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ECONOMIC IMPACT OF THE JAPAN–CHINA–USA FREE TRADE AGREEMENT ON JAPAN USING BOTH STATIC AND DYNAMIC GTAP MODELS

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Abstract:
The Japanese government has been actively involved in so-called mega Free Trade Agreements (FTAs). The purpose of this paper is to measure the potential impact of the Japan–China–USA Free Trade Agreement (JCUFTA) on Japan; in particular, on the Japanese agricultural sector using static and dynamic GTAP models. When tariffs are eliminated between Japan, the USA and China, the GDPs of the three countries will all increase, but the impact on the GDPs of the three countries is less than 1% in both static and dynamic models. The results also show that the total value of agricultural production in Japan is expected to decline by more than 10%.

Keywords:
Free trade agreement of Japan, Global Trade Analysis Project, CGE

JEL Codes:
F15, F17, C68

1. Introduction

The Japanese government has been actively involved in so-called mega Free Trade Agreements (FTAs) including the Trans-Pacific Partnership (TPP), the Regional Comprehensive Economic Partnership (RCEP), and the Japan–China–Korea FTA (Kim et al., 2015). Several previous empirical studies have sought to measure the potential economic impact of mega FTAs that include Japan.

The potential economic impacts of FTAs have been most widely evaluated using numerical simulation with a computable general equilibrium model such as the Global Trade Analysis Project (GTAP) model. A number of studies have quantified the effects of various Japan-inclusive mega FTAs using both the static GTAP model (e.g., Cabinet Secretariat of Japan, 2013, 2015; Akahori et al., 2014, 2017) and the dynamic GTAP model (e.g., Bhattacharyay and Mukhopadhyay, 2015; Lee and Itakura, 2016).

The purpose of this paper is to measure the potential impact of the Japan–China–USA Free Trade Agreement (JCUFTA) on Japan and, in particular, on the agricultural sector in Japan using numerical simulation with a computable general equilibrium model.

Several previous studies investigate the economic integration between Japan, China and the USA (Greaney and Lovely, 2009; Dean et al., 2009; Greaney and Li, 2009; Todo et al., 2009; Ma et al., 2009; Yu, 2009; Bown and McCulloch, 2009; Petri and Plummer, 2009). However, apart from Kawai and Zhai (2009), no previous studies

measure the potential impact of the JCUFTA using numerical simulation with a computable general equilibrium model. While Kawai and Zhai (2009) used a 'static' computable general equilibrium model, we use not only 'static' but also 'dynamic' computable general equilibrium models. Regarding the sector classification in Kawai and Zhai's (2009) model, there is only one, undivided, agricultural sector. Our static and dynamic models have a subdivided agricultural sector classification.

2. Methodology

2.1. The dynamic GTAP model

The key feature of the dynamic GTAP model, in comparison with the standard static GTAP model, is its ability to handle international capital mobilities. More details of the features of the dynamic GTAP model are explained in Ianchovichina and Walmsley (2012).

The dynamic GTAP model is a recursively dynamic computable general equilibrium model of the world economy that extends the standard static GTAP model to include features that improve the treatment of the long run in the model but retains all its other features (Ianchovichina and Walmsley, 2012). Within a recursively solvable discrete-time framework, a given database refers to a given time period; a simulation takes the database to the next time period, with simulation results representing changes between the initial period and the next (Ianchovichina and Walmsley, 2012).

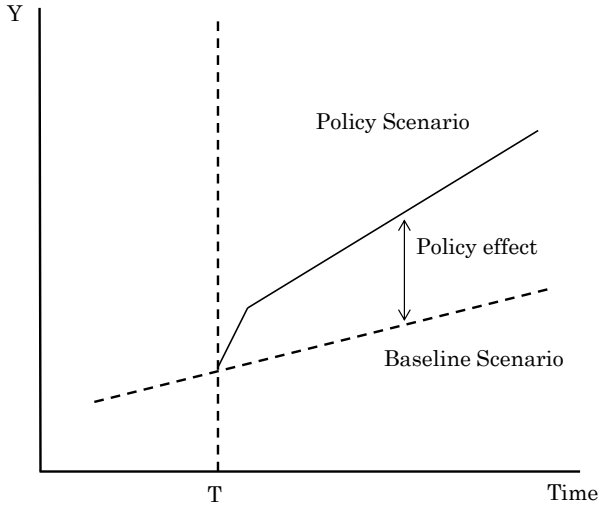

Figure 1: Baseline and Policy Scenarios.
Source: Itakura (2012)

To grasp policy effects using the dynamic GTAP model, two types of simulation should be implemented. The first type is baseline simulation, which assumes an economy in which the policy is not implemented. The second type is policy simulation, which assumes an economy in which the policy is implemented. We compare the results of these simulations to evaluate the effects of the policy (Figure 1).

The baseline scenario contains information on macroeconomic variables. These variables include projections for real GDP, gross investment, capital stocks, population, and total labor force (Lee and Itakura, 2016).

2.2. Data and Scenario

In this study, we employ the GTAP database version 9, which has a 2011 base year and distinguishes 140 countries/regions and 57 sectors. The JCUFTA simulations focus on the economic impacts, not only on the entire economy but, in particular, on agricultural sector output. For this purpose, the data have been aggregated into nine countries/regions and 25 sectors, as shown in Tables 1 and 2.

Table 1: Regional Aggregation.

No.	Aggregated Country/region	GTAP Country/region
1	Japan	Japan
2	China	China
3	USA	United States
4	Korea	Korea
5	ASEAN	Indonesia, Singapore, Malaysia, Philippines, Thailand, Viet Nam, Cambodia, Lao People's Democratic Republic, Brunei Darussalam, rest of Southeast Asia
6	ANZ	Australia, New Zealand
7	Rest of North America	Canada, Mexico
8	EU-27	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom
9	Rest of world	All the other economies/regions

Table 2: Sector Aggregation.

No.	Aggregated Sector	GTAP Sector
1	Paddy rice	Paddy rice
2	Wheat	Wheat
3	Cereal grains nec[1]	Cereal grains nec
4	Vegetables, fruit and nuts	Vegetables, fruit and nuts
5	Oil seeds	Oil seeds
6	Sugar cane, sugar beets	Sugar cane, sugar beets
7	Plant-based fibers	Plant-based fibers
8	Crops nec	Crops nec
9	Bovine cattle, sheep, goats, horses	Bovine cattle, sheep, goats, horses
10	Animal products nec	Animal products nec
11	Raw milk	Raw milk
12	Wool, silkworm cocoons	Wool, silkworm cocoons
13	Bovine cattle meat products	Bovine cattle meat products
14	Meat products	Meat products
15	Vegetable oils and fats	Vegetable oils and fats
16	Dairy products	Dairy products
17	Processed rice	Processed rice
18	Sugar	Sugar
19	Food products nec	Food products nec
20	Beverages and tobacco products	Beverages and tobacco products
21	Forestry, fishing	Forestry; fishing
22	Natural resources	Coal; Oil; Gas; Mineral nec
23	Manufacturing	Textiles; Wearing apparel; Leather products; Wood products; Paper products, publishing; Petroleum, coal products; Chemical, rubber, plastic products; Mineral products nec; Ferrous metals; Metal nec; Metal products; Motor vehicles and parts; Transport equipment nec; Electronic equipment; Machinery and equipment nec; Manufactures nec

24	Transport	Transport nec; Water transport; Air transport
25	Services	Electricity; Gas manufacture, distribution; Water; Construction; Trade; Communication; Financial services nec; Insurance; Business services nec; Public administration, Defense, Education, Health; Dwellings

Nec means not elsewhere classified.

Table 3: Initial Trilateral Tariffs on Different Sectors.

Sectors	Japanese tariffs on imports from China (%)	Japanese tariffs on imports from USA (%)	Chinese tariffs on imports from Japan (%)	Chinese tariffs on imports from USA (%)	USA's tariffs on imports from Japan (%)	USA's tariffs on imports from China (%)
Paddy rice	410	410	0	0	1	1
Wheat	0	19	0	1	2	2
Cereal grains nec[1]	5	8	1	1	0	0
Vegetables, fruit and nuts	18	10	19	12	8	1
Oil seeds	94	3	6	2	0	0
Sugar cane, sugar beets	0	0	0	20	0	0
Plant-based fibers	0	0	0	5	0	0
Crops nec	4	0	3	8	2	2
Bovine cattle, sheep, goats, horses	0	11	10	2	3	0
Animal products nec	5	4	9	7	1	0
Raw milk	0	0	0	0	0	0
Wool, silkworm cocoons	1	28	0	38	2	1
Bovine cattle meat products	1	38	20	12	2	2
Meat products	10	57	18	10	3	2
Vegetable oils and fats	0	2	15	9	0	2
Dairy products	25	89	13	6	20	6
Processed rice	231	241	0	1	3	4
Sugar	28	23	49	50	27	26
Food products nec	11	11	13	11	4	3
Beverages and tobacco products	5	3	20	6	3	4
Forestry, fishing	4	1	8	1	1	1
Natural resources	0	0	3	0	0	0
Manufacturing	2	1	7	6	1	3
Transport	0	0	0	0	0	0
Services	0	0	0	0	0	0

Nec means not elsewhere classified.

This regional aggregation highlights the importance of Japan's major trading partners in the agricultural and food sectors. The sector aggregation framework was designed to distinguish agricultural sectors important for the present analysis. The aggregated agricultural sector in Table 2 includes sectors from No. 1 (paddy rice) to No. 12 (wool, silkworm cocoons), and the food sector includes sectors from No. 13 (bovine cattle meat products) to No. 20 (beverages and tobacco products).

Japan's highest tariffs on imports from China and the USA are levied on paddy rice (410%) (Table 3). The only sectors in Japan whose tariffs are higher than 100% are paddy rice and processed rice. In contrast, there is no sectors in China and the USA whose tariffs are higher than 100%.

To evaluate the effects of the JCUFTA using the dynamic GTAP model, the baseline scenario was first established, showing the path of each of the nine countries/regions over the period 2011–2030. Real GDP projections and capital stocks were obtained from Fouré et al. (2010). Projections for population were taken from the United Nations (2015), while those for labor are based on the working-age population (14–65-year-olds). Labor is divided into skilled labor and unskilled labor. In the base case scenario, tertiary education is used to estimate skilled labor (Walmsley et al., 2000).

To evaluate the effects of the JCUFTA using the static computable general equilibrium model, we use the static version of the GTAP model with standard closure (Akahori et al., 2017).

We applied the same scenario, which assumes the complete removal of all import tariffs, not only on the agricultural sector but also in the nonagricultural sector, for both the static and dynamic GTAP models. For the dynamic GTAP simulation, we assumed that the JCUFTA is implemented from 2017, tariffs are uniformly reduced over five years and tariffs on all items are eliminated by 2021.

3. Results

The impacts on real GDP and the agricultural sector caused by the JCUFTA are shown in Tables 4 and 5. The static GTAP simulation model showed the increase in real Japanese GDP to be 0.15% (Table 4). The increase in real GDP for China and the USA were 0.14% and 0.01%, respectively. The economic gain of a small economy such as Japan from an FTA with larger economies such as USA and China is larger because the trade dependence of smaller economies on larger economies is larger (Kawai and Zhai, 2009).

Table 4: Impacts of the JCUFTA on Real GDP (%).

Real GDP	Static model	Dynamic model						
		2017	2018	2019	2020	2021	2025	2030
Japan	0.15	0.03	0.07	0.13	0.21	0.29	0.54	0.82
China	0.14	0.04	0.08	0.13	0.18	0.24	0.40	0.49
USA	0.01	0.00	0.01	0.01	0.02	0.02	0.04	0.03

Table 5: Impacts of the JCUFTA on Agricultural Sector Outputs (%).

Agricultural sector output	Static model	Dynamic model						
		2017	2018	2019	2020	2021	2025	2030
Japan	–11.27	–1.11	–2.66	–4.79	–7.86	–13.15	–13.76	–14.78
China	–0.07	–0.03	–0.07	–0.10	–0.12	–0.08	–0.01	0.04
USA	2.17	0.26	0.60	1.00	1.46	2.01	1.95	1.81

Based on the static GTAP model, agricultural sector output in Japan declined by 11.27%, whereas agricultural sector output in the USA expanded by 2.17% (Table 5).

On the other hand, the dynamic GTAP model suggests that real GDP in 2021, when all import tariffs have been removed, will be 0.29% points higher than the baseline in Japan (Table 4). Real GDP in China and the USA in 2021 will be 0.24% points and 0.02% points higher, respectively, than their baselines. Agricultural sector output in Japan in 2021 is predicted to decline by 13.15% points compared with the baseline, while in the USA in 2021 it is predicted to increase by 2.01% points compared with the baseline (Table 5).

Table 6: Impacts of JCUFTA on Sector Outputs (2030 year % point difference from baseline).

Sector	Japan	China	USA	Korea	ASEAN	ANZ	RONA	EU27	ROW
Paddy rice	–40.87	1.16	3.15	–0.06	–0.06	–0.93	3.14	0.65	0.06
Wheat	–31.09	–0.25	–1.97	1.43	1.49	–0.15	0.58	0.56	0.27
Cereal grains nec[1]	–8.08	0.20	1.73	0.87	–0.12	–0.44	0.59	–0.03	–0.03
Vegetables, fruit and nuts	–1.81	0.09	–0.37	–0.25	0.03	–0.10	1.13	0.21	–0.01
Oil seeds	–28.91	0.99	–0.60	1.44	0.40	–1.30	–3.94	0.22	–0.34
Sugar cane, sugar beets	–1.16	0.09	0.05	0.37	–0.03	–0.49	0.09	–0.06	–0.19
Plant-based fibers	0.97	–0.59	1.14	2.59	1.05	–0.34	0.66	0.68	0.00
Crops nec	–6.65	–1.47	–2.02	0.49	0.26	–0.04	0.54	0.04	–0.06
Bovine cattle, sheep, goats, horses	–15.67	0.09	4.06	–0.47	–0.33	–2.02	0.95	–0.13	–0.13
Animal products nec	–19.81	–0.36	5.74	–1.26	–0.84	–0.41	–0.76	–0.27	–0.15
Raw milk	–13.99	–0.33	3.69	–1.81	–0.55	–0.68	–0.04	–0.20	–0.11
Wool, silkworm cocoons	1.26	–0.33	111.44	2.15	0.08	0.76	0.10	3.28	–0.10
Bovine cattle meat products	–18.18	–1.94	4.42	–0.53	0.11	–3.53	–0.51	–0.10	–0.12
Meat products	–26.21	–2.23	8.98	–1.31	–1.71	0.47	–1.72	–0.33	–0.22
Vegetable oils and fats	14.13	–0.34	–0.78	–1.85	0.30	–0.17	0.84	–0.06	–0.22
Dairy products	–17.65	–0.38	4.36	–1.58	–0.41	–0.84	0.00	–0.23	–0.14
Processed rice	–28.88	0.79	45.07	–0.79	–0.06	–1.33	–0.21	–0.20	–0.15
Sugar	–1.26	0.10	–0.06	0.16	0.03	–0.22	0.22	0.00	–0.16
Food products nec	0.45	0.22	0.72	–1.46	–0.33	–0.24	–0.08	–0.08	–0.22
Beverages and tobacco products	1.13	0.26	0.09	–0.47	–0.22	–0.25	–0.14	–0.08	–0.14
Forestry, fishing	–0.15	0.14	0.06	–0.37	–0.18	0.02	–0.10	–0.15	–0.10
Natural resources	–0.09	–0.03	–0.04	0.02	–0.02	–0.03	0.01	–0.02	–0.03
Manufacturing	1.23	0.46	0.11	–0.78	–1.02	–0.05	–0.83	–0.36	–0.48
Transport	–0.37	0.35	0.13	0.69	0.02	–0.19	–0.09	0.33	–0.09
Services	0.90	0.45	0.00	–1.15	–0.65	–0.33	–0.51	–0.25	–0.25

Nec means not elsewhere classified.

Table 6 shows that agricultural sectors and food sectors tend to decline in Japan: in particular, paddy rice will decline by 40.87% points. In contrast, in the USA, the agricultural and food sectors are likely to expand. The formation of a JCUFTA contracts the Japanese agricultural sector due to reduced import tariffs on the Japanese agricultural sector (Kawai and Zhai, 2009).

4. Conclusions

In this paper, we measure the potential impact on Japan's economy and, in particular, on its agricultural sector expected to be caused by the Japan–China–USA Free Trade Agreement (JCUFTA) using the standard static and dynamic GTAP models.

As a result of our analysis, when tariffs are eliminated between Japan, the USA and China, the GDPs of the three countries will all increase, but the impact on the GDPs of the three countries is less than 1% in both static and dynamic models. However, both models show clearly that the value of agricultural production in Japan is expected to decline by more than 10%.

The following are suggested as future research tasks. First, the effect of nontariff barriers should be taken into account. Second, some features of recent trade analysis such as product diversity and firm heterogeneity should be incorporated into the model.

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