.316
ROW	0.632	0.649	0.436	0.538	0.439	0.888	0.956	0.638	0.987	0.516	0

Notes: (1) BMSV denotes Brunei+Malaysia+Singapore+Vietnam, AN denotes Australia+New Zealand, CP denotes Chile+Peru. (2) We see group countries as a whole to calculate trade costs.

Source: Calculated by authors.

For trade costs, in equation (11), X_{ir} and X_{ri} are separately exports and imports between countries i and r. This trade data is from the UN comtrade database, and total world trade data is from WTO International Trade Statistics 2012. Due to market clearing, intranational trade X_{ii} or X_{rr} can be rewritten as total income minus total exports (see equation (8) in Anderson and Wincoop(2003)),

$$X_{ii} = y_i - X_i \tag{12}$$

Where X_i is the total exports, defined as the sum of all exports from country i, which is

$$X_i \equiv \sum_{r,i\neq r} X_{ir} \tag{13}$$

This data is from the UN Comtrade database also. For y_i, GDP data are not suitable because they

are based on value added, whereas the trade data are reported as gross shipments. In addition, GDP data include services that are not covered by the trade data (Novy, 2008). It is hard to get this income data according to such a definition, so here we use GDP data minus total service value added. We get GDP data from World Bank database, and the service share of GDP data from World Development Indicators (WDI) of World Bank database, we then calculate results for GDP minus services. We take the value of γ to be 8.3 as in Eaton and Kortum (2002). Results are shown in Table 2.

5. Data and Parameter Calibration

We use 2011 as our base year in building a benchmark general equilibrium dataset for use in calibration and simulation following the method set out in Shoven and Whalley (1992). There are eleven countries in our model, and ROW data is obtained from total world values minus values for the other twenty-one countries. For the two goods, we assume secondary industry (manufacturing) reflects tradable goods, and primary and tertiary industries (agriculture, extractive industries, and services) yield non-tradable goods. For the two factor inputs, capital and labor, we use total labor income (wage) to denote labor values for inputs by sector. All data are in billion US dollars. We adjust some of the data values for mutual consistency for calibration purposes.

All data are from World Bank database (World Development Indicate). We use agriculture and service share of GDP data and GDP data to yield production data of tradable goods and non-tradable goods, and use capital/GDP ratio to yield capital and labor input in production. We set the upper bound in our monetary structure, Y^0, to equal 1000 in all countries; and change this value in later sensitivity analysis to check its influence on simulation results. These data are listed in Table 3.

Table 3 Base Year Data Used For Calibration and Simulation (2011 Data in Billion US$)

Country	GDP	T-G	NT-G	Y_i	Y_0	yi	Capital		Labor	
							T-G	NT-G	T-G	NT-G
USA	14991.3	2998.3	11993	-788.2	1000	211.8	959.5	1289.2	2038.8	10703.8
EU	17589.8	4397.5	13192.3	-413.1	1000	586.9	1945.5	1220.7	2452	11971.6
China	7318.5	3366.5	3952	155	1000	1155	1387.6	2125.3	1978.9	1826.7
Japan	5867.2	1642.8	4224.4	-32.2	1000	967.8	516.3	657.1	1126.5	3567.3
Korea	1116.2	680.9	435.3	30.8	1000	1030.8	204.5	119.2	476.4	316.1
Canada	1736.1	590.3	1145.8	-0.2	1000	999.8	309.6	89.7	280.7	1056.1
Mexico	1153.3	415.2	738.1	-1.2	1000	998.8	207.6	80.7	207.6	657.4
AN	1539.1	314.2	1224.9	46.7	1000	1046.7	81.3	321.4	232.9	903.5
CP	425.5	164.9	260.6	14.4	1000	1014.4	96.2	10.1	68.7	250.5
BMSV	667.6	462	205.6	-204.3	1000	795.7	84.9	90.5	377.1	115.1
ROW	17492.2	6295	11197.2	1192.3	1000	2192.3	1584.9	2860.3	4710.1	8336.9

Note: (1) Units for production, capital, labor, inside money and endowments are all billion US$, and labor here denotes factor income (wage). (2) AN denotes Australia+New Zealand, CP denotes Chile+Peru, BMSV denotes Brunei+Malaysia+Singapore+Vietnam. (3) We add countries together to generate AN, CP, BMSV values. (4) We use world values minus all individual countries to generate ROW values.

Sources: EU data from EU statistics, and the currency unit is Euro, we use annual average exchange rate to change them into US dollar currency unit; Other countries' data are all calculated from WDI of World Bank database.

Trade data between each pair of countries are from the UN Comtrade database. We use individual country total export and import values to indirectly yield exports to and imports from the ROW. Using production and trade data, we can then calculate each country's consumption values. All trade data are listed in Table 4.

Table 4：Trade between Countries in 2011 (Unit: Billion USD)

Country	Importer										
	USA	EU	China	Japan	Korea	Canada	Mexico	AN	CP	BMSV	ROW
Exporter											
USA	0	256.7	103.9	66.2	43.5	280.7	174.9	31	24.2	54	510.5
EU	329.3	0	172	61.8	41	37.4	30.1	43.3	13.2	56.5	1149.6
China	417.3	406.7	0	148.3	82.9	25.3	52.2	37.6	15.5	90.1	622.5
Japan	132.4	93.9	194.6	0	66.2	8.9	10.2	19.7	3.2	58.3	235.8
Korea	58.6	50.3	162.7	39.8	0	4.9	16.5	9.3	3.8	41.9	167.4
Canada	319.1	31.5	22.2	13	6.6	0	9.6	2.3	1.5	2.4	42.2
Mexico	275	22.6	6	4	2.3	10.6	0	2	3.9	2.2	21
AN	13.7	20.6	87.7	59.8	27.8	2.1	1.5	0	16.4	27.9	49.5
CP	16.2	24.1	28.5	12.1	6.9	5.7	2.3	5.3	0	5.1	20.8
BMSV	56.8	73.5	69.6	52.1	24.5	3.3	4.8	38	16.7	0	62.9
ROW	715.4	1367.4	896.2	398.3	222.7	71.7	48.7	71.8	14.2	268.1	0

Notes: (1) BMSV denotes Brunei+Malaysia+Singapore+Vietnam, AN denotes Australia+New Zealand, CP denotes Chile+Peru. (2) We get trade data of AN, CP, and BMSV by adding separate country's trade together, and these do not include inner trade between these group countries. (3)We get the ROW trade data by deducting from each country's total export, total import and total world trade value.

Sources: United Nations (UN) Comtrade database and WTO Statistics.

We divide trade costs into two parts, import tariffs and all other non-tariff barriers. We obtain each country's import tariff data from WTO Statistics Database. For ROW, we use world average tariff rate to denote these values. We calculate all other non-tariff barriers by using trade costs minus import tariffs. All import tariffs are listed in Table 5.

Table 5: Import Tariffs for Countries in 2011 (Unit: %)

Country	USA	EU	China	Japan	Korea	Canada
Tariff	3.5	5.3	9.6	5.3	12.1	4.5
Country	Mexico	AN	CP	BMSV	ROW	/
Tariff	8.3	2.4	4.9	4.8	7.8	/

Notes: (1) Import tariffs here are simple average MFN applied tariff rates. (2) We use the average individual country's import tariff to get country groups' import tariff. (3) We use import tariff of the world to denote the tariff for the ROW.

Source: WTO Statistics Database.

There are no available estimates of elasticities for individual countries on the demand and production sides of the model. Many of the estimates of domestic and import goods substitution elasticity are around 2 (Betina *et al*, 2006), so we set all these elasticities in our model to 2 (Whalley and Wang, 2010).

With these data, we calibrate the model parameters. When used in model solution these will regenerate the benchmark data as an equilibrium for the model. Then, using these parameters we can simulate the effects of TPP changes under different scenarios.

6. Simulation Results

We report counterfactual simulation results in this part to assess the potential effects of TPP on China and other countries under different scenarios. We divide trade costs into two parts, import tariffs and other all non-tariff barriers. According to the TPP negotiation targets, the aim is to set up a free trade area, and for import tariffs to be completely eliminated among participants after the negotiation of the TPP. In the meanwhile, TPP negotiations will focus on institutional areas, technical and standard barriers, investment, services and other impediments, which imply other all non-tariff barriers will be reduced and, in the long run, even completely removed.

We do not know how much of the trade cost can be reduced by TPP. Therefore, in our simulation analysis, we first assume that the TPP will completely eliminate tariff barriers (free trade), and then either partially (with weights denoting the percentage by which non-tariff barriers will be reduced) or completely eliminate other all non-tariff barriers. Specifically, we show three different cases of results for each scenario. The first is whole trade cost elimination case, the second is whole tariff elimination and 50% non-tariff barrier elimination case, and the third is only tariff elimination case. We think that the second case will be the situation nearest to the reality.

We focus on effects on welfare (utility), production, export, import and imbalance (equals export minus import), and use percentage changes compared to benchmark 2011 data to show these effects. This paper explores the TPP effects on China, so we mainly analyze the simulation results for China, and in this meanwhile some other large countries including the US, the EU, Japan, Korea, Canada, Mexico and the ROW.

6.1 Impacts on China of Being in or Out of TPP

We initially use three different scenarios to capture TPP effects, the first assumes TPP eliminates all trade costs (including tariff and other all non-tariff barriers) between members; the second assumes TPP eliminates tariff and half (50%) non-tariff barriers between members; the third assumes TPP only eliminates tariff between member countries. Table 6 shows the results for China being either out of or in TPP.

Table 6: TPP Effects of China Being In or Out TPP (% Change)

Items	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
			China Out of TPP		
Trade Cost Elimination	-0.2568	0.0319	1.2167	-0.6627	17.1287
50% NTB Elimination	-0.1395	0.0233	0.4599	-0.3399	7.2315
Only Tariff Elimination	-0.0558	0.0092	0.2429	-0.1360	3.4516
			China In TPP		
Trade Cost Elimination	1.0227	1.2281	19.1662	10.8667	89.4366
50% NTB Elimination	0.3087	0.4064	9.4332	5.1604	45.6104
Only Tariff Elimination	-0.0699	-0.0970	2.4266	1.9208	6.7095

Notes: (1) Units for all results are %. (2) The change in welfare (ΔWelfare) equals the change in total utility. (3) NTB denotes non-tariff barriers (NTB). (4) ΔImbalance denotes percent change of imbalances, some countries' initial trade imbalances are relatively small so their imbalance percent changes may large.

Source: Calculated and compiled by authors.

When China is out of TPP, her welfare and imports will decrease, production, export and imbalance will increase under the present TPP agreement. China's exports will increase, imports will decrease, then trade imbalance increase and total GDP will increase but consumption will decrease and so welfare decreases. TPP will decrease consumption prices within member countries, then TPP member countries will have more income and will consume more which will increase China's export. China will have a slight lose by TPP due to the exclusion liberalization.

If we take a 50% non-tariff barrier elimination as an example, we find that China's welfare will decrease 0.1395%, production will increase 0.0233%, export will increase 0.4599%, import will decrease 0.3399% and imbalance will increase 7.2315%.

When China is in TPP, her welfare, production, export, import and imbalance all will increase. Comparatively, trade and trade imbalance increase the most. These means China will gain from participating in TPP. In the 50% non-tariff barrier elimination case, China's welfare will increase 0.3087%, production will increase 0.4064%, export and import will separately increase 9.4332% and 5.1604%, and imbalance will increase 45.6104%.

In general, a TPP will slightly hurt China on welfare, but total production, export and imbalance will gain. If China takes part in the TPP, she will gain in all aspects. Therefore it is good for China to participate in TPP negotiations. Only a tariff reduction free trade agreement is harmful to China due to terms of trade effects. Involve in non-tariff barrier negotiation is however good for China.

6.2 Impacts on TPP Countries When China Is In or Out

For the TPP member countries, all of them will gain, and smaller countries will gain more than larger countries. These TPP member countries' welfare, production, export and import all will increase under TPP agreement. On the welfare side, and in a 50% non-tariff barrier elimination case when China is out of TPP, the US will increase 0.1667%, Canada will increase 0.3858%, Mexico will increase 0.7327%, AN (Australia and New Zealand) will increase 0.4441%, CP (Chile and Peru) will increase 1.8512%, and BMSV (Brunei, Malaysia, Singapore and Vietnam) will increase 0.0651% (See Table 7).

When China is in TPP, all member countries will gain, and the gains of these member countries are bigger than the situation of China being out of TPP. In the meanwhile, small countries will gain more than large countries. Specifically, all member countries' welfare, production, export and import will increase and the percentage changes are larger than the situation of China being out of TPP. We take the 50% NTB elimination situation as an example, the welfare of the US, Canada, Mexico, AN, CP and BMSV will separately increase 0.0034%, 0.1985%, 0.2239%, 0.1619%, 0.2185% and 0.5972% (See Table 8).

In summary, TPP initiation will benefit all member countries on welfare, production, export and import. Comparatively, small countries may gain more than large countries, and benefits to present TPP members will be larger when China engaged in the TPP.

Table 7: Effects on TPP Countries of China Being Out of TPP (%)

Items	Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
Only Tariff Elimination	US	0.0208	-0.0403	3.3900	2.2183	-0.1745
	Canada	-0.0347	0.0092	0.0503	-0.0598	2.0767
	Mexico	0.1480	-0.0250	4.7346	5.3013	23.0459
	AN	0.1917	-0.1027	5.1234	7.5655	77.7445
	CP	0.0160	-0.0465	1.2429	1.1377	1.8658
	BMSV	0.0651	-0.5764	0.8241	3.0330	-40.0218
50% NTB Elimination	US	0.1667	0.0770	6.1629	4.0591	-0.2375
	Canada	0.3858	0.2052	6.3158	7.1289	32.5840
	Mexico	0.7327	0.4826	9.3735	11.6008	75.6072
	AN	0.4441	0.4258	6.9422	7.2941	4.8587
	CP	1.8512	2.3178	12.2489	29.2972	-302.9911
	BMSV	2.5403	1.8536	9.1710	6.2810	0.5791
Trade Cost Elimination	US	0.3697	0.2476	10.2079	7.2765	1.2898
	Canada	1.0281	0.5899	7.8454	11.5239	126.6945
	Mexico	1.7932	1.2843	13.3880	18.5872	167.9971
	AN	1.4156	1.1745	14.5665	19.4694	-14.4607
	CP	3.1157	11.9145	55.8999	76.2060	-319.5825
	BMSV	4.0134	7.9331	32.2193	13.2274	-24.2443

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

Table 8: Effects on TPP Countries of China Being In TPP (%)

Items	Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
Only Tariff Elimination	US	0.0034	-0.0557	4.4675	2.9185	-0.2448
	Canada	0.1985	-0.0710	4.8832	5.7964	34.3878
	Mexico	0.2239	-0.2840	4.9837	9.0811	126.8297
	AN	0.1619	-0.1147	4.8148	2.6134	17.8484
	CP	0.2185	-0.7200	2.2316	4.1982	-34.1330
	BMSV	0.5972	-0.7760	2.2435	1.9335	1.3218
50% NTB Elimination	US	0.2698	0.3493	9.1358	6.0389	-0.2856
	Canada	0.9211	0.3454	6.2473	10.4855	143.1812
	Mexico	1.4188	0.9891	8.0730	17.8981	300.2429
	AN	1.0416	0.4445	12.7380	12.9742	11.3391
	CP	1.8501	3.0488	24.0918	33.2409	-145.0849
	BMSV	4.3699	3.6312	13.4965	11.2848	6.9210
Trade Cost Elimination	US	0.7516	0.9001	15.2813	11.9264	5.0750
	Canada	2.8550	1.0216	5.6278	22.1492	539.4233
	Mexico	3.5474	3.0521	10.5770	33.1111	680.6752
	AN	3.9890	1.2777	17.4098	41.1849	-123.3505
	CP	4.3425	13.6352	86.2277	94.3215	-63.4367
	BMSV	-2.4077	16.0932	87.6852	8.7458	-147.0041

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

6.3 Impacts on Other Non-TPP Countries

Simulation results in Table 9 reveal that most non-TPP countries' welfare decrease, export increase and import decrease. This may be because exports increase and imports decrease making the consumption of these non-TPP countries decreases and the welfare to decrease. For production, the EU will lose in all situations, but Japan, Korea and ROW will gain under only tariff elimination and 50% NTB elimination situations. Import and imbalance results are changing in different scenarios.

Table 9: Effects on Other Non-TPP Countries (%)

Items	Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
			China Out of TPP			
Only Tariff Elimination	EU	-0.0159	-0.0037	0.1185	0.0365	-0.3561
	Japan	-0.0208	0.0014	0.1021	-0.0260	-2.9181
	Korea	-0.0347	0.0092	0.0503	-0.0598	2.0767
	ROW	-0.0249	0.0028	0.1068	0.0012	0.3741
50% NTB Elimination	EU	-0.0400	-0.0051	0.2046	0.0486	-0.6989
	Japan	-0.0607	0.0054	0.1698	-0.1263	-6.8107
	Korea	-0.0949	0.0232	0.0982	-0.1706	5.0438
	ROW	-0.0497	0.0045	0.2071	-0.0015	0.7351
Trade Cost Elimination	EU	-0.0230	-0.0380	0.4457	0.5533	1.0689
	Japan	0.0041	-0.0445	-0.0011	0.6379	15.0644
	Korea	0.2727	-0.0910	-0.8776	0.6243	-28.5130
	ROW	-0.0400	-0.0237	0.4150	0.2746	0.7706
			China In TPP			
Only Tariff Elimination	EU	-0.0254	0.0014	0.0014	-0.0581	-0.3437
	Japan	-0.0387	0.0045	-0.1569	-0.1105	0.9370
	Korea	-0.0520	0.0111	-0.2680	-0.0957	-3.4382
	ROW	-0.0542	0.0159	-0.0554	-0.1307	0.1351
50% NTB Elimination	EU	-0.0533	0.0074	-0.1686	-0.1512	-0.0677
	Japan	-0.0401	-0.0173	-0.7762	0.1586	21.2647
	Korea	0.1439	-0.0523	-1.3873	0.3386	-33.1442
	ROW	-0.0897	0.0237	-0.2432	-0.2293	-0.2783
Trade Cost Elimination	EU	0.1394	-0.0826	-0.4953	1.2838	9.8084
	Japan	0.5111	-0.2453	-3.2436	4.2245	172.8375
	Korea	2.4724	-0.6875	-7.6388	5.2113	-244.0880
	ROW	0.0165	-0.0370	-0.8999	0.4279	-4.2608

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

When China participates in TPP, non-TPP countries' impacts are different. For the EU and Japan, their welfare will be hurt under only tariff elimination and 50% non-tariff barrier elimination situation, but increase under trade cost elimination. For Korea, its welfare will decrease under only tariff elimination, but will increase in a 50% NTB elimination case and trade cost elimination case. All of these countries' production will decrease under a trade cost elimination situation. According to these results we can say that TPP effects on non-TPP countries when China took part in the TPP are not clear, some countries will gain but some countries will lose.

In summary, TPP effects on non-TPP countries are not just negative or positive; they depend on different countries and different scenarios. But they are mostly negative effects on welfare. Therefore, we can see that TPP does not just hurt non-member countries; in some circumstances it will benefit non-member countries.

6.4 Comparing the Effects of TPP Free Trade and Global Free Trade

In this part, we compare the effects of TPP free trade and global free trade and report simulation results in Table 10 and Table 11 which shows changes under global free trade relative to the benchmark situation.

Table 10: Effects on China of TPP and Global Free Trade (%)

Items	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
			TPP without China		
Only Tariff Elimination	-0.0558	0.0092	0.2429	-0.1360	3.4516
50% NTB Elimination	-0.1395	0.0233	0.4599	-0.3399	7.2315
Trade Cost Elimination	-0.2568	0.0319	1.2167	-0.6627	17.1287
			Global Free Trade		
Only Tariff Elimination	-0.5072	-0.6220	10.6674	9.3769	21.5940
50% NTB Elimination	1.7149	2.3948	35.5081	27.8426	100.4114
Trade Cost Elimination	4.2901	6.9137	72.0556	52.6337	236.4986

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

Table 11: Global Free Trade Effects on Some Large Countries (%)

Items	Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
Only Tariff Elimination	USA	-0.0840	-0.2387	9.2945	5.8810	-1.0901
	EU	-0.0758	-0.3982	8.6828	6.8269	-2.0658
	Japan	0.0048	-0.4210	8.8868	7.7473	-17.9798
	Korea	0.8658	-1.7892	7.7417	15.3242	-131.7793
	Canada	0.2288	-0.3263	6.2414	7.2367	38.3985
50% NTB Elimination	USA	1.6667	1.4266	36.3874	23.7811	-1.9637
	EU	2.9699	1.7072	48.6666	39.8822	-2.2084
	Japan	2.3623	1.6936	37.3781	37.0937	30.6722
	Korea	4.7261	3.8673	23.0081	36.0231	-216.4758
	Canada	2.8386	1.3425	14.8814	24.3597	321.1192
Trade Cost Elimination	USA	4.1679	4.4252	82.5152	53.8724	-4.6221
	EU	7.6513	6.0277	119.2251	97.7601	-5.0901
	Japan	5.4971	5.5893	81.8558	82.2413	90.9458
	Korea	9.7306	12.8046	43.7806	65.3743	-353.5568
	Canada	7.0622	5.8638	34.7256	57.6372	774.9863

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

For China, a TPP without China will lower welfare but increase production; global free trade will benefit China in nearly all aspects. Comparatively, the effects of global free trade are much higher than TPP. We take 50% NTB elimination case as an example, TPP will decrease China's

welfare by 0.1395%, increase production by 0.0233%, increase export by 0.4599%, decrease import by 0.3399% and increase imbalance by 7.2315%. In the meanwhile, global free trade will increase China's welfare by 1.7149%, production by 2.3948%, export by 35.5081%, import by 27.8426% and imbalance by 236.4986%.

For other large countries, global free trade is beneficial to almost all these countries in all aspects including welfare, production, export, import and imbalance. But under only tariff elimination circumstance, some large countries' welfare and production will decrease because of terms of trade effects, these large countries will export more but import less and their total consumption will decrease when welfare decreases.

In general, global free trade effects are beneficial to nearly all countries, but TPP will hurt some countries. In the meanwhile, the effects of global free trade are bigger than TPP.

6.5 Comparing Trade Cost Barrier to Tariff at Same Rate

We compare the effects of trade cost barrier to tariff at same rate in this scenario to show in part changes in model behavior. Trade cost barrier include tariff and non-tariff barrier, tariff will collect tax revenue but non-tariff barrier is net loss and cannot collect revenue. In this paper we use trade cost to simulate the effects of TPP, what we do here is assuming that all trade costs are tariff and will collect revenues, and then with this same rate we compare the trade cost barrier effects to tariff effects. The purpose is to show that trade cost barrier is different from tariff barrier and prove that our using trade cost to assess the effect of TPP is important and valuable. We compare trade cost effects and tariff effects with the case of TPP effects of China being out. Table 12 and Table 13 show simulation results.

Table 12: Comparing Effects on China of Non TPP Participation under Trade Costs and Tariff at Same Rate (%)

Items	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
			Trade Cost Modeling		
Only Tariff Elimination	-0.0558	0.0092	0.2429	-0.1360	3.4516
50% NTB Elimination	-0.1395	0.0233	0.4599	-0.3399	7.2315
Trade Cost Elimination	-0.2568	0.0319	1.2167	-0.6627	17.1287
			Equivalent Tariff		
Only Tariff Elimination	-0.0626	0.0102	0.2191	-0.1352	11.4471
50% NTB Elimination	-0.2112	0.0351	0.4361	-0.4530	28.6110
Trade Cost Elimination	-0.4631	0.0773	0.8607	-0.9947	59.6547

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

For China, the TPP effects on China of non TPP participation under trade cost modeling and equivalent tariff modeling are nearly the same. China will be hurt in welfare when out of TPP, but total production, export and imbalance will increase, import will decrease. Comparatively, these TPP effects on welfare, production, import and imbalance are weaker under trade cost modeling than under equivalent tariff modeling. Reversely, TPP effect on export under trade cost modeling is stronger than under equivalent tariff modeling.

Table 13: Effects on Some Large Countries with China Being out of TPP When Whole Trade Costs are Tariff (%)

Items	Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
Only Tariff Elimination	USA	0.0293	-0.0408	3.3576	2.1831	-0.2478
	EU	-0.0191	-0.0031	0.1039	0.0259	-0.3535
	Japan	-0.0262	0.0019	0.0873	-0.0326	-3.6797
	Korea	-0.0437	0.0103	0.0386	-0.0649	1.1215
	Canada	0.1486	-0.0363	4.5838	5.3485	171.1810
50% NTB Elimination	USA	0.0396	0.0956	6.0838	3.9690	-0.4075
	EU	-0.0671	-0.0021	0.1688	-0.0023	-0.8341
	Japan	-0.1076	0.0116	0.1142	-0.2391	-10.9838
	Korea	-0.1708	0.0395	0.0599	-0.2770	3.5881
	Canada	0.2381	0.2180	6.0357	7.1765	254.5828
Trade Cost Elimination	USA	-0.0022	0.3066	10.0248	6.5350	-0.6873
	EU	-0.1453	-0.0017	0.3153	-0.0267	-1.6900
	Japan	-0.2420	0.0268	0.1953	-0.5676	-23.7694
	Korea	-0.3795	0.0871	0.1138	-0.6239	7.8411
	Canada	0.2647	0.7086	8.3389	10.0318	377.1546

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

For other large countries, TPP effects on welfare, production, export, import and imbalance of China being out under equivalent tariff modeling are the same as the results under trade cost modeling either. Main differences are that effects under equivalent tariff modeling are mostly stronger than under trade cost modeling on welfare, production, import and imbalance.

These results thus suggest that the TPP effects under trade cost barrier situation are the same as tariff barrier TPP effects in same rates. It suggests that our simulation results are reliable.

6.6 Impacts of Japan In/Out TPP

Japan will become member of TPP in August 2013. As one of big developed countries, its joining TPP will influence the global economy significantly. We thus further explore the effects if Japan joins in. We do this by scenario simulation and report these results in Table 14 and Table 15.

Simulation results show that China's welfare will be adversely affected by TPP, and this loss is larger than the case if Japan does not participate in the TPP. Under 50% NTB elimination case, China's welfare will decrease 0.1758% when Japan is in TPP but will decrease 0.1395% when Japan is out of TPP. China's production will increase because of export increase and import decrease, then imbalance increase. These effects are more significant when Japan Joins in TPP.

For some other large countries, effects are different for different countries and different non-tariff elimination cases. Under the 50% NTB elimination case, some countries' welfare will increase including the US, Japan and Canada, but some countries' welfare will decrease including the EU and Korea. Almost all countries' production will increase except production. Most countries' export and import will increase except Korea. Most countries' imbalance will increase except the EU and Japan. Compared with effects of Japan out of TPP, the effects of TPP have

increased.

Table 14: Effects on China When Japan In/Out TPP (%)

Items	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
		Japan and China Out of TPP			
Only Tariff Elimination	-0.0558	0.0092	0.2429	-0.1360	3.4516
50% NTB Elimination	-0.1395	0.0233	0.4599	-0.3399	7.2315
Trade Cost Elimination	-0.2568	0.0319	1.2167	-0.6627	17.1287
		Japan In TPP, China Out of TPP			
Only Tariff Elimination	-0.0671	0.0107	0.2111	-0.1649	3.3944
50% NTB Elimination	-0.1758	0.0273	0.3077	-0.4351	6.5965
Trade Cost Elimination	-0.2004	0.0078	0.8774	-0.5738	13.1647

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

Table 15: Effects on Some Other Large Countries When Japan Joins In TPP (%)

Items	Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
Only Tariff Elimination	USA	0.0175	-0.0520	3.7242	2.4495	-0.1537
	EU	-0.0191	-0.0031	0.1024	0.0227	-0.3593
	Japan	-0.0103	-0.0791	1.6662	1.6984	2.4255
	Korea	-0.0528	0.0125	0.0330	-0.0981	2.4446
	Canada	0.1533	-0.0407	4.8577	5.4138	22.8273
50% NTB Elimination	USA	0.2676	0.1941	7.8922	5.3079	0.0303
	EU	-0.0477	-0.0024	0.1094	0.0039	-0.5013
	Japan	0.5891	0.3491	9.4239	8.8443	-4.2433
	Korea	-0.1379	0.0277	-0.0062	-0.2646	4.7482
	Canada	0.5385	0.2726	7.1674	8.1742	39.6966
Trade Cost Elimination	USA	0.6679	0.5567	13.8591	10.7280	4.3336
	EU	0.0600	-0.0648	0.1612	0.9579	4.7753
	Japan	1.7761	1.0960	19.7910	22.7881	90.4559
	Korea	0.9290	-0.2749	-2.8899	1.9918	-92.7179
	Canada	1.8883	0.7342	8.2223	16.3648	271.3036

Notes: The Same as in Table 6.

Source: Calculated and compiled by authors.

In general, Japan's participation in TPP will further hurt China in welfare and made the TPP effects more significant and severe. For some large countries in TPP, they will benefit in both welfare and production. For some large countries out of TPP, they will be hurt by Japan's participation in welfare.

6.7 Sensitivity Analysis to Elasticities and Upper Bound Money Y^0

We perform sensitivity analysis by changing the values of elasticities and upper bound money to check the robustness of TPP effects with China being out of TPP. We change elasticities in both production and consumption to separately equal 1.5 and 2.5, and change the upper bound Y^0 to 2000, then compared with benchmark situation of elasticities equal 2 and upper bound Y^0 equals 2000. We then recalibrate parameters and simulate TPP effects. For simplicity, we only check the

sensitivities of TPP effects for the 50% NTB elimination case, which is the main result for this paper. These results are reported in Table 16.

We compare these sensitivity analysis results with benchmark simulation results; we find that nearly all results are the same. It suggests that our simulation results are robust.

Table 16: Sensitivity Analysis Results to TPP Effects When China Being Out of TPP (50% NTB Elimination Case)

Country	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance	ΔWelfare	ΔProduction	ΔExport	ΔImport	ΔImbalance
		Elasticity=1.5, Inside Money=1000					**Elasticity=2, Inside Money=1000**			
USA	0.1607	0.0994	4.7385	3.1121	-0.1807	0.1667	0.0770	6.1629	4.0591	-0.2375
EU	-0.0362	-0.0056	0.1759	0.0733	-0.4160	-0.0400	-0.0051	0.2046	0.0486	-0.6989
China	-0.1099	0.0095	0.2811	-0.1365	4.1261	-0.1395	0.0233	0.4599	-0.3399	7.2315
Japan	-0.0522	-0.0003	0.1627	-0.0054	-3.9161	-0.0607	0.0054	0.1698	-0.1263	-6.8107
Korea	-0.0768	0.0044	0.1126	-0.0287	2.6345	-0.0949	0.0232	0.0982	-0.1706	5.0438
Canada	0.3671	0.2318	4.9869	5.5005	28.8038	0.3858	0.2052	6.3158	7.1289	32.5840
Mexico	0.6828	0.5207	7.4283	8.7800	63.9259	0.7327	0.4826	9.3735	11.6008	75.6072
AN	0.4164	0.4776	5.2780	5.5859	3.5048	0.4441	0.4258	6.9422	7.2941	4.8587
CP	1.6979	3.1432	9.3499	21.4865	-141.2708	1.8512	2.3178	12.2489	29.2972	-302.9911
BMSV	2.2021	2.2381	7.8453	4.9062	-0.9322	2.5403	1.8536	9.1710	6.2810	0.5791
ROW	-0.0421	-0.0042	0.1681	0.0646	0.4278	-0.0497	0.0045	0.2071	-0.0015	0.7351
		Elasticity=2.5, Inside Money=1000					**Elasticity=2, Inside Money=2000**			
USA	0.1738	0.0544	7.5977	5.0045	-0.3341	0.1515	0.0861	6.2229	3.8427	-0.9894
EU	-0.0439	-0.0025	0.2102	-0.0110	-1.0758	-0.0395	0.0015	0.1400	-0.0607	-1.0004
China	-0.1623	0.0401	0.6364	-0.5790	10.1449	-0.1035	0.0206	0.2946	-0.2916	5.1901
Japan	-0.0697	0.0149	0.1592	-0.3083	-10.5801	-0.0574	0.0127	0.1343	-0.2534	-9.1380
Korea	-0.1213	0.0511	0.1009	-0.3761	9.0683	-0.0748	0.0354	0.0959	-0.2674	6.3579
Canada	0.3963	0.1804	7.6852	8.7072	32.9322	0.2866	0.2020	6.1695	7.2451	41.1886
Mexico	0.7700	0.4479	11.3784	14.4311	81.6547	0.5152	0.4590	9.1627	11.9439	97.9903
AN	0.4627	0.3756	8.6978	8.9405	7.2179	0.3052	0.4342	7.0534	7.0769	6.9235
CP	2.0978	1.3471	14.1231	38.0275	-825.1906	1.1333	2.1500	11.6601	30.5568	-267.0706
BMSV	2.8043	1.4815	10.2980	7.6310	2.4009	1.5980	1.8529	9.1575	6.2832	0.5814
ROW	-0.0574	0.0176	0.2300	-0.1040	1.0824	-0.0521	0.0118	0.1358	-0.0806	0.6829

Notes: The same as in Table 6.

Source: Calculated and compiled by authors.

7. Conclusions and Remarks

We explore the potential effects of a Trans-Pacific Partnership (TPP) negotiation on participant and large non-participant countries, stressing the effects on China. We use a general equilibrium model with monetary structure incorporating inside money to yield an endogenously determined trade surplus, and also numerically calibrate to 2011 data in a 11 country single period global general equilibrium model. We calculate trade costs using a revised gravity model method following Novy (2008) and Wong (2012). We incorporate trade costs in the numerical general equilibrium model and explore potential TPP effects on China and other countries. We capture possible TPP effects by considering four different scenarios. These are: (1) TPP impacts on China, TPP countries, and other non-TPP countries of China being in or out of TPP; (2) Comparison of TPP and global free trade effects; (3) Comparison of trade cost barrier to tariff at same rate; (4) Impacts of Japan in or out of TPP.

Our simulation results reveal that present TPP arrangements will hurt a non-participating China and other non-TPP member countries in welfare, but benefit TPP member countries. The total production of China and some other non-TPP countries will be increased because of increased export, decreased import and increased trade imbalances. Comparing the results of China being in or out of TPP, China will significantly gain after taking part in TPP. Effects from a comparison of TPP and global free trade suggest that global free trade is beneficial to all countries, not like TPP which just benefits member countries and some of other countries but not the whole. The comparison of TPP effects with trade cost barrier and tariff barrier reveal that they are the same and therefore our simulation results are reliable. At last, when Japan joins TPP, China who is out of TPP will suffer further in welfare compared with a TPP without Japan, but Japan and other TPP member countries will gain from it.

TPP will hurt non-member countries including China, but these negative effects are not large. Japan can gain from TPP participation; but this will hurt China further. China will gain if she joins TPP, and it will benefit other countries in TPP. Therefore TPP may become more important and have more influence if China can become a member. But compared with global free trade, TPP may just benefit some countries, but not like global free trade which benefits the whole.

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