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On the effects of trade liberalization policies on regional economies based on "Transnational Interregional Input-Output Table between China and Japan"

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Abstract: Rapid expansion of economies and trades in Asian countries can be accelerated by Free Trade Agreements, Economic Partnership Agreements among countries as well as development policy of each country. To foresee the effects of those agreements and policies on trades and logistics, a sophisticated data set and analytical tool are needed.

This paper characterizes and analyzes the interregional trade values in Japan and China, which have not been dealt by most of the traditional country-based models, by using "Transnational Interregional Input-Output Table between China and Japan." To ensure the consistency and operability of the model, it extends an existing general equilibrium trade model (GTAP model) and divides its Japanese and Chinese parts into eight and seven regions, respectively, using the data on the interregional input-output table.

As a result, while keeping the structure of the standard model, it enables us to compute conveniently the regional changes in trade values resulted from changes in economic conditions such as a trade agreement, decrease in maritime transportation cost and regional development. This paper significantly contributes to the fields of regional trade analyses and future cargo-volume predictions, by showing the possibility of general equilibrium, regional IO-based analysis based on a published data set and a popular model.

Key Words: Transnational Interregional Input-Output Table, GTAP model, trade liberalization, regional economies in Japan and China

1. INTRODUCTION

Of fundamental importance for future estimates concerning international port and airport facilities is the value of trade (or volume of trade). Up to this point, such as the Economic Committee of APEC (1997), Kawasaki (2003) and Shibasaki et al (2005a), a large amount of research estimating country-by-country trade figures has been conducted, given economic shocks and overall growth in the world economy. However, in order to consider investment and maintenance in transportation properly at regional level, just deriving the overall fluctuations in national trade is insufficient. What is needed is an estimation of the future changes in trade figures for each individual region. Some preceding researches, such as the one undertaken by Shibasaki et al (2005b), derived regional trade figures from national trade using proportional distributions of existing shares. As far as the authors are aware, only a few works, such as the one by Mizutani et al (2006), have taken into account regional interactions explicitly to estimate Japanese port cargo volumes or values but they had several problems with respect to operability and costs in data collection or model construction.

Under this circumstance, this paper introduces a relatively simple method for creating trade estimates that explicitly take into account regional interactions, by using the Transnational Interregional Input-Output Table between China and Japan recently created by the Japan External Trade Organization (JETRO) and GTAP's (Global Trade Analysis Project) model and data. Specifically, those that illuminate specific effects by region, such as Free Trade Agreements (FTA) or Economic Partnership Agreements (EPA) that Japan might potentially enter into, the Western China Regional Development Strategy, and efforts to reduce the shipping charges related to port facilities.

With respect to the possibility of forecasting by region on the basis of the published International Regional Inter-industry Trade Relations Table and a user-friendly, general purpose model, we believe that this paper will play an important role in the spread of trade analysis by regional level.

Chapter 2 explains the data-preparation methodology. Chapter 3 explains the impact of FTAs and EPAs. Chapter 4 explains the impact of China's 'Great Western Region Development'. Chapter 5 investigates the impact of reductions in shipping costs related to port facilities, and Chapter 6 provides a summary and indicates potential areas for expansion.

2. DATA SEGMENTATION BY COUNTRY

The analyses in this paper employed existing GTAP data (version 6). Data concerning Japan and China (mainland) were segmented into a number of regions within each country taking into account the Transnational Interregional Input-Output Table between China and Japan and were used as the basis of an inter-regional trade simulation.

"The 2000 Transnational Interregional Input-Output Table between China and Japan" (hereafter referred to as the "Transnational Interregional Table") has developed by the IDE-JETRO (Institute of Developing Economies, Japan External Trade Organization) in 2007, which is compiled from the 2000 Asian International Input-Output Table and interregional input-output tables of both China and Japan. It depicts the industrial network extended over the nineteen regions, namely China (seven regions), Japan (eight regions), ASEAN5 (Indonesia, Malaysia, the Philippines, Singapore and Thailand), East Asia(Korea and Chinese Taipei) and the United States of America, and gives a minute picture of input composition and output distribution of each domestic industry vis-à-vis home as well as foreign countries' industries.

2.1 Principles for data segmentation

Data were drawn from the Transnational Interregional Table. The GTAP data contained information on 52 industries with 2001 as the reference year, while the Transnational Interregional Table consisted of 10 industries with 2000 as the reference year. There were also a few other differences in data format.

Because there were no further data beyond the 10 industries available for the Transnational Interregional Table, and further fragmentation did not contribute to more precise analyses, we aggregated the GTAP data into 10 industries and segmented them into several regions concerning Japan and China.

With respect to the different years used in the datasets, due to the difficulties presented by the prospect of interpolating and correcting the Transnational Interregional Table data (which would have involved the same amount of work as producing data for a different year's Transnational Interregional Table) we used the numerical values from the GTAP data that had been aggregated into 10 industries and segmented them by using relative regional ratios gleaned from the existing Transnational Interregional Table data.

Using these principles, we were able to preserve the totals from the domestic trade figures for both Japan and China, so we can guarantee that the data are at least as precise as the standard for the by-country GTAP data for the 10 industries.

2.2 Segmentation method

A detailed explanation of the methodology can be found in Appendix A. Because the Transnational Interregional Table does not include data on such variables as savings, capital investment in infrastructure, population, land, and natural resources, data collection was conducted separately using government statistics for them. Information on other variables, including inputs, yields, final demand, trade, and taxation data were taken from the Transnational Interregional Table.

(1) Industry sectors

As stated in 2.1 above, GTAP data (for 57 industries) were aggregated to correspond to the 10 industries found in the Transnational Interregional Table (agriculture, mining, manufacture of daily necessities, manufacturing of industrial materials, machining and assembly, public utilities, construction, trade, transportation, and service industries). A detailed explanation of the classification comparisons used in the synthesis can be found in Appendix B.

(2) Geographic regions and segmentation of the variables

The regions comprising the Transnational Interregional Table are Japan, divided into 8 regions (Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku, Shikoku, Kyushu and Okinawa) and China (mainland) divided into 7 regions (Northeast, North China, East China, South China, Central China, Northwest, and Southwest), the U.S., a region consisting of South Korea and Taiwan, another region consisting of 5 ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand), and a region comprised of other countries, for a total of 19 regions. (A detailed explanation of the regions of Japan and China appears in Appendix C).

Regional ratios of Japanese or Chinese international trade were used as the numerical values for segmentation of trade between Japan or China on the one side, and the United States, on the other. Where the other trading partner was South Korea, Taiwan, or the 5 ASEAN countries (where a number of countries were integrated) the ratio for each group was applied to the various countries. For other countries, ratios from the “other countries” section of the Trade Relations Table were used for all of the countries.

The relative region by region ratios (two-dimensional array) from the Trade Relations Table were used for segmentation of Japan-China trade. For inter-regional exports and imports within each of Japan and China, Trade Relations Table ratios were used to isolate inter-regional exports and imports from intra-regional inputs and then added as trade, because GTAP original variables only count international trades.

The same methodology was employed with respect to duties, export taxes, import taxes, and shipping and insurance charges. Simple regional ratios were used to segment the

domestic variables for both Japan and China, with respect to regional inputs, outputs, final demand, domestic taxes, and capital infrastructure variables, etc.

(3) Segmentation methods for each variable

Basically, segmentation followed the inter-regional ratios (or region-by-region relative ratios) for each industry on the Transnational Interregional Table, but the following methods were employed with respect to data that were incomplete on the Input-Output Table.

i) Shipping and insurance charges

The Input-Output Table contains shipping and insurance cost data for receiving regions and receiving industries, but they are not segmented by originating region or originating industry. In order to segment the GTAP data, f.o.b. trade figures for originating regions and originating industries were proportionally distributed.

ii) Customs and import duties

Because data regarding customs and import duties were not segmented by originating region or originating industry, c.i.f. trade figures were proportionally distributed.

iii) Domestic taxes

Because data regarding domestic taxes on imported goods were not segmented by originating region or originating industry, customs and import duties were added to c.i.f. trade figures, which were then proportionally distributed.

iv) Export duties

Trade data on the Trade Relations Table already contains export duties, but no information is available for receiving regions, receiving industries, originating regions, or originating industries so f.o.b. trade figures were proportionally distributed for each dimension.

v) Zero or negative values

When inter-regional relative ratios calculated for a given industry come out as zero for all regions on the Trade Relations Table, and a relative ratio cannot be calculated (where positive values could be seen in the GTAP data) segmentation was carried out using the relative ratio for the total value of all industries.

For variables in a given industry for which there was a clear expectation of a positive value for the calculation of inter-regional relative ratios, but where a negative value was obtained for any region, low reliability was attributed to that series and segmentation was carried out using the relative ratio for the total value of all industries.

vi) Proportions for intermediate input, government final demand, and private-sector final demand

With respect to relative ratios for intermediate input, government final demand, and

private-sector final demand for domestic goods and export goods, by originating industry, information was available from both GTAP and the Transnational Interregional Table, but taking into consideration that 1) there were reliability issues with the Transnational Interregional Table data because of the large number of zero or negative values reported for investment and government final demand, and 2) the general principle of using the GTAP data as the standard for segmentation and also applying them to expenditure categories, the GTAP data ratios were kept and segmentation based on the Transnational Interregional Table was carried out within each expenditure category.

3. ANALYZING EFFECTS RELATED TO FTA AND EPA

3.1 Configurations related to FTA and EPA

World trade data including data from Japan's 8 regions and China's 7 regions were created according to the methodology outlined above. In this section and section 3.2, the model was configured with Free Trade and Economic Partnership agreements (FTAs and EPAs) into which Japan has already entered, as well as potential future agreements, in order to see the effects on each region in Japan and China. In section 3.3, additional data concerning FTAs and EPAs entered into among countries other than Japan are added to the configuration in order to see those effects on each region.

With respect to FTAs and EPAs concerning Japan, 3 patterns were included: agreements already signed (including those that have already taken effect until now after 2001), those in the negotiation stages, and those under consideration. Effects on trade figures arising from the elimination of customs duties on goods originating from and arriving in Japan were measured. Information with regards to specific trade partners was taken from public documents published by the Ministry of Foreign Affairs and the Ministry of Economy, Trade and Industry, as follows:

i) In effect or signed:

Japan – Thailand, Japan – Malaysia, Japan – Singapore, Japan – Mexico, Japan – Chile, Japan – Philippines, and Japan – Indonesia

ii) Under negotiation:

In addition to “in effect or signed” above,

Japan – South Korea, Japan – Vietnam, Japan – India, Japan – Australia, and Japan – Switzerland.

Japan is also currently negotiating an FTA with the Gulf Co-operation Council in the Middle East, but because it is not fully included among the countries or regions of GTAP, it has not been included in these analyses.

iii) Under consideration:

In addition to “under negotiation” above,

Japan – China (each region), Japan – EU, Japan – New Zealand, and Japan – ASEAN (as a whole).

Because rates of customs duties are already known for countries with which an agreement is already in effect or has been signed, they were arranged to convert to 10 industries (of which 5 are tradable commodities) by using trade values as weights as shown in Appendix D. With regards to agreements under negotiation or under consideration, where tariff rates have not yet been fixed, they were set to zero, noting the WTO’s conditions for FTAs that ‘customs duties and other restrictive trade regulations be completely eliminated with the establishment of regional trade organizations’ and Japan’s Ministry of Foreign Affairs Economic Bureau’s EPA Negotiating Team’s (2007) statement that ‘Japan considers the elimination within 10 years of duties on 90% or more of trade with an EPA or FTA partner, as one important benchmark for judging compliance with the WTO’.

3.2 Analysis of effects and comparison with existing model

In order to compare the data and model we created with the existing GTAP model and data, we conducted a simulation configured as explained above, calculated the total value of international trade for Japan’s 8 regions (excluding domestic trade) and compared the results with the existing model configured in the same way. The results appear in Figure 1. The figures match exactly with pre-shock trade figures. We were able to simultaneously confirm consistency between initial conditions and to observe similar movement for both in terms of direction of change. With respect to absolute values, those employing data that were segmented by region tended to be higher. This might be due, for example, to the fact that domestic inter-regional inputs were explicitly taken into account and the effects of economic shocks were spread across the region, among other possibilities.

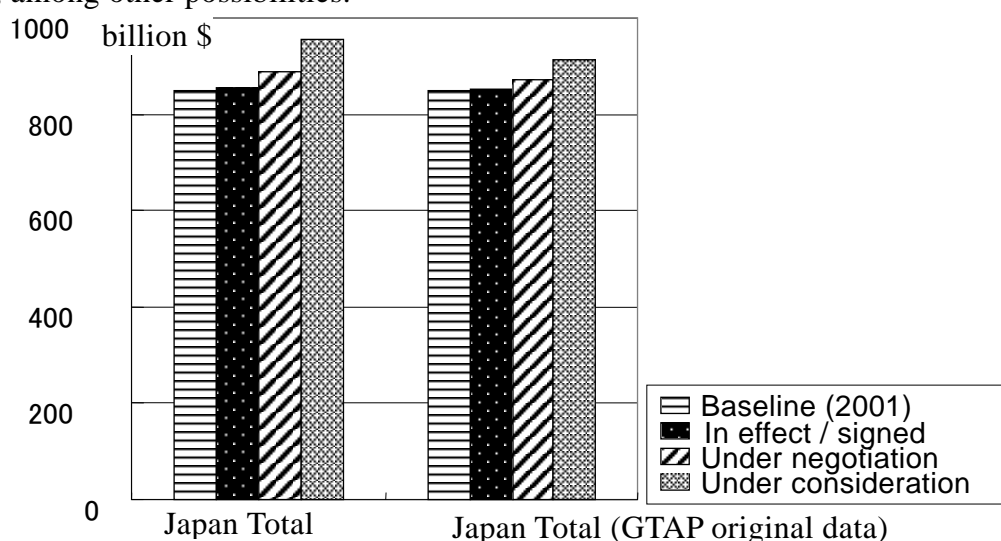


Figure 1. Changes in Japan’s trade figures (total): comparison between data segmented by region and original GTAP data

Next, we will look at the effects by region, gleaned from the data and model created this time. The effects of FTAs and EPAs in which Japan is involved on each region's international import and export figures (total of export values and export values, excluding domestic trade) is illustrated in Figure 2 (change in absolute values) and Figure 3 (rate of change).

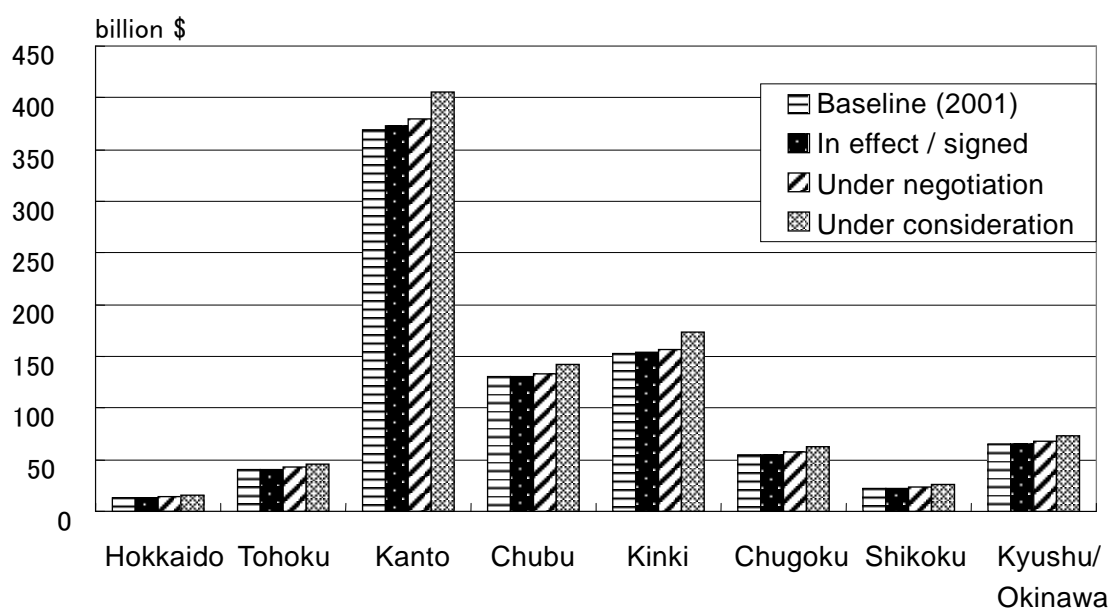


Figure 2. Effects on import/export figures for each domestic regions due to FTAs or EPAs involving Japan

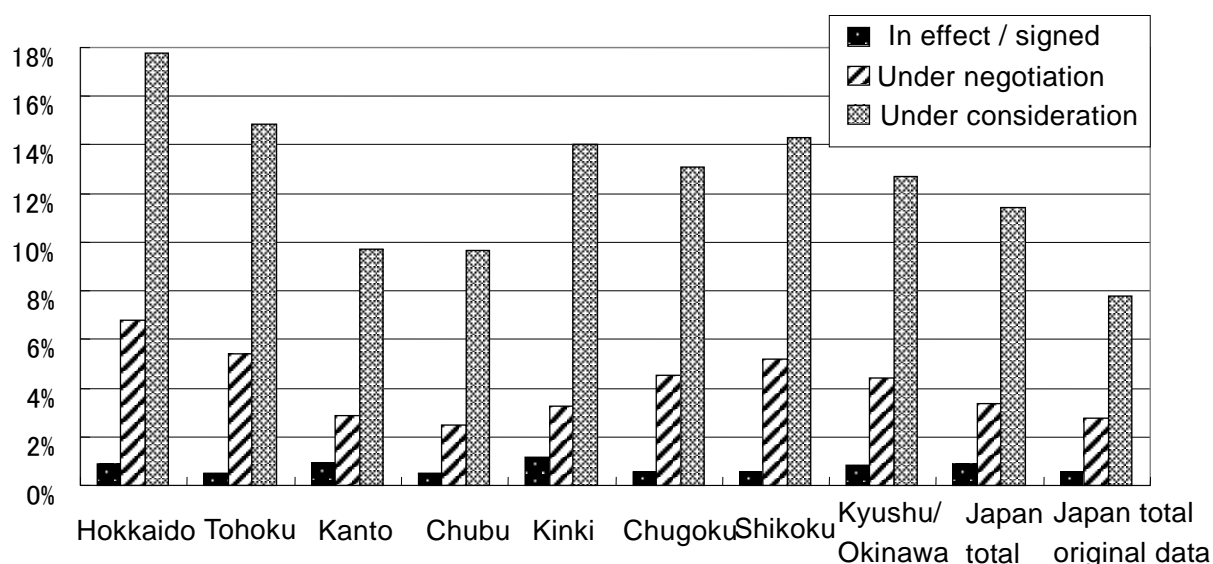


Figure 3. Rates of change in import/export values for each domestic region due to FTAs or EPAs involving Japan

In each region, international imports and exports values were found to increase in step with the stage of progress towards an FTA or EPA. Both figures also show a clear differential in inter-region effects. In the present case, figures for absolute values in Kanto (including Tokyo Metropolitan Area) and rates of increase in each of Hokkaido, Tohoku, and Western Japan, show a relatively large change. More detailed analysis of exports and imports reveal that increased imports are central for Hokkaido and Tohoku and increased exports play a central role for Western Japan.

When agreements under consideration are added to the configuration, agreements with China and the EU are listed. Accordingly, Kinki Region (including the second largest economic area such as Osaka, Kyoto and Kobe), where rates of increase for trade figures were relatively small as far as item ii) “under negotiation”, has quite large increase rates when “agreements under consideration” are added, revealing that regional differences in trade partners and the structure of trade results in differential effects from the influence of the agreements.

With regard to domestic Japanese inter-regional imports and exports, small decreases were observed in each region, when item i) excepting the case of “existing agreements”, due to substitutions in imports and exports resulting from FTAs and EPAs, but as can be seen in Figure 4, a positive change can be observed in total exports and imports (international + domestic inter-regional exports and imports) for each region except Hokkaido.

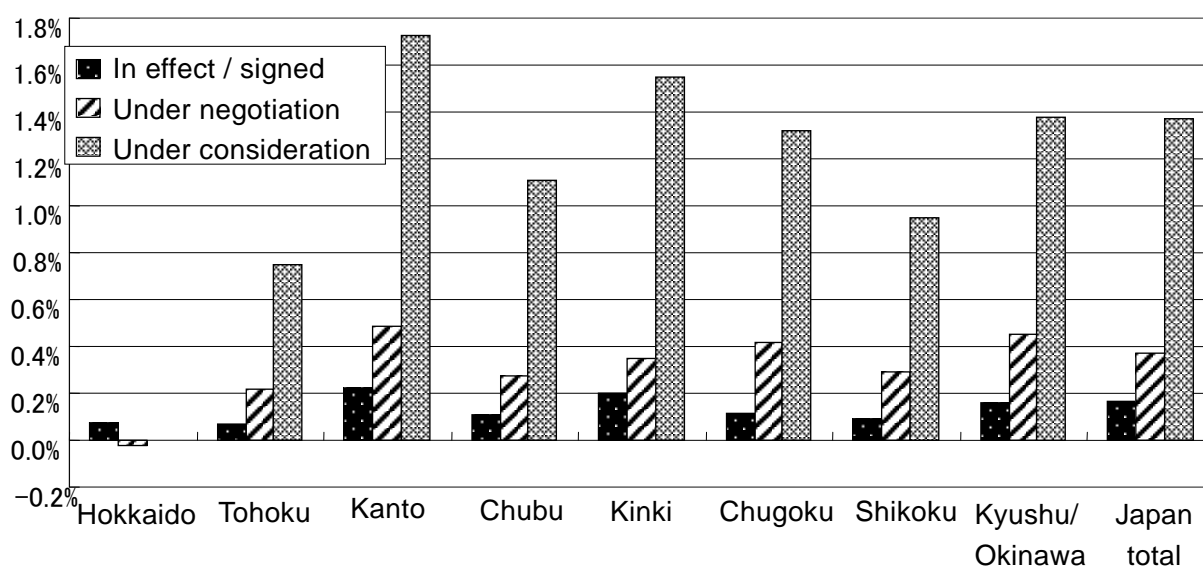


Figure 4. Rates of change in total exports and imports for each domestic region due to FTAs or EPAs involving Japan

Figure 5 shows the changes in rates of GDP for each domestic region. When compared to regional fluctuations in trade figures as shown up to Figure 4, there are found less regional disparity with respect to GDP and the effect is expected to diffuse through the domestic input-output structure.

Figure 6 shows changes in exports for each region of China. Simply because Japan is entering into agreements with various countries besides China under configuration ii) “agreements under negotiation” almost no change is evident, but under configuration iii) “agreements under consideration”, by the assumption of an agreement between Japan and China, large changes can be observed in each region, particularly China’s Northeast, North, and East.

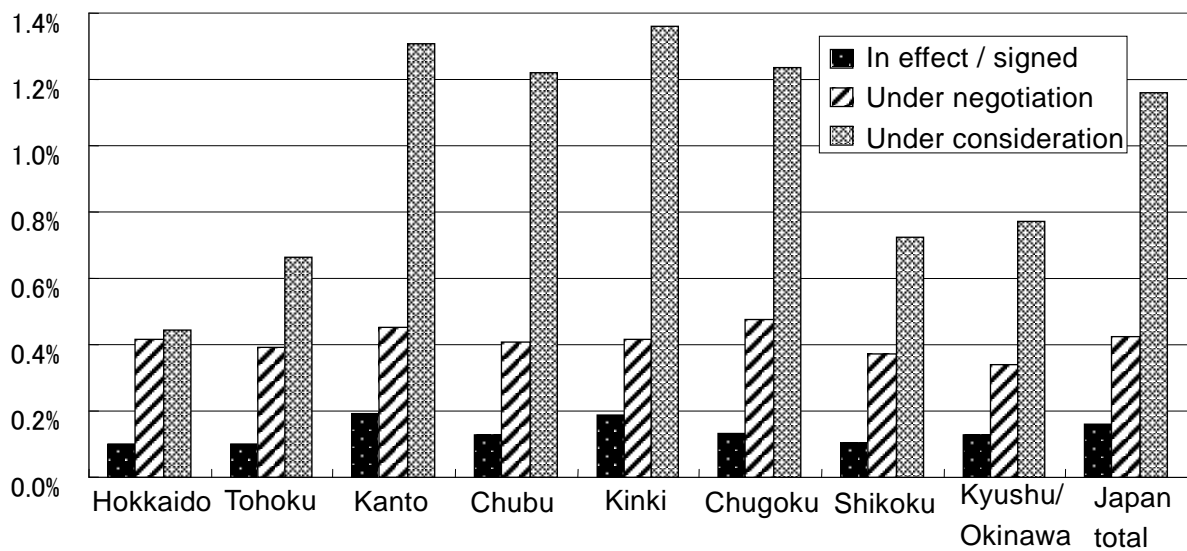


Figure 5. Rates of change in GDP for each domestic region due to FTAs or EPAs involving Japan

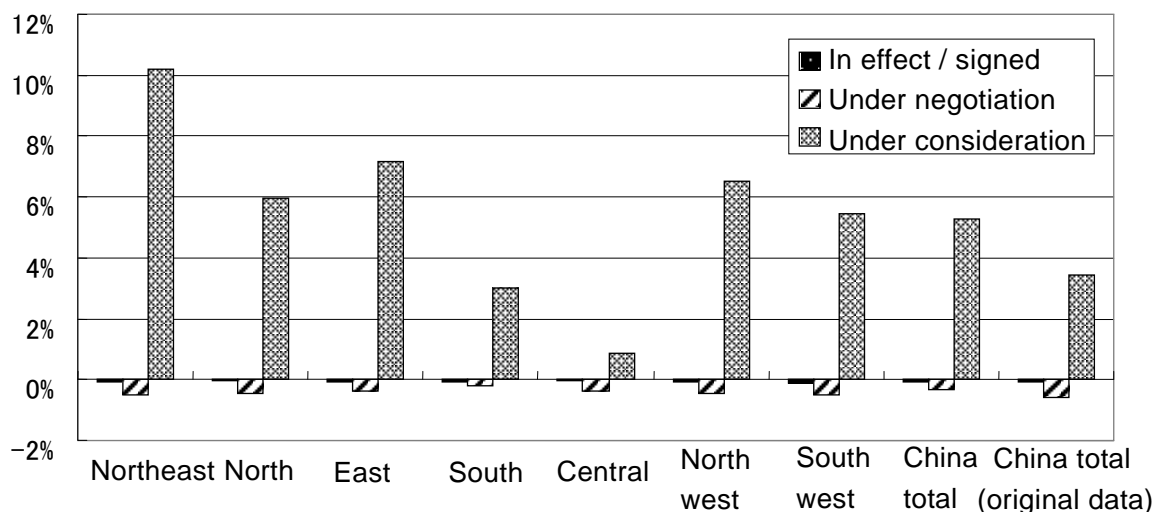


Figure 6. Rates of change in international exports and imports in each region of China

3.3 Analyses including third-country FTAs and EPAs

Analysis up to previous section was limited to the effects of FTAs and EPAs involving Japan, but this section will reflect more general configurations comprising FTAs and EPAs concluded or under consideration between countries other than Japan (e.g., between the U.S. and South Korea), looking at the effects on each region within Japan.

(1) Configuration

It is possible to work with 87 countries using the original GTAP data and model, but because grasping a matrix of 87 x 87 countries' agreements concluded, under negotiation, or under consideration is extremely difficult, we have put the countries other than Japan and China into 33 groups, added the 8 Japanese and 7 Chinese regions.

In order to understand the state of inter-regional progress in FTAs and EPAs, we referred to JETRO (2008) and some materials from the Ministry of Foreign Affairs and categorized them into "in effect or signed", "under negotiation", and "under consideration" as per the previous section (see Appendix E). Because it is extremely difficult to comprehend details with respect to agreements under negotiation and under consideration between third countries, in addition to rates of customs duties under agreements in effect or already signed, all tariff rates in questions were set at zero. Further, in order to eliminate asymmetry, we also set rates of customs duties for FTAs and EPAs involving Japan to zero, including those in effect or already signed.

Due to the possibility that only certain countries within the groups that we created, as explained above, might have concluded an FTA or EPA, we have defined a group as FTA- or EPA-concluded if over half the countries or over half the value of trade within the group, are affected. In that regard, the EPA under negotiation between Japan and Switzerland that was included in analyses up to the previous section has been removed (because Switzerland is being treated as part of the "Europe" group in this section).

(2) Analysis of effects

Figure 7 shows the effect on international imports and exports calculated for each region in the country, according to the configuration for this section. The point of comparison with Figure 3 is that in cases where only Japan is party to an FTA or EPA, the growth rates in imports and exports for each region drop slightly. This is also true where FTAs or EPAs have been concluded between third countries, because the production and consumption increases that accompany trade also undergo a shift to third countries. When we look as far as item iii), agreements under consideration, rates of increase for international imports and exports decline 1 or 2 points. And because the breadth of decline in domestic exports and imports within the country also grows, we can see a pattern of negative changes with respect to total exports and imports (international + domestic inter-regional exports and imports) in some regions. The effects from declines in total exports and imports are comparatively small in Kanto, Kinki and other regions centered around large metropolitan areas, while the decline has

a large impact on regions such as Hokkaido, Tohoku, and Shikoku.

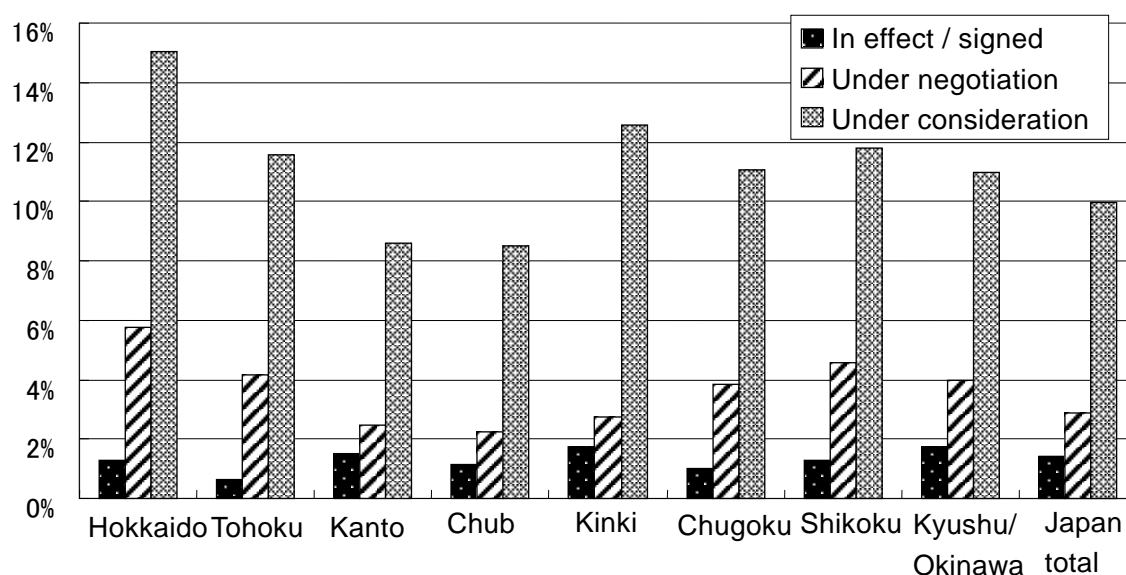


Figure 7. Effect on international exports and imports for each region of Japan as a result of FTAs or EPAs including third countries

4. ANALYSIS OF EFFECTS RESULTING FROM THE “GREAT WESTERN REGION DEVELOPMENT” IN CHINA

In the previous chapter, we analyzed the effects of trade policies in Japan and the rest of the world on trade by region, but in this section, because the model we created is capable of analyzing also the effectiveness of investment, etc., by region, we will analyze the effects of the Great Western Region Development policy that the Chinese government has been pursuing since 2000, i.e., development in the western region of the country (Gansu, Guizhou, Qinghai, Shanxi, Sichuan, and Yunnan provinces, Chongqing Municipality, Ningxia Hui Autonomous Region, Tibet Autonomous Region, and the Xinjiang Uyghur Autonomous Region).

4.1 Configuration related to “Great Western Region Development” in China

China’s “Great Western Region Development” represents an attempt to economically stimulate the western region of the interior, which is behind in development compared to the coastal areas. This policy has been in effect since the March 2000 National People’s Congress. It is known for 4 projects, the “West-to-East Natural Gas Transportation Project”, the “The South-to-North Water Diversion Project”, the “West-to-East Electricity Transmission Project”, and the “Qingzang Railway Project”. Because it would be difficult to input accurate figures on the scale of investment for these development projects, we perform sensitivity analyses by configuring a 5% to 10% increase in capital investment in infrastructure over all of China, and alternatively,

to take the same total amount of investment, but provide it only to the Northwest region (Inner Mongolia, Shanxi, Gansu, Qinghai, Ningxia, and Xinjiang), and the Southwest region (Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, and Tibet) yielding increases of 26.3% and 52.6% respectively, to compare the effects of increases in investment broadly spread over the whole country, and increased investment concentrated only in the western region.

4.2 Analysis of effects

Figure 9 displays the effects on each region in China in terms of total exports and imports, calculated according to the configuration for this section. Compared to equitable capital infrastructure investment over the whole of China, investment concentrated in China's western region also has a direct effect on total exports and imports by region.

Figure 10 shows the effect of this configuration on Japan. Looking at the upper level of the figure displaying total imports, we can see that Western Region Development has a large positive effect on each region in Japan, compared to the effect of the same amount of investment spread across all of China. This could be because domestic consumption within China would absorb a wide variety of goods resulting from an increase in production spread out across all of China, but goods produced in China's western region are mainly for export, which would accelerate exports. However, as the lower level of the figure shows, there would be a decrease in each Japanese region's change in total exports, without a great deal of difference resulting from the pattern of investment.

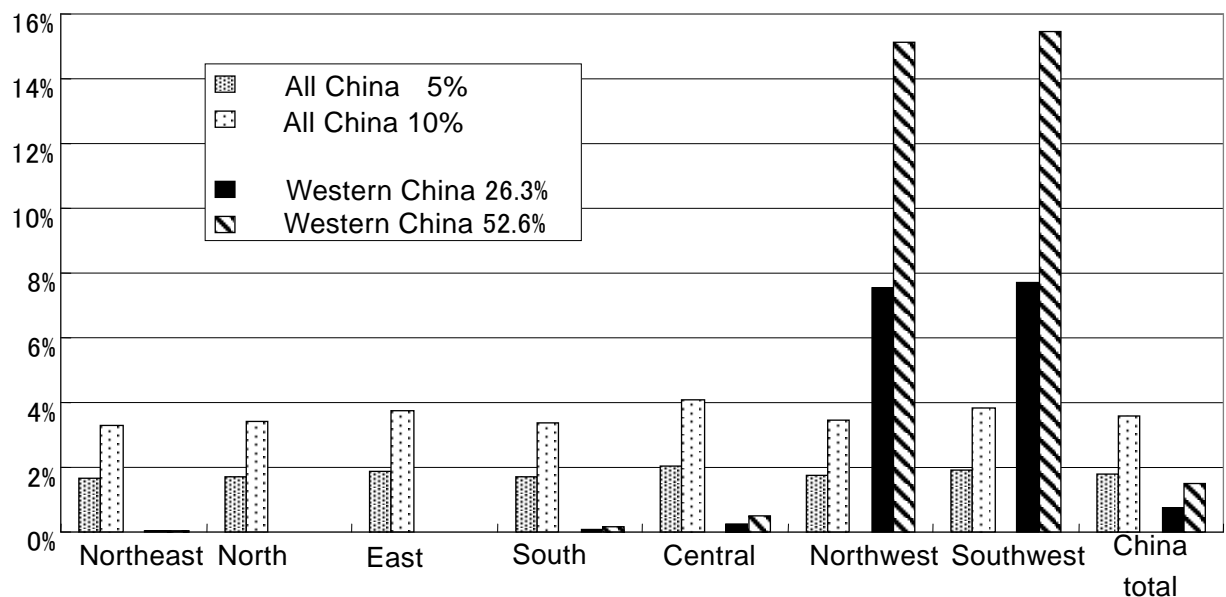


Figure 9. Changes in rates of change in total exports and imports for each region of China as a function of investment in all of China and the Western Region

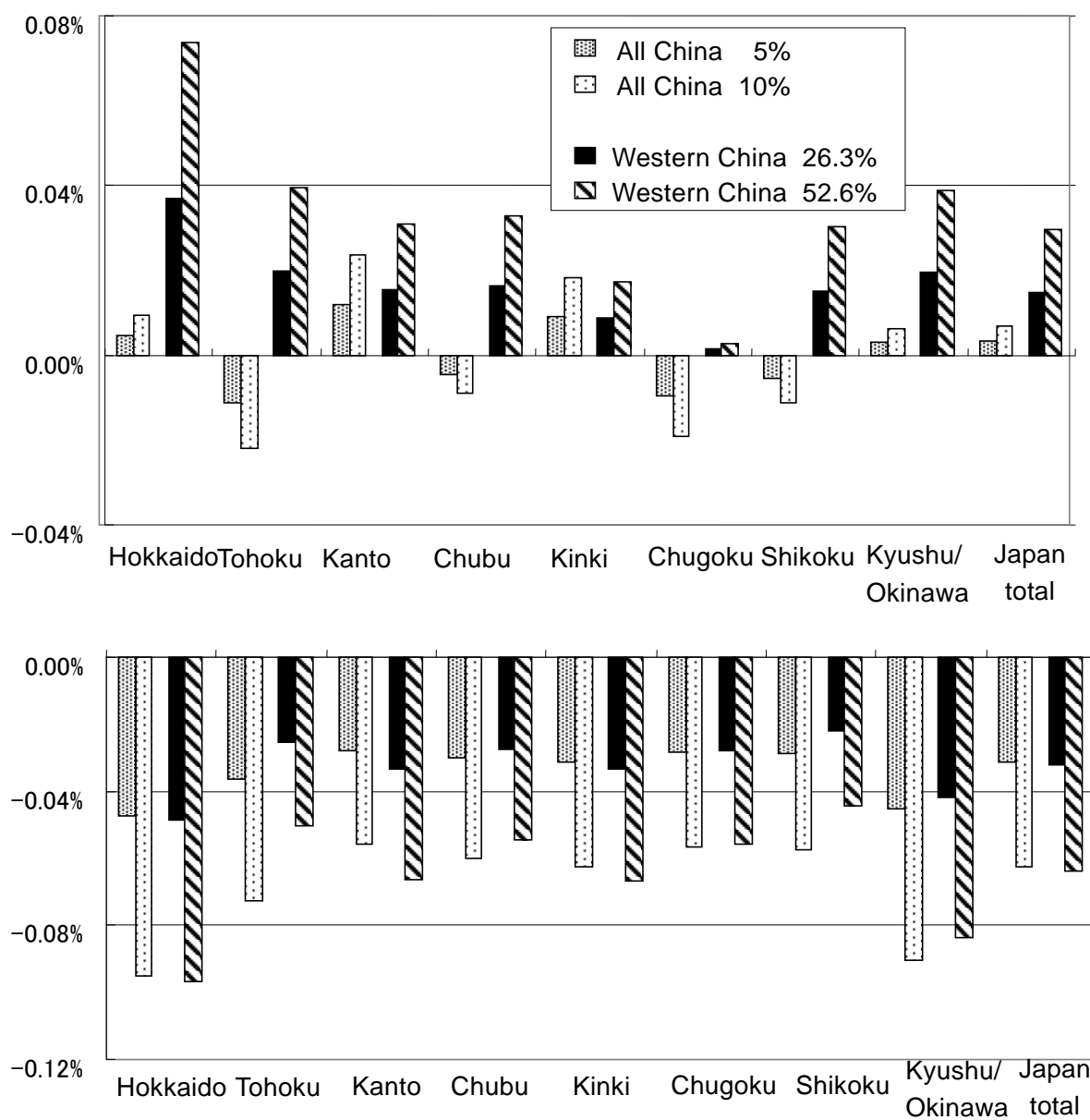


Figure 10. Rates of change in total imports (top) and total exports (bottom) in each region of Japan resulting from investment in China's Western Region

5. ANALYSIS OF EFFECTS OF SHIPPING COST REDUCTIONS DUE TO PORT FACILITIES

The last analysis in this paper will be an analysis of the effects of shipping cost reductions due to Japan's port infrastructure. Specifically, this configuration takes into account Japan's Super Hub Port initiative, launched in 2002. We looked at the effects of reductions in shipping costs with respect to trade originating in and terminating in the Kanto, Chubu, and Kinki regions.

5.1 Configuration related to decreases in shipping costs due to port facilities

As in the previous chapter, because of the difficulty in accurately inputting the scale of decreases in shipping costs due to the Super Hub Port infrastructure, we performed sensitivity analyses by increasing the shipping efficiency parameters (atd, ats) by 2.5% or 5.0% for the Kanto, Chubu, and Kinki regions. (The shipping efficiency parameter is the inverse of shipping costs and the resulting changes are equivalent to an approximate reduction of 2.4% or 4.8% in the respective shipping costs).

5.2 Analysis of effects

Figure 11 shows the effects on total exports and imports for each region in Japan, for this configuration. In addition to being able to see increases in total exports and imports in the Kanto, Chubu, and Kinki regions where improvements were made in shipping efficiencies, we can also observe slight decreases in the other regions, except Hokkaido. The total for Japan shows an overall increase and we can see that a 5.0% increase in shipping efficiency yields an increase of approximately 0.5% in total exports and imports.

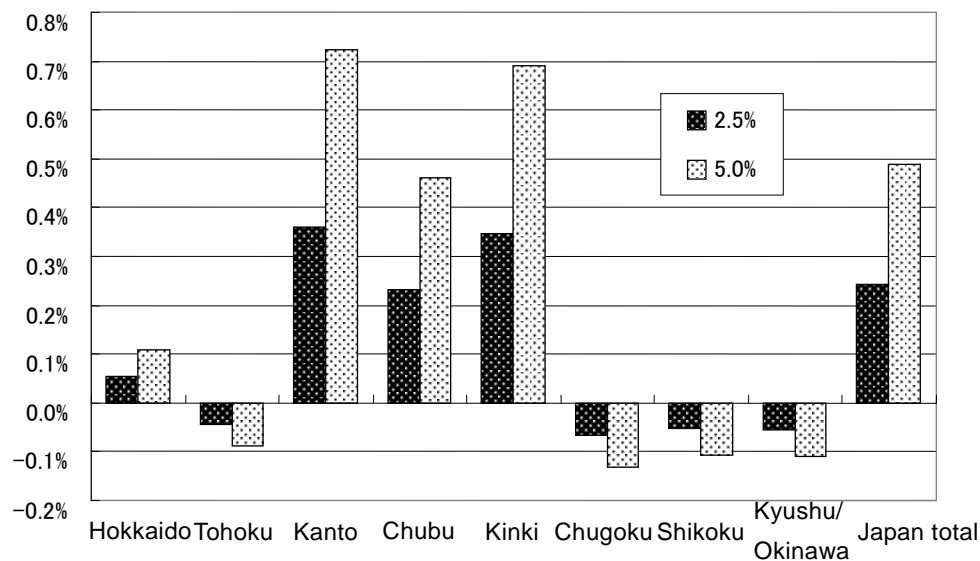


Figure 11 Rates of change in total exports and imports for each domestic region as a result of increased shipping efficiency

6. CONCLUSION

In this paper, GTAP data were segmented with reference to the Transnational Interregional Input-Output Table between China and Japan, recently created by JETRO and a comparatively simple methodology for trade forecasting explicitly taking into account inter-regional interactions was introduced. Specifically, impacts by region related to FTAs and EPAs that Japan and its neighbor countries could potentially enter into, China's Western Region Development policy, and Japan's Super Hub Port initiative.

In the future, we hope that this will be employed as a policy support tool for port and airport policy planning and implementation, in association with the examination of scenarios related to various Asian countries' economies and international logistics infrastructure, and an integrated analysis system for the evaluation of policies related to trade and the distribution of goods (see Figure 12).

Future projects include annual adjustments to the Inter-regional Trade Relations Table and an understanding of detailed data on shipping costs, etc., not recorded on a region-by-region basis in the Inter-regional Trade Relations Table, among others. We also hope to conduct deeper enquiries into the processes and causes that emerged from the results of each of the present analyses.

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Appendix A: Detailed explanation of data segmentation methodology by country

SAVE (Savings)

i) Japan

Estimated by subtracting (citizens' final expenditures + government's final expenditures) from disposable income. Data are obtained from prefectural citizens' earnings data as well as total expenditures within the prefecture of the "Annual Report on Total Economic Activity Among Prefectural Citizens*." SAVE was extracted from GTAP based on relative rates among regions. However, because Tokyo Prefecture does not publish disposable income figures for its citizens earnings for citizens of Tokyo (at market value) were estimated on the basis of the ratio between total disposal income and total income (at market value) for citizens of every prefecture in the Kanto region (as defined by the Transnational Interregional Table) besides Tokyo.

*2001 "Annual Report on Total Economic Activity Among Prefectural Citizens" from the Economic and Social Research Institute Cabinet Office

ii) China

The same type of data was unavailable for China so estimated investments by F-00003 of the Transnational Interregional Table. SAVE was extracted from GTAP based on relative rates among regions.

VKB (Capital investment in infrastructure)

i) Japan

In order to extrapolate from the long-term data related to capital stock from Take and Fukao's "Japan Prefectural Database*" (up to 1995; 1980 baseline values) Annual Report on Total Economic Activity Among Prefectural Citizens' gross fixed capital formation - depreciation of fixed capital (1995 values) were re-calculated at 1980 values and added, for years 1996 and beyond. This method was used to extrapolate up to 2001 and VKB was extracted from GTAP based on relative rates among regions.

*Fukao, K. and Take, K., 2000. Japanese Prefectural Database in "The convergence of economic factors in production inputs in postwar Japan: Can the Solow growth model be applied?". *Economic Research* 51, (2).

ii) China

2001 estimates for Chinese capital infrastructure investment by province were taken from Yoshihiro Hashiguchi and Kuang-hui Chen's (2006)* estimates.

*Hashiguchi, Y. and Chen, K., 2006. Estimating China's Provincial Capital Stocks: Ezaki and Sun's Method and an Alternative. *Journal of Political Economy and Commercial Science*. 193(6), 73-86.

VDEP (Capital depreciation)

i) Japan, China:

Because GTAP sets the capital depreciation for all countries and regions at 4%, capital infrastructure investment for each region in Japan and China was also set at 4%, as estimated in VKB above.

POP (Population)

i) Japan

The 2001 (October 1) “Intercensal adjustment of current population*”, Intercensal adjustment by prefecture was used to derive the POP.

*Ministry of Internal Affairs and Communications Statistics Bureau “Intercensal adjustment of current population”

ii) China

The 2000 version of the total population by region of the “Chinese Regional Economic Statistics Annual*” was used to derive the POP.

*“Chinese Regional Economic Statistics Annual” China Finance and Economics Publisher, 2001.

VXWD (Export figures: World trade value)

- 1) The existing VXWD from GTAP was used for trade for originating or receiving countries other than Japan and China.
- 2) For trade in which the originating or receiving country was either Japan or China inter-regional relative rates for intermediate inputs and final demands (f.o.b. values) from the Transnational Interregional Table were used, in cases where the trading partner was ASEAN, South Korean, Taiwan, or the U.S., to derive VXWD.
- 3) For trade in which the originating or receiving country was either Japan or China, where 2) above did not apply, region by region relative rates for intermediate inputs and final demands (c.i.f. values) for ‘the rest of the world’ from the Transnational Interregional Table were used to derive VXWD.
- 4) For trade between Japan and China, inter-regional relative rates for intermediate inputs and final demands (f.o.b. values) from the Transnational Interregional Table were used to derive VXWD.
- 5) For inter-regional trade within Japan and China, the GTAP originally records as VDGM (domestic goods purchased by government), VDPM (private consumption of domestic goods), and VDFM (intermediate input in domestic goods; including shipping and insurance charges). Transnational Interregional Table were used and ratios calculated for each country’s domestic originating industries’ export income, international shipments, insurance charges, intra-regional intermediate inputs, and final demand, on an f.o.b. basis, and after the intra-regional part was excluded, region by region relative rates were then used for segmentation purposes.

VXMD (exports: market value)

VXMD is calculated by subtracting export duties from VXWD (f.o.b.).

- 1) Existing VXMD from GTAP was used for trade neither originating in nor received by either Japan or China.
- 2) For trade either originating in or received by either Japan or China the difference between VXWD and VXMD (export duty portion) was segmented using ratios related to VXWD from 2), 3), or 4) above and added back into VXWD.
- 3) For inter-regional total exports and imports within Japan and China, export duties were set to zero and VXWD derived as in item 5) from VXWD above was used as VXMD.

VTWR (International transport margins)

This item actually refers to shipping cost and insurance charges.

- 1) Existing VTWR from GTAP was used for transportation margins for trade neither originating in nor received by either Japan or China.
- 2) For trade either originating in or received by either Japan or China, BT, which is international shipping and insurance charges (by receiving country and receiving industry) of the Transnational Interregional Table was segmented by the f.o.b. total imports for each originating country or originating industry (including inter-regional total imports for Japan and China) and used to segment the VTWR.
- 3) For inter-regional total exports and imports within Japan and China, the Transnational Interregional Table f.o.b. total exports and imports were used to segment amounts equivalent to international shipping and insurance charges from VDGM, VDPM, and VDFM, derived from item 5) of VXWD above.

Because SplitCom software, which was used to perform the substitutions, is not equipped to differentiate among land, sea, and air transportation shipping modalities, differentiation by opt, wtp, and atp was not performed. In addition, for reference, inter-regional shipping distances within Japan and China were sought in order to confirm correspondence with the above

VST (international transport exports)

Totals are almost identical to VTWR. Because a correlation can be observed with the transportation section exports in the Transnational Interregional Table, relative ratios for total exports by originating region were used to segment VST.

VIWS (exports: world prices)

Shipping and insurance charges were added to VXWD (f.o.b.) to calculate VIWS, which is equivalent to c.i.f. trade figures. VTWR was added to VXWD for every item.

VIMS (imports: market prices)

VIMS is calculated by adding customs duties and import duties to VIWS (c.i.f.).

- 1) Existing VIMS from GTAP was used for trade neither originating in nor received by

either Japan or China.

- 2) For trade either originating in or received by either Japan or China, DT, customs duties and import/export duties (by receiving country and receiving industry), of the Transnational Interregional Table was segmented by the c.i.f. total imports for each originating country or originating industry (including inter-regional total imports for Japan and China) and added to VIWS.
- 3) For inter-regional total exports and imports within Japan and China, customs and import/export duties were set to zero and VIWS was used.

VIGM (import goods government final demand: market prices), **VIPM** (import goods private sector final demand: market prices), and **VIFM** (import goods intermediate inputs: market prices)

VIGM, VIPM and VIFM totals are equivalent to VIMS.

- 1) In principle, VIGM, VIPM and VIFM ratios from the original GTAP data were used for distribution. However, because as we can see from item 5) of VXWD above, we must use ratios equivalent to VDGM, VDPM, or VDFM for domestic goods, rather than the original ratios for inter-regional total imports and exports within Japan and China, this section was separated out and ratios for domestic goods used. Ratios for imported goods were used for the remaining sections.
- 2) The items in 1) above were segmented with the receiving country's inter-regional ratios from the Transnational Interregional Table and the two were then added together.

VIGA (import goods government final demand: participants' prices), **VIPA** (import goods private sector final demand: participants' prices) and **VIFA** (import goods intermediate inputs: participants' prices)

Each of the variables above was calculated by adding domestic taxes to each of VIGM, VIPM and VIFM.

- 1) Because the Transnational Interregional Table does not include data on domestic taxes, the domestic tax portions of VIGA and VIPA were added to segments derived with the same ratios used for VIGM and VIPM.
- 2) With regards to VIFA, indirect domestic taxes VV00004 were segmented by the Japan China International Inter-regional Trade Relations Table's c.i.f. total imports for each originating country, originating industry, and receiving region, then separated out the intra-regional part and the remaining part was used.

VDGM (domestic goods government final demand: market prices), **VDPM** (domestic goods private sector final demand: market prices) and **VDFM** (domestic goods intermediate inputs: market prices)

First, values (by originating industry) for domestic inter-regional total imports and exports included in VIGM, VIPM, and VIFM were excluded. VDGM and VDPM were segmented with regional ratios of Japan and China by the Transnational Interregional Table while VDFM was segmented using ratios by region and by receiving industry.

VDGA (domestic goods government final demand: participants' prices), **VDPA** (domestic goods private sector final demand: participants' prices) and **VDFA** (domestic goods intermediate inputs: participants' prices)

Each of the variables above was calculated by adding domestic taxes to each of VDGM, VDPM and VDFM.

- 1) Because the Japan China International Inter-regional Trade Relations Table does not include data on domestic taxes, the domestic tax portions of VDGA and VDPA were added to segments derived with the same ratios used for VDPM and VDFM.
- 2) With regards to VDFA, domestic indirect taxes VV00004, excluding VIFA item 2), were used.

VFM (materials purchase: market prices)

Materials were comprised of Land, Unskilled Labor, Skilled Labor, Capital, Natural Resources (respective values)

EVOA and EVFA are similar variables, but VFM has goods-by-region dimension so it was estimated at first as a standard and extended to EVOA and EVFA.

1) Land

- i) Japan: Segmented by region according to the "Area of Cultivated Land, and Expansion and Dilapidation of Cultivated Land, by Prefecture", contained in the Ministry of Agriculture, Forestry and Fisheries' "Statistical Survey of Agricultural Produce" (2000). Land value by area was assumed to be fixed inter-regionally.
- ii) China: Total arable land area for 1996 from China Statistics Publisher's 2003 "China Statistics Annual" was used for segmentation by region.

2) Unskilled labor and skilled labor

Because detailed data by region concerning unskilled and skilled labor were not available for either Japan or China these ratios were assumed to be constant within each country (using original GTAP data). The V00001 (wage distribution) ratio of the Transnational Interregional Table was used to segment labor (value) by region and by industry.

3) Capital

Ratios from the Japan China International Inter-regional Trade Relations Table's V00002 (business surplus) + V00003 (reduction in fixed capital) were used for both Japan and China.

4) Natural resources

They are comprised of agricultural resources and mineral resources. Ratios for agricultural resources were assumed to be equivalent to those of land, which were used. Mineral resources were segmented as outlined below:

- i) Japan: "Output by Prefecture" from the 2001 "Survey of Trends in the Domestic Mining Industry" produced by the Ministry of Economy, Trade, and Industry was used.
- ii) China: The total value of coal, petroleum, black powder mining, and non-metallic

mining, taken from “Production Figures by Category and by Province (1995 census)” of JETRO’s “China’s Long-term Economic Statistics” (compiled by Sei’ichi Nakajima) was used.

EVFA (materials purchase value: participants’ price) or **FTRV** (materials taxation)
Because no data related to materials taxation were available, original GTAP data were segmented according to the same ratio as VFM.

EVOA (output value: participants’ price)
VFM was calculated for industries and the original GTAP data, calculated by inter-regional ratio, was segmented.

FBEP (materials subsidy)
It equals $-(EVFA - VFM - FTRV)$, calculated from those three variables.

ISEP (Intermediate input subsidy)
Because domestic subsidies were $-(VDFA - VDFM)$ and the export portion was $-(VIFA - VIFM)$ ISEP values were calculated and used.

OSEP (Production subsidies)
Subsidies for value-added production were assumed to be in proportion to $-(VXMD + VDPM + VDGM)$. For Japan and China, segmentation was by each industry’s ratio by region.

ADRV (Anti-dumping strategy)
Because the values for all items in the original GTAP data are zero, zero was used for each region in Japan and China.

TFRV (Ordinary tariffs)
TFRV was calculated and used in order to arrive at $(VIMS - VIWS)$.

PURV (Values for price agreed export duties, etc.)
Because the values for all items in the original GTAP data are zero, zero was used for each region in Japan and China.

VRRV (**VER** Value of export duties, etc.)
Because the values for all items in the original GTAP data are zero, zero was used for each region in Japan and China.

MFRV (**MFA** export duty, etc. values)
 $MFRV + XTRV = VXWD - VXMD$
 $VXWD - VXMD$ was calculated and MFRV and XTRV ratios related to industry by originating region and country by receiving region and country were derived. The

former was multiplied by the MFRV ratio.

XTRV (Ordinary export duties)

MFRV results excluding the XTRV portion were used.

Appendix B: Commodity Classification of Transnational Interregional Input-Output Table between China and Japan and original GTAP Database

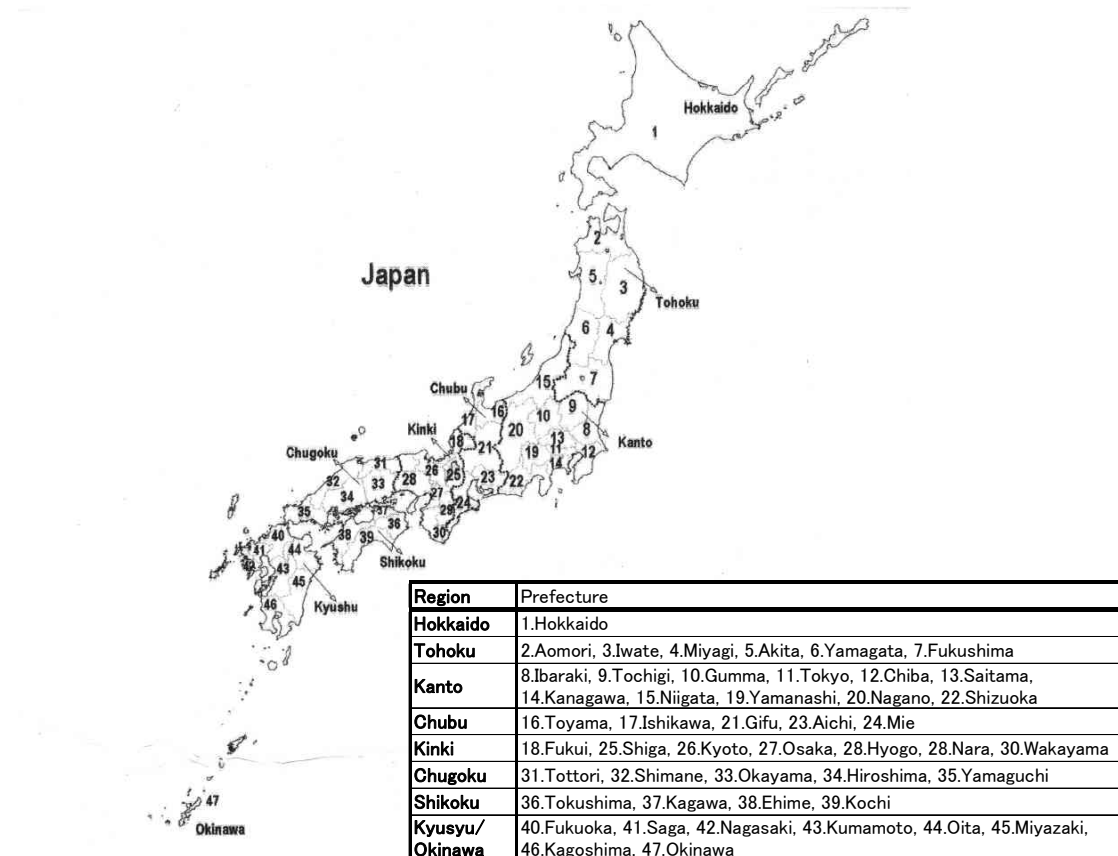
Transnational Interregional

Table (10)

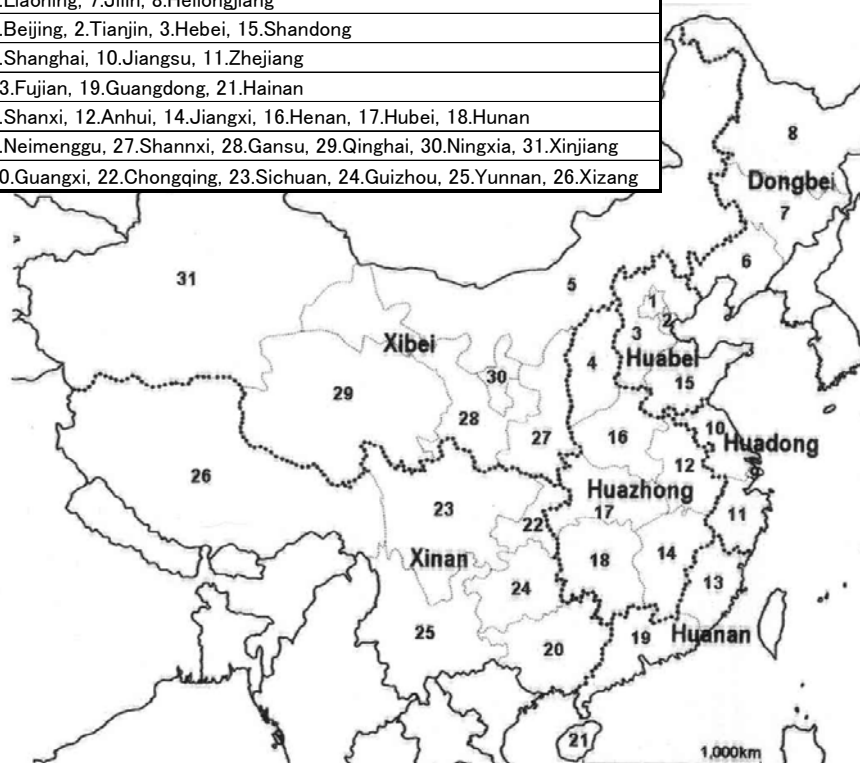
GTAP(57)

No.	Code	No.	Code	Description
1	Agriculture	1	pdr	Paddy rice
		2	wht	Wheat
		3	gro	Cereal grains nec
		4	v_f	Vegetables, fruit, nuts
		5	osd	Oil seeds
		6	c_b	Sugar cane, sugar beet
		7	pfb	Plant-based fibers
		8	ocr	Crops nec
		9	ctl	Cattle,sheep,goats,horses
		10	oap	Animal products nec
		11	rmk	Raw milk
		12	wol	Wool, silk-worm cocoons
		13	frs	Forestry
		14	fsh	Fishing
2	Mining	15	coa	Coal
		16	oil	Oil
		17	gas	Gas
		18	omn	Minerals nec
3	Household Consumption Products	19	cmt	Meat: cattle,sheep,goats,horse
		20	omt	Meat products nec
		21	vol	Vegetable oils and fats
		22	mil	Dairy products
		23	pcr	Processed rice
		24	sgr	Sugar
		25	ofd	Food products nec
		26	b_t	Beverages and tobacco products
		27	tex	Textiles
		28	wap	Wearing apparel
		29	lea	Leather products
		30	lum	Wood products
		42	omf	Manufactures nec
4	Basic Industrial Materials	31	ppp	Paper products, publishing
		32	p_c	Petroleum, coal products
		33	crp	Chemical,rubber,plastic prods
		34	nmm	Mineral products nec
		35	i_s	Ferrous metals
		36	nfm	Metals nec
		37	fmp	Metal products
5	Processing and Assembling	38	mvh	Motor vehicles and parts
		39	otn	Transport equipment nec
		40	ele	Electronic equipment
		41	ome	Machinery and equipment nec
6	Utilities	43	ely	Electricity
		44	gdt	Gas manufacture, distribution
		45	wtr	Water
7	Construction	46	cns	Construction
8	Trade	47	trd	Trade
9	Transport	48	otp	Transport nec
		49	wtp	Sea transport
		50	atp	Air transport
10	Services	51	cmn	Communication
		52	ofi	Financial services nec
		53	isr	Insurance
		54	obs	Business services nec
		55	ros	Recreation and other services
		56	osg	PubAdmin/Defence/Health/Education
		57	dwe	Dwellings

Appendix C: Regional Division of Japan and China



Region	Province
Dongbei	6.Liaoning, 7.Jilin, 8.Heilongjiang
Huabei	1.Beijing, 2.Tianjin, 3.Hebei, 15.Shandong
Huadong	9.Shanghai, 10.Jiangsu, 11.Zhejiang
Huanan	13.Fujian, 19.Guangdong, 21.Hainan
Huazhong	4.Shanxi, 12.Anhui, 14.Jiangxi, 16.Henan, 17.Hubei, 18.Hunan
Xibei	5.Neimenggu, 27.Shannxi, 28.Gansu, 29.Qinghai, 30.Ningxia, 31.Xinjiang
Xinan	20.Guangxi, 22.Chongqing, 23.Sichuan, 24.Guizhou, 25.Yunnan, 26.Xizang



**Appendix D: Tariff Reduction Rate set in the Model reflecting Japanese FTA/EPA
(in effect or signed)**

Change of Japanese Tariff					
partner country	industry	2008	2010	2015	2020
Singapore	1.Agriculture	-9.91	-29.73	-49.56	-49.56
	3.Household Consumption Products	-1.14	-2.09	-7.60	-7.60
Malaysia	1.Agriculture	-0.76	-1.52	-3.80	-3.80
	3.Household Consumption Products	-6.82	-6.82	-6.82	-6.82
Philippines	1.Agriculture	-97.80	-97.80	-97.80	-97.80
	3.Household Consumption Products	-34.34	-34.34	-34.34	-34.34
Thailand	3.Household Consumption Products	-2.97	-4.85	-6.83	-7.53
Indonesia	3.Household Consumption Products	-9.38	-9.38	-9.38	-9.38
Chile	1.Agriculture	-0.36	-0.51	-0.92	-1.10
	3.Household Consumption Products	-21.58	-22.47	-24.93	-27.07
	4.Basic Industrial Materials	-7.27	-29.08	-65.43	-79.97
Mexico	1.Agriculture	-16.50	-36.39	-56.28	-56.37
	2.Mining	0.00	-50.00	-50.00	-50.00
	3.Household Consumption Products	-47.27	-48.16	-48.41	-48.59
Change of Partner Country's Tariff					
partner country	industry	2008	2010	2015	2020
Singapore	3.Household Consumption Products	-100.00	-100.00	-100.00	-100.00
Malaysia	4.Basic Industrial Materials	-4.80	-15.43	-39.44	-49.72
	5.Processing and Assembling	-19.28	-38.74	-77.48	-77.48
Philippines	4.Basic Industrial Materials	-3.58	-3.58	-3.58	-3.58
Thailand	4.Basic Industrial Materials	-13.75	-16.55	-23.54	-27.74
	5.Processing and Assembling	0.00	0.00	-49.26	-49.26
Indonesia	4.Basic Industrial Materials	-31.91	-31.91	-31.91	-31.91
	5.Processing and Assembling	-5.23	-15.78	-35.99	-64.54
Chile	1.Agriculture	-2.24	-2.24	-2.24	-2.24
	3.Household Consumption Products	-1.44	-1.44	-1.44	-1.44
	4.Basic Industrial Materials	-0.35	-1.06	-2.82	-3.52
	5.Processing and Assembling	-75.55	-75.55	-75.55	-75.55
Mexico	4.Basic Industrial Materials	-3.19	-9.56	-25.73	-32.10
	5.Processing and Assembling	0.00	0.00	-12.02	-12.02

(%)

Appendix E: State of Inter-Rgional Progress in FTAs and EPAs

1. already in effect until 2007
2. already signed until 2007 but still not in effect
3. in the negotiation stages
4. under consideration

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
No.	Region	jpn	kor	chn	hkg	tw	phl	vnm	tha	mys	sgp	idn	bgd	ind	lka	usa	can	mex	xc	per	chl	xap	sae	med	eur	rus	afr	aus	nzl	xoc	xea	xse	xsa	xna	xsu	xme	
1	jpn		3	4			2	3	1	1	1	2		3				1			1				4			3	4			4					
2	kor			4			1	1	3	1	1	1		3		2	3	3		4	1		4	3	3	4		4	4			1					
3	chn				1		1	1	1	1	1	1		4					4		1							3	3		1	1					
4	hkg																																				
5	tw																		1																		
6	phl							1	1	1	1	1		3		4								3	3			3	3			1					
7	vnm								1	1	1	1		3		4								3	3			3	3			1					
8	tha									1	1	1	3	3	3	3				3				3	3			1	1			1					
9	mys										1	1		3		3					4			3	3			3	3			1					
10	sgp											1		1	4	1	3	3		3	1			1	1			1	1			1					
11	idn													3										3	3			3	3			1					
12	bgd														1	1																		1			
13	ind															1					3		3	3	3	3		4				3	1				
14	lka																																	1			
15	usa																1	1	1	2	1	4	4					1								4	
16	can																	1	3	4	1	3	3														
17	mex																		1	4	1	1	1	1	1			4									
18	xc																			4	1	4	4	3	3												
19	per																				2	1	1	4	4												
20	chl																					4	1	1	1			3	1								
21	xap																						1	4	4												
22	sae																							3	3												
23	med																								1								3				
24	eur																										1						3				
25	rus																																		1		
26	afr																																				
27	aus																												1	4			3				4
28	nzl																																3				
29	xoc																																				
30	xea																																				
31	xse																																				
32	xsa																																				1
33	xna																																				
34	xsu																																				
35	xme																																				

Definition of Region

No.	Region	
1	jpn	1. Japan (8 regions)
2	kor	2. South Korea
3	chn	3. China (7 regions)
4	hkg	4. Hong Kong
5	twm	5. Taiwan
6	phl	6. Philippines
7	vnm	7. Vietnam
8	tha	8. Thailand
9	mys	9. Malaysia
10	sgp	10. Singapore
11	idn	11. Indonesia
12	bgd	12. Bangladesh
13	ind	13. India
14	lka	14. Sri Lanka
15	usa	15. United States of America
16	can	16. Canada
17	mex	17. Mexico
18	xcm	18. Central America
19	per	19. Peru
20	chl	20. Chile
21	xap	21. Other Andean Pacts
22	sae	22. Other South America
23	med	23. Mediterranean Countries
24	eur	24. North European Countries
25	rus	25. Russia
26	afr	26. Africa
27	aus	27. Australia
28	nzl	28. New Zealand
29	xoc	29. Other Oceania
30	xea	30. Other East Asia (North Korea, Mongolia, Macao)
31	xse	31. Other Southeast Asia (Brunei, Cambodia, Laos, Myanmar, East Timor)
32	xsa	32. Other South Asia (Pakistan, Afghanistan, Nepal, Bhutan, Maldives)
33	xna	33. Other North America
34	xsu	34. CIS Countries excluding Russia
35	xme	35. Middle East