The Comparison of East Asia Free Trade Areas Based on CGE Model

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Abstract

Recently, with the suspension of the WTO “Doha Round” negotiation, many countries have turned to pursue free trade agreement (FTA) with their trade partners because FTA involves fewer nations than multilateral trading system. Based on the status quo of East Asia trade and relevant theories of FTA, this paper uses the GTAP (Global Trade Analysis Project) model, one of the CGE (Computed General Equilibrium) models, to simulate four scenarios: CAFTA, three “10+1” FTA, Doha Round based “10+3” FTA (Doha “10+3” ) and Doha Round based “10+6” FTA( Doha “10+6”). The result indicates that Doha “10+3” is superior to Doha “10+6” and other integration modes. Thus, relevant trade policies can be raised.

Key Words: FTA, East Asia, CGE Model, Competitiveness

1 Introduction

With the development of economic globalization, the relationship among all trade partners in the world follows two mainlines: multilateralism represented by the WTO and regionalism represented by FTAs. The rise of new trade protectionism often stalls negotiations of multilateralism, which drives the dramatic development of FTAs. In order to improve the trade volume of their countries and regions, Asian countries, especially those of East Asia, try to build FTAs to elude various trade barriers in the past years like EU and NAFTA.

In recent years, China has been devoting itself to pushing negotiation of FTAs. So far China has completed or been working on 12 FTA negotiations, which involve 29 countries and regions. The trade volume with these countries or regions amounts to a quarter of China’s total foreign trade volume. For example, China has finished the negotiations of the establishment of China-ASEAN free trade agreement (CAFTA) and China-New Zealand bilateral free trade agreement and on the way to reach China-Australia bilateral free trade agreement. China is active in seeking the feasibility to sign the FTA with India and Korea too. As to the economic integration of more East Asian countries, ASEAN launched “10+3” summit in Dec, 1997; China put forward the plan of China-Japan-Korea FTA in Nov, 2002; ASEAN launched “10+6” summit to discuss the possibility of establishing “East Asia Community” in Dec, 2005. In this paper we will compare the economic effects of all these integration modes.

Usually a country expects to pursuit economic and political benefit from its establishment of FTAs with other nations or regions. So does China. China currently selects FTA negotiation targets according to three main principles: relieve international pressure, exert complementariness and pursuit economic benefit. If we can use data to calculate the complementariness and economic
benefit, this will provide solid evidence for China to select its negotiation targets and choose the best economic integration mode. This paper uses CGE model to calculate and analyze the economic effects of the different FTAs of East Asia which China took part in or has been working on. Then, we can get the best regional cooperation mode for China and also for the East Asian nations. Hopefully, it will help them to decide its best FTA strategy.

2 Literature Review on Empirical Study of FTA

The main empirical modes used in relevant studies of FTA are: Balassa model, Gravity model and CGE model.

Balassa model is widely used to compute effects of trade creation and trade diversion. Its theory is to utilize the change of import income elasticity of demand, before and after regional cooperation trade (RCT), to illuminate trade creation and trade diversion of RCT. The hypotheses are: import income elasticity of demand is constant before RCT. That means the import income elasticity of demand, the relationship of import and GDP, changes while RCT occurs. If the import income elasticity of demand increases after RCT, it means trade creation happens; if reduces after RCT, it means trade diversion happens. Balassa (1967) analyzed effects of trade creation and trade diversion of European Economic Community with this model. Afterwards, Wilford (1970), Nagent (1971), Willmore (1976) analyzed American Common Market with this model.

Gravity model can tell us trade effects in which specific year are distinct after setting up Customs Union or FTA, which is superior to Balassa model. Its theory is: use the change of dummy variable to explain trade effects of regional organizations, and regional economic integration or preferential regional trade arrangements. If the coefficient of dummy variable increases, regional organizations promote regional trade. If reduces, restrain regional trade. Admittedly, this model has its own disadvantages. This model assumes that all the countries in the sample develop in a similar route, and they don’t change their trade behavior during the development period. Obviously, this hypothesis is unrealistic because not only the product function, but also the utility function is different and these two functions will change systematically as enhancement of economic level.

The above two models are ex post facto researches of regional economic integration, whereas CGE model is used to make prior analysis of regional economic integration. CGE model can calculate the effects of intra-regional trade and economic welfare caused by the establishment of regional integration organizations, which can afford proofs for government decision makers. What’s more, CGE model is particularly popular with researchers analyzing the potential impact of: (a) global trade liberalization under a future WTO round, (b) regional trade arrangement, (c) economic consequences of attempts to reduce carbon dioxide emissions via carbon taxes, and (d) domestic impacts of economic shocks in other region(e.g. rapid growth in China). It can analyze the effects of building regional economic integration organization not only on regional trade, but also on product, employment and social welfare. Furthermore, the model can demonstrate in detail on the gain and loss of participators in terms of regional trade. Gilbert (2001) applied both CGE model and Gravity model to analyze the effects of FTA among Asia-Pacific countries.

The GTAP model used in this paper is a multi-country and multi-sector CGE model and the GTAP database is in its version 6. The database contains bilateral trade, transport, and protection data characterizing economic linkages among regions, together with individual-country
input-output data bases that account for intersectoral linkages with each region. With the constantly updated database of GTAP, the credibility of simulation results is increasing. Philip D. Adams (1998) used GTAP model and GTAP database version 4 to compute economic effects of APEC trade liberalization on its members. And the result indicates that trade liberalization can enhance capital stock and real GDP. Jingxiao Xue, Bowei Zhang (2004) used GTAP model and GTAP database version 5 to compute economic effects of several trade cooperation arrangements in East Asia. And the result reveals that China-Japan-Korea-ASEAN FTA can bring the most benefit to China, followed by China-Japan-Korea FTA, China-Japan FTA and CAFTA. Meng Meng, Zhaoyang Zheng (2007) used GTAP model and GTAP database version 6 to analyze economic effect of East Asia “10+3” and three “10+1”. The conclusion shows that “10+3” mode can obviously enhance social welfare and overall economy of East-Asia countries. However, so far, no one have used GTAP model to study the trade cooperation mode of 16 members of East Asia Summit.

3 Scenario Simulations and Result Analysis of GTAP Model

GTAP model, a multi-region and multi-sector CGE model, stems from Australia SALTER trade model. It was built to implement policy simulation analysis of global trade issues. There are five sectors in GTAP model: household, producer, government, global bank and international trade and transport activity. The model assumes that household expenditures, government purchase and saving (flow into global bank) compose final domestic demand. And output depends on the consumption and saving behavior of household sector and government sector. The saving all flows into global bank and global bank decides the distribution of investment capital. Consumptions of household sector and government sector derive from both domestic and abroad producers. Domestic producers use original input and intermediate products to engage in their productive activities. And part of intermediate products comes from domestic producers; other part comes from foreign manufacturers. Part of domestic products sell at home, others export.

In this paper, software “Run GTAP” is applied to solve GTAP model. GTAP model, GTAP database and software Run GTAP are developed by global trade research centre of Purdue University.

GTAP database consists of data of 87 countries (regions) and 57 sectors (industries). Therefore, analysis of any scenarios is required to be carried out after data aggregation. Since requisite of simulation and restrictions of Run GTAP, this paper aggregates 87 countries into 10 regions: China, ASEAN (10 countries), Korea, Japan, New Zealand, Australia, India, the United States, EU (27 countries) and other countries in the world; also aggregates 57 sectors into 8 industries: food, fruits and vegetables, plant fiber (mainly cotton), meat products, sugars products, other agricultural products, manufactory products and service.

3.1 Scenario and Basic Scheme Design

GTAP database version 6 contains the economic trade and production data of 87 countries till year 2001. In this paper, we modify the relevant data according to the trade liberalization degree during period of 2006-2008 and update the baseline which forms new basic scheme closer to status quo. It will be useful for reference and comparison of follow-up scenarios simulation.

We make the following adjustments:

1) 12 countries have been integrated into EU after 2001. So we reduce the tariff rate to zero
Among EU 27 countries;

2) According to the latest data publicized on the WTO website, we update the level of import tariffs of 7 industries (excluding service industry) of 9 regions (excluding the other regions in the world);

3) According to the new-added bilateral and multilateral trade agreements after 2001, we update the following data: the tariff rate of agricultural products between China and ASEAN reduced to zero from 2006; the average tariff rate reduced to 1.95% among ASEAN nations from 2008; China’s tariff rate for agricultural products imported from New Zealand reduced by 23.5% and tariff rate for industrial products imported from New Zealand reduced by 41.8% from 2008; Meanwhile, New Zealand's tariff rate for agricultural products imported from China reduced by 24% and tariff rate for industrial products from China reduced by 21%; the import tariffs reduced by 66.24% averagely from ASEAN to Korea, the import tariffs reduced by 25.87% averagely from Korea to ASEAN in Jun, 2007; the import tariffs of industrial products between America and Australia reduced by 99%, the import tariffs of agricultural products reduced by 66% from Australia to America, the import tariffs of agricultural products reduced to zero from America to Australia;

4) According to relevant government policies and achievements of world agricultural trade liberalization negotiation, we update following data: China abolished agricultural tax from 2006, so we change China’s domestic support from negative value to zero in the database; developed countries canceled export subsidy of cotton from year 2006 (the developed countries discussed in this paper are EU, America, Japan, Australia and New Zealand).

Tariffs and subsidy on agricultural products cannot be reduced to zero in short term because some developed countries hold higher level of trade protection on agricultural products. Therefore, based on preliminary simulations, we change simulation conditions by introducing the achievements of Doha Round of agricultural trade negotiations within five years. Then, the third and fourth scenarios may be closer to the real trade world: Doha “10+3” FTA and Doha “10+6” FTA. We modify and supplement following conditions related to agricultural trade liberalization:

1) Import tariffs
   Falkner program: If the highest bound tariffs in developed countries range from 0 to 20%, it will be reduced by 50%; if range from 20% to 50%, reduced by 57%; if range from 50%-75%, reduced by 64%; if higher than 75%, reduced by 66% or 73%. The reduce degree of developing countries at different levels will be two thirds of developed countries.
   Lamy program: Developed countries, at the highest level of bound tariffs (higher than 75%), should reduced customs tariff rate by 70%.
   In order to simplify data processing, we adopt Falkner program. So the simulation conditions will be: tariffs on agricultural products reduced by 50% in developed countries such as: EU, America, Australia, New Zealand and Japan; and that will be 33% in developing countries such as: China, ASEAN, Korea and India.

2) Export subsidies
   Members of FTA will abolish export subsidies of agricultural products till year 2013, according to “Ministerial Declaration in Hong Kong” signed during the Hong Kong Ministerial Conference of “Doha Round”.
3) Domestic support

Domestic support is divided into output subsidies, input subsidies, land-based subsidies and capital-based subsidies in GTAP model. However, those other three variables except output subsidies are made endogenous in software Run GTAP. Therefore, this paper uses output subsidies to express level of domestic support.

We reduce the level of domestic support of EU by 80%, 70% for America and Japan, 55% for Australia and Korea by combining the results of both Falkner program and Lamy program.

This study simulates four scenarios: CAFTA, three “10+1” FTAs (China-ASEAN, Korea-ASEAN, Japan-ASEAN), Doha “10+3” FTA and Doha “10+6” FTA.

3.2 To compare and analyze simulation effects of different FTAs

3.2.1 To compare the change of GDP

Figure 3-1 to Figure 3-4 show the GDP and its change of China, ASEAN, Korea and Japan respectively under the four scenarios.

![GDP value and growth rates of China](image-url)
Figure 3-2 Value and growth rates of ASEAN’s GDP

Figure 3-3 Value and growth rates of Korea’s GDP
The figures above reveals that GDP of China, ASEAN, Korea and Japan under Doha “10+3” mode is higher than Doha “10+6” mode.

3.2.2 Change of Social Welfare

Figure 3-5 shows change of China’s social welfare at four scenarios:
From Figure 3-5, we can see China's social welfare enhance 0.526% under the mode of CAFTA, but decrease by different degrees under the other three modes. Yet, the smallest reduction, under the mode of Doha “10+3” FTA, is 12.446%.

Table 3-1 details changes of China’s social welfare under the four simulation scenarios:

<table>
<thead>
<tr>
<th>FTA mode</th>
<th>CAFTA</th>
<th>Three “10+1”</th>
<th>Doha “10+3”</th>
<th>Doha “10+6”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocative efficiency</td>
<td>-3.05%</td>
<td>-6.68%</td>
<td>29.29%</td>
<td>29.52%</td>
</tr>
<tr>
<td>Terms of trade</td>
<td>7.99%</td>
<td>-37.75%</td>
<td>-140.77%</td>
<td>-157.72%</td>
</tr>
<tr>
<td>Change of social overall welfare</td>
<td>0.53%</td>
<td>-13.32%</td>
<td>-12.45%</td>
<td>-16.32%</td>
</tr>
</tbody>
</table>

From Table 3-1, we know that terms of trade is the main reason of change of China’s social welfare. Terms of trade are better under the mode of CAFTA, which bring about the increase of China’s social welfare. However, terms of trade get worse under the other three modes, which decrease China’s social welfare dramatically. Thereinto, the largest reduction of welfare caused by terms of trade (157.72%) is under the mode of Doha “10+6”. Then, the total social welfare reduces by 16.32%.

Figure 3-6 shows change of ASEAN’s social welfare at four scenarios:

Figure 3-6 Change rates of ASEAN’s welfare

Figure 3-6 indicates ASEAN's social welfare enhances by a greater degree at all the four scenarios, among which “10+1” FTA is most beneficial in terms of social welfare increase, which
is 335.68%. And the least beneficial mode is Doha “10+6” FTA. This reveals that ASEAN, China, Korea and Japan are complementary in many fields. In regardless of what mode of East Asia FTAs, ASEAN will increase its overall social welfare.

Table 3-2 details changes of ASEAN’s social welfare under the four simulation scenarios:

<table>
<thead>
<tr>
<th>FTA mode</th>
<th>CAFTA</th>
<th>Three “10+1”</th>
<th>Doha “10+3”</th>
<th>Doha “10+6”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocative efficiency</td>
<td>56.09%</td>
<td>129.62%</td>
<td>110.52%</td>
<td>106.33%</td>
</tr>
<tr>
<td>Terms of trade</td>
<td>313.15%</td>
<td>416.52%</td>
<td>88.00%</td>
<td>58.01%</td>
</tr>
<tr>
<td>Change of overall</td>
<td>242.50%</td>
<td>355.68%</td>
<td>107.67%</td>
<td>86.63%</td>
</tr>
<tr>
<td>social welfare</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3-2 tells us that the main reason for enhancing ASEAN’s social welfare for the mode of CAFTA and three “10+1” FTA, is changes of terms of trade; and the main reason for the mode of Doha “10+3” and Doha “10+6”, is changes of allocative efficiency.

Figure 3-7 shows change of Korea’s social welfare at four scenarios:

Figure 3-7 Change rates of Korea’s welfare

From Figure 3-7, we know that the most enhancement of Korea’s social welfare from the mode of Doha “10+3” FTA is 216.51%, whereas the most reduction from the mode of CAFTA is 14.43%.

Table 3-3 details changes of Korea’s social welfare under the four simulation scenarios:

<table>
<thead>
<tr>
<th>FTA mode</th>
<th>CAFTA</th>
<th>Three</th>
<th>Doha</th>
<th>Doha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3-3 demonstrates that Japan’s social welfare mainly depends on terms of trade in the
mode of CAFTA, but mainly depends on allocative efficiency in the other three modes.

### 3.2.3 Changes of Trade Volumes and Trade Balance

Figure 3-9 shows change of China’s export value in the four scenarios:

![Change rates of China's export value by products](chart)

<table>
<thead>
<tr>
<th></th>
<th>CAFTA</th>
<th>Three &quot;10+1&quot; FTAs</th>
<th>Doha &quot;10+3&quot;</th>
<th>Doha &quot;10+6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td>-0.75%</td>
<td>1.20%</td>
<td>11.64%</td>
<td>12.06%</td>
</tr>
<tr>
<td>Fruit&amp;Vegetable</td>
<td>-0.37%</td>
<td>-0.12%</td>
<td>19.62%</td>
<td>19.88%</td>
</tr>
<tr>
<td>Plant Fibre</td>
<td>-0.36%</td>
<td>-0.14%</td>
<td>10.90%</td>
<td>12.15%</td>
</tr>
<tr>
<td>Meat</td>
<td>-1.45%</td>
<td>-2.16%</td>
<td>-12.42%</td>
<td>-11.32%</td>
</tr>
<tr>
<td>Sugar</td>
<td>0.64%</td>
<td>-4.80%</td>
<td>12.54%</td>
<td>14.10%</td>
</tr>
<tr>
<td>Other Agr.Prod.</td>
<td>-0.50%</td>
<td>-1.88%</td>
<td>14.22%</td>
<td>14.58%</td>
</tr>
<tr>
<td>Industry Products</td>
<td>2.57%</td>
<td>2.16%</td>
<td>7.84%</td>
<td>7.93%</td>
</tr>
</tbody>
</table>

From Figure 3-9, we know that generally speaking, the greater enhancement of China’s export value happens in the mode of Doha “10+3” and Doha “10+6”.

Figure 3-10 shows change of China’s import value in the four scenarios:
From Figure 3-10, we know that generally the greater enhancement of China’s import value happens in the mode of Doha “10+3” and Doha “10+6” too.

Figure 3-11 shows change of China’s trade balance in the four scenarios:
From Figure 3-11, we can see China’s trade surplus will be reduced in all those four modes. Thereinto, the most reduction from the mode of Doha “10+6” is 4.61%, followed by 4.59% from the mode of Doha “10+3”. Under these two modes, China’s import value exceeds its export value, which cuts the trade surplus dramatically.

Figure 3-12 shows change of ASEAN’s export value in the four scenarios:

<table>
<thead>
<tr>
<th>Products</th>
<th>CAFTA</th>
<th>Three “10+1” FTAs</th>
<th>Doha “10+3”</th>
<th>Doha “10+6”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td>-0.64%</td>
<td>-3.12%</td>
<td>-4.22%</td>
<td>-4.19%</td>
</tr>
<tr>
<td>Fruit&amp;Vegetable</td>
<td>-0.59%</td>
<td>5.13%</td>
<td>2.40%</td>
<td>2.60%</td>
</tr>
<tr>
<td>Plant Fibre</td>
<td>-1.17%</td>
<td>-4.25%</td>
<td>7.37%</td>
<td>7.49%</td>
</tr>
<tr>
<td>Meat</td>
<td>-4.90%</td>
<td>9.89%</td>
<td>5.68%</td>
<td>6.60%</td>
</tr>
<tr>
<td>Sugar</td>
<td>-1.84%</td>
<td>170.72%</td>
<td>14.78%</td>
<td>16.73%</td>
</tr>
<tr>
<td>Other Agr.Prod.</td>
<td>-1.44%</td>
<td>8.01%</td>
<td>5.21%</td>
<td>5.49%</td>
</tr>
<tr>
<td>Industry Products</td>
<td>2.65%</td>
<td>3.66%</td>
<td>3.17%</td>
<td>3.09%</td>
</tr>
</tbody>
</table>

Figure 3-12 Change rates of ASEAN’s export value by products

Figure 3-12 tells us export value of sugar products increases much more than other products among all four modes. And the most is 170.72% from the mode of three “10+1”.

Figure 3-13 shows change of ASEAN’s import value in the four scenarios:
Figure 3-13 Change rates of ASEAN’s import value by products

Figure 3-13 indicates the import values of all the products are bigger from the mode of three “10+1” than that from the other three modes except plant fibre.

Figure 3-14 shows change of ASEAN’s trade balance in the four scenarios:
Figure 3-14 Value and change rates of ASEAN’s trade balance

From Figure 3-11, we can see ASEAN’s trade surplus will be reduced at all those four modes among which the most reduction 3.46% is from the mode of Doha “10+6”, followed by 3.21% from the mode of Doha “10+3”. Under these two modes, ASEAN’s import value exceeds its export value, which cuts the trade surplus efficiently.

Figure 3-15 shows change of Korea’s export value in the four scenarios:

Figure 3-15 Change rates of Korea’s export value by products

From Figure 3-15, we know that generally speaking, the greater enhancement of Korea’s export value is from the mode of Doha “10+3” and Doha “10+6”, especially the export value of meat products, which increases by 168.39% and 173.21% respectively.

Figure 3-16 shows change of Korea’s import value in the four scenarios:
From Figure 3-16, we know that generally speaking, the greater enhancement of Korea’s import value comes from the mode of Doha “10+3” and Doha “10+6”, especially for the export value of crops and fruit & vegetable products.

Figure 3-17 shows change of Korea’s trade balance in the four scenarios:
From Figure 3-17, we can see Korea’s trade surplus will be reduced among all those three modes except the mode of CAFTA. Thereinto, the most reduction 11.27% is from the mode of Doha “10+6”, followed by 10.99% from the mode of Doha “10+3”.

Figure 3-18 shows change of Japan’s export value in the four scenarios:

Figure 3-17 Value and change rates of Korea’s trade balance
From Figure 3-18, we know that generally speaking, the greater increase of Japan’s export value derives from the mode of Doha “10+3” and Doha “10+6” except the export values of meat and sugar products, which is smaller than that from the mode of three “10+1”.

Figure 3-19 shows change of Japan’s import value in the four scenarios:

Figure 3-19 Change rates of Japan’s import value by products

Figure 3-19 shows that the greater enhancement of Japan’s import value comes from the mode of Doha “10+3” and Doha “10+6” except the import value of sugar products (198.59%) from the mode of three “10+1”.

Figure 3-20 shows change of Japan’s trade balance in the four scenarios:
From Figure 3-20, we can see Japan’s trade surplus will be reduced in all those three modes except the mode of CAFTA. Thereinto, the most reduction, from the mode of Doha “10+3”, is 8.48%, followed by 8.13% from the mode of Doha “10+6”.

4 Conclusions

We simulated four scenarios by GTAP model and Run GTAP above, and we can draw the following conclusions:

1) Doha “10+3” is better than Doha “10+6” for China, ASEAN, Korea and Japan. According to the comparison of two scenarios, we can see these four countries and regions’ growth rate of GDP and social welfare is higher in the mode of Doha “10+3” than that in the mode of Doha “10+6”.

2) The mode of Doha “10+6” and Doha “10+3” can efficiently reduce China’s higher trade surplus. This proves that promoting trade liberalization in East Asia is conducive to reducing China’s trade surplus, which may help ease the trade disputes related to China.

3) China’s food, fruits and vegetables, meat products and sugar products have a comparative advantage when we conduct complete free trade with ASEAN, South Korea and Japan. However, this comparative advantage will be dwarfed by the powerful and efficient competition from other agricultural nations like India, Australia and New Zealand in the mode of Doha “10+6”. Therefore, in face of more open markets of agriculture products, China is also required to enhance its international competitiveness of agricultural products in future.

In conclusion, building “10+3” FTA is not just advantageous for China, but also a win-win strategy for ASEAN, Korea and Japan comparing with building “10+6” FTA. All countries in East Asia should also push the “Doha Round” negotiation actively. They can promote free trade by
both multilateralism and regional trade liberalization. Furthermore, all nations should work on reducing bound tariffs of agricultural products all over the world and optimizing the allocation of resources so as to enhance overall social welfare.

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