The Emergence of a 'Greater China' and its Impact on World Trade

--A Computable General Equilibrium Analysis

Zhi Wang and G. Edward Schuh*

ABSTRACT

This paper investigates the effects of economic integration among Taiwan, Hong Kong, and China (CEA). A seven-region, seven-sector computable general equilibrium model for world production and trade is developed for this purpose. The simulation results demonstrate that the three Chinese economies would benefit greatly from further integration by means of liberalizing trade policies. The opportunity cost of isolating the United States from East Asia is high for both the US and the three Chinese economies and suggests that an economically integrated CEA is in the long term strategic interest of the United States.

Key Words: CGE Model, three Chinese economies, Economic integration, and U.S. Long term interest

Journal of Economic Literature Classification Numbers: C68,D58,F02

Paper prepared for presentation in the international conference

" Greater China and the World Economy, July 17-18, Hong Kong

* Zhi Wang is an economist at the Economic Research Services, United State Department of Agriculture. G. Edward Schuh is a professor of Humphrey Institute of Public Affairs, University of Minnesota, U.S.A. Corresponding address: Room 5141, 1800 M Street, N.W. Washington D.C 20036-5831. Tel:(202)694-5242. Fax:(202)694-5793. E-mail: zwang@econ.ag.gov. Views expressed in this paper are those of the author and do not represent the opinions of USDA/ERS or Purdue University or University of Minnesota. The authors expresses their gratitude to Dr. Frederick Crook for his comments and suggestions on an earlier version of the paper. The authors also thanks the two anonymous reviewers and guest editor Dr. Lenord Cheng for their very valuable suggestions. However, the authors are responsible for any of the remaining errors.

The Emergence of a 'Greater China' and its Impact on World Trade

--A Computable General Equilibrium Analysis

1. Introduction:

For more than 30 years Japan has been the economic center of Asia. But since the late 1980's the Chinese Economic Area (CEA), an informal economic region that embraces China, Hong Kong and Taiwan, is rapidly emerging as a new epicenter for industry, commerce, and finance. It weathers recent Asia financial crisis relative well than most of its neighbors and is one of the world fastest growing economies in terms of rate of investment, industrial expansion, income and exports. Its total external trade reached $766 billion in 1997 (after minus $191 billion intra-CEA trade), exceeding the total trade of Japan ($760 billion) and accounting for more than 8 percent of the world total[1].

In spite of huge political differences, complementary factor endowment and mutual economic interests, geographical proximity and cultural affinity, plus the efficiency of Hong Kong as a "commercial middleman," have enabled the three Chinese economies to develop a rather intense trade and investment linkages in past decade. The indirect trade between Taiwan and China increased from less than $1 billion in 1987 to more than $26 billion in 1997[2]. The dependence of Taiwan's exports on China and Hong Kong's market increased dramatically from less than 8 percent in 1987 to 26 percent in 1997, cross-Straits trade has become the major source of Taiwan's trade surplus in recent years. The rapid growth of indirect trade was fueled by Taiwan's direct investment in China. The actually used direct investment from Taiwan has reached $18.4 billion by the end of 1997[3]. Trade with Hong Kong has constituted over one-third of China's total world trade since 1989 and more than half of Hong Kong's industrial output has been processed on the mainland since 1990. China and Hong Kong are also the major investors in each other's economies since 1993. China has invested in almost all sectors in Hong Kong, while Hong Kong and Taiwan businesses account for more than 65% of China's total foreign direct investment during the reform period (1978-1998).

Much of those investments has gone to labor-intensive industries producing consumer goods for exports, and is the most significant factor behind China's successful export drive (Sun, 1991). The merging of Taiwan and Hong Kong's capital and know-how with China's cheap labor will bring the potential for development to catch up with Japan in the not too distant future. According to World Bank's projection, if the current trend continues, the combined GDP of these three Chinese economies will rank ahead of Germany and Japan in the year 2002 and will approach that of the United States if it is valued by PPP (purchasing power parities) price rather than exchange rates.

The economic integration between Hong Kong and China has been further intensified since Hong Kong returned to China's sovereignty on July 1, 1997. Although the political dispute on the problem of sovereignty between governments across Taiwan Straits promises no easy solution, the economic relations between China and Taiwan are expected to improve further after resuming the quasi-official talks between the two governments in October, 1998[4] and after the two economies enter the World Trade Organization (WTO). The close economic ties and continuously deepening economic dependence among the three Chinese economies may eventually bond them into a common market exemplified by the West European experience (Cheng, 1998) . Taking account of the reunification of Macao with China by 1999 and the traditional, linguistic and cultural ties with people of Taiwan and Singapore, the world is very likely to witness the gradual emergence of a Chinese-based economy in East Asia in the near future. It contains an array of potential markets that far exceeds that of Europe and has the potential for providing a principal engine of world growth in the next century.

The impact of the CEA is just beginning to be felt. Its immense demand for infrastructure is creating exceptional opportunities for foreign investment, and its rapid export growth generate powerful pressures for adjustment around Asia-Pacific. How trade patterns and other economies in the world will be affected by this integration process and what role this fast growing Chinese-based economy in East Asia will play in the context of Pacific Rim economic development, especially in the economic relation of Japan and the United

States? Obviously, it is an important intellectual task to assess the impacts of economic integration among the three Chinese economies on the rest of the world, quantitatively estimate its benefits and costs, and fully understand the challenge and opportunities it brings to the world community, thus shaping the policy toward such a process. In this paper, a seven-region, seven-sector Computable General Equilibrium (CGE) model for world production and trade was built for this purpose. The model is used to study the impact of trade liberalization among Taiwan, Hong Kong and China by forming a Chinese free trade area, and by a common tariff cut among CEA, Japan, the United states and European Union. The analysis is implemented by two sets of simulations. The first set reduces shipping cost between Taiwan and China[5], and eliminates all import protections among the three Chinese economies; while the second set reduces bilateral import protection among the assumed Chinese Free Trade Area and different combinations of industrial countries by 50 percent.

Rest of the paper is organized as follows. Section 2 contains an overview of the factor endowments, initial production structure and trade patterns, and comparative position of major economic regions involved. Section 3 describes structure and major assumptions of the model. Section 4 presents results from the two sets of simulations. Section 5 concludes the paper with its major policy implications.

2. Economic Structure and Trade Pattern of the United State, Japan, and the three Chinese Economies

The CGE model used in this analysis was calibrated around a seven-region, seven-sector world Social Accounting Matrix (SAM) estimated for 1995 based on version 4 of the Global Trade Analysis Project (GTAP) database (Hertel, 1997). Details of this type of multi-regional SAM and its construction from the GTAP Database are described in Wang (1994). The seven regions are: China, Hong Kong, Taiwan, Japan, the United States, the European Union (EU, 15 member countries), and Rest of The World. The seven production sectors include: agricultural products, processed food, natural resource-based products, labor-intensive light manufactures, manufactured intermediates, machinery and equipment; and transportation and

services, with a portion of which is allocated to international shipping. The correspondence between model sectors and GTAP and International Standard Industrial Classification (ISIC) is given in appendix A.

This section outlines the base year factor endowments, structure of net trade, and comparative position of each economic region included in the model, and briefly describes the patterns of protection among the relevant regions. The purpose of this SAM-based data analysis is to provide an overview of each region's comparative advantages, and trade linkages among the regional economies so as to facilitate understanding of simulation results reported later in this paper.

2.1 Factor Endowment, Structure of Production and Trade

Table 1 presents data on factor endowments, intensity, cost, and the relative size of the economic regions included in the model. It shows that there are tremendous differences in factor intensities and factor costs among these regions. China, as a low-income developing country, is weakly endowed with capital relative to labor. It has the lowest capital-intensity (capital stock per worker), and the highest rental-wage ratio. The reverse is true for Japan, EU, and the United States. Hong Kong and Taiwan, as newly industrialized economies, are at a stage of development between the advanced industrial countries and China. This is indicated by the fact that they either have a lower capital intensity or a higher rental-wage ratio than that of Japan, EU, and the United States. Their labor cost is much higher than China, but only one half of the industrial countries.

(**Insert table 1 here**)

In terms of natural resources, Japan, Hong Kong, Taiwan, and China are poorly endowed with arable land relative to labor. Therefore, they have the lower land/labor intensities (arable land per worker) and relatively higher land returns (relative to labor and capital) compared with other regions. This condition is just the opposite in the United States. Land as an abundant factor earns a relatively lower return there. These factor endowment differences are quite important for understanding production and trade patterns across regions based on conventional trade theory.

Trade theories generally identify two types of international trade. Among developed industrial countries with similar endowments and technology, intra-industry trade is more common[6], whereas between high and low income economies with different factor endowments and stages of technology development, trade is still on an inter-industry basis. The wide range in factor endowments and stages of economic development of the regions in our model suggests that perhaps the traditional Heckscher-Ohlin arguments (based on different factor endowment) may explain the production and trade pattern among them to a large extent.

Table 2 summarizes information on the sectoral structure of each regional economy. For each of the seven sectors, the base year data for share of output (column 1), value added (2), final demand (3), imports (4) and exports (5) are reported. Columns 6-7 show the share of exports in gross output and the share of import in total demand. The RCA index[7] as indicators of comparative advantage are reported in columns 8. Columns 9-11 list factor share in value-added by sectoral details in order to provide a reference about relative factor intensity in each of the seven sectors specified in the model. For example, labor intensive manufacture has the highest unskilled labor value-added share among the 4 manufacturing sectors for all regions. The three value-added shares should sum to 100 except for agriculture and natural resource based products, residuals in those two sectors are value-added share for agricultural land and natural resources respectively. Column 12 list the share of value-added in total output, which provides information about the role of intermediate inputs in each sector across regions.

(**Insert table 2 here**)

These data provide a snapshot of the sectoral compositions of production, income, demand, and trade of each region in the model and clearly delineate the differences in structure and international comparative advantage among China, the Chinese NIEs, and industrial countries. China is five times more primary-intensive than the industrial countries, and its manufacturing sectors, especially the labor intensive manufactures, is relatively larger than that in industrial countries because of a relatively smaller service sector

in its economy. Japan, European Union, and the United States are dominated by a large service sector with a much smaller nondurable manufacturing sector. Hong Kong and Taiwan, are between China and the industrial countries. They share with China the same characteristic of a relative lager labor intensive manufacturing sector on one hand, and with the advanced countries a relatively large service sector on the other hand.

Trade shares are also consistent with intuition about each region's international comparative advantage. For example, nondurable manufactures, as a labor, especially unskilled labor intensive industry (with a relatively higher share of unskilled labor in value-added) constitutes more than 45 percent of China's exports, while machinery and equipment as capital (both human and capital) intensive goods made up more than 35 percent of its imports. The reverse is true for Japan, EU, and the United States. Taiwan and Hong Kong are in the middle, with a lower labor intensive export share but a higher machinery and equipment or service export share than China, but a higher labor-intensive export share than Japan, EU and the United States.

Columns 6 and 7 in Table 2 present measures of trade dependence, -- exports in gross output and imports in total demand at sectoral level, respectively. Because of their geographical location and small size, Hong Kong and Taiwan have the highest trade dependence. Recent market-oriented economic reform have also caused China to be deeply linked with the world economy, especially its manufacturing sectors. In 1995, China exported more than 40 percent of its gross labor intensive manufactured output and imported more than 25 percent of its machinery and equipment demand from abroad. The United states, EU, and Japan, as the largest economies in the world, are relatively more self-sufficient. However, Japan's island economy leads it to rely on other countries to supply a large portion of its total natural resource based products demand, while it exported more than a quarter of its total machinery and equipment production to foreign markets. Although the overall trade dependency of the United states was lower than 6 percent, at the sectoral level nearly 20 percent of its labor intensive manufactured goods and more than a quarter of its machinery and equipment demand were imported from abroad in 1995.

The RCA index in column 8 reveals each region's relative international comparative advantage: among industrial countries, Japan's comparative advantage is concentrated in machinery and equipment, while the United States has comparative advantage on agricultural products, EU on processed food, besides their common comparative advantage in service sector and capital intensive production. China's comparative advantage is concentrated in labor intensive manufacturing sectors, while Taiwan and Hong Kong not only have comparative advantage on such sectors as China, but also are in the process of moving up their ladder to capital intensive products (Taiwan) or service sectors (Hong Kong) as other industrial countries.

2.2 Comparative Position of Japan, the United States, and the Chinese Economies

The structure data based on the world SAM reviewed above provides detailed information on the domestic economies and trade patterns of Japan, EU, the United States, and the three Chinese economies in East Asia. The impression given by the data is generally consistent with intuition about these economies based on conventional international trade theory. At one extreme, China is seen as a major competitor in labor-intensive nondurable manufactured exports and an important importer of capital/technology-intensive products for its modernization program. At the other extreme, Japan, EU and the United States are seen as major suppliers of capital/technology-intensive goods and as the final market for labor-intensive consumer products. Hong Kong and Taiwan are seen as intermediate between the two extremes. They are important suppliers of manufactured goods to China, and become both demanders and suppliers of technology/capital-intensive products from Japan, EU and the United States, while still remaining important suppliers of labor-intensive goods for industrial countries.

2.3 Import Protection across Regions

Most general equilibrium analysis of regional integration focuses on the removal of ad valorem equivalent price distortions against imports from exiting trade barriers. As shown in the literature, the pattern and level of protection are very important in determining the impacts of trade liberalization. The larger the initial distortion, the greater the induced impact from an assumed policy change. For this analysis, the impact

of the emergence of the CEA depends on the structure of existing trade barriers captured by the estimated global SAM. The initial sector import protection rate as percentage of c.i.f value in each region is presented in Table 3. Note that these rates include the tariff equivalent of non-tariff barriers for agricultural and food products, and antidumping duties for the United States and EU (Hertel, 1997).

The import protection rates show that there are substantial variations between commodity groups and across regions. Food and agricultural sectors are highly protected, especially in Japan, China and Taiwan. The high protection rates reflect high tariffs and many non-tariff barriers, such as import licensing and quotas, in those countries. The average protection rates in other sectors are generally low, especially for natural resource based sectors in industrial countries. The rates of import protection are generally higher in China than other regions in the model, especially for its manufacturing sectors.

(**Insert table 3 here**)

All this structural information discussed above will have important implications for understanding the impact of economic integration among the Chinese economies on trade pattern across regions. However, this information cannot be considered in isolation, since changes in trade policies and protection levels in any of the regions and sectors will have impacts on other regions and sectors. It is on this point that the application of a CGE model which includes major regions in the world can make a significant contribution to understanding and predicting the possible impact of the emergence of the CEA in East Asia.

3. Structure of the Model and Major Assumptions

The model used in this paper is an extension of de Melo and David Tarr's basic general equilibrium trade model (1992) to a multi-country setting. In the extension, we follow John Whalley's tradition (1985) to endogenize all regions including rest of the world, and incorporate the macro economic specifications from Devarrajan, Lewis and Robinson (1990), as well as an international shipping sector similar to GTAP model (Hertel, 1997). Moreover, the Leontief technology in de Melo and Tarr's model is replaced by CES production function, which allows substitution between value-added and aggregate intermediate inputs in the upper-level of the production tree, and the ELS demand system has been extended to ELES system thus

household saving decisions become endogenous in the model. Linkage between trade performance and total factor productivity is also introduced into the model as import embodied technology transfer across regions via firms' intermediate inputs. Because duality approach is used throughout the specification, the model is relatively simple and transparent in structure. An algebraic description of an earlier version of the model can be found in Wang and Slagle (1996) or Wang (1997), and a detailed variable and equation list of the modified version used in this paper is available from the authors upon request. The model is implemented by General Algebraic Modeling System (GAMS, Brooke et al., 1988).

In this analysis, seven regions and seven production sectors in each region are specified to represent the world economy. Each region is assumed to have basically the same structure. Five primary factors of production are modeled: agriculture land, natural resources, capital, unskilled-labor, and skilled-labor. The division between skilled and unskilled labor is a distinction between professional workers and production workers[8]. Agricultural land and natural resource are sector specific, while capital and labor are assumed to be mobile across sectors, but immobile between regions.

3.1 Production and Demand structures

In each region, there is one competitive firm in each sector, which produces only one product. The production is characterized by two-level nesting of constant elasticity of substitution (CES) functions. At the first level, firms are assumed to use two types of inputs: a composite primary factor and an aggregate intermediate input according to a CES cost function. At the second level, the split of intermediate demand is assumed to follow Leontief specification, therefore, there are no substitution among intermediate inputs. Technology in all sectors exhibit constant return to scale implying constant average and marginal cost. Firm's output is sold on the domestic market or exported to other regions through a constant elasticity of transformation (CET) function[9].

Agents in each region value products from different regions as imperfect substitutes (the Armington assumption). The private household in each region maximizes a Stone-Geary utility function over the 7 composite goods, subject to their budget constraints, which leads to the Extended Liner Expenditure System

(ELES) of household demand. Household savings are treated as demand for future consumption goods with zero subsistence quantity (Howe, 1975). An economy-wide consumer price index is specified as the price of savings. It represents the opportunity cost of giving up current consumption in exchange for future consumption (Wang and Kinsey, 1994). Government spending and investment decisions in each region are based on Cobb-Douglas utility functions, which generate constant expenditure shares for each composite commodity. In each region, firm intermediate inputs, household consumption, government spending and investment demand constitute total demand for the same Armington composite of domestic products and imported goods from different sources. A two-level nested CES aggregation function is specified for each composite commodity in each region. The total demand is first divided between domestic produced and imported goods, then the expenditure on imports is further divided according to the geographical origin under the assumption of cost minimization. Complete trade flow matrices for all trade partners are part of the model solution. To distinguish between Hong Kong's re-exports and Hong Kong's domestically produced goods for exports, all Hong Kong's re-exports are allocated back to their original source countries in the model's base year data, therefore solutions of bilateral trade flows between Hong Kong and all its trade partners, including China, are only imports for its own consumption and exports from its own domestic production.

There is an international shipping industry in the model to transport products from one region to another. Each region is assumed to allocate a fraction of the output of its transportation and service sector to satisfy the demand for shipping which is generated by interregional trade. The global shipping industry is assumed to have a unitary elasticity of substitution among supplier sources. This means the margins associated with this activity are commodity/route specific. In equilibrium, the total value of international transportation services at the world price equals the sum of the export proportions of the service sector's output from each region.

3.2 Equilibrium, Exchange Rate and Macro Closure

Within each region, the model solves for domestic commodity and factor prices that equate supply and demand in all goods and factor markets. The model also solves for world prices equating supply and

demand for sectoral exports and imports across the world economy. In addition, for each region, the model specifies an equilibrium relationship between the balance of trade and the real exchange rate (which measures the average price of traded goods — exports and imports — relative to the average price of domestically produced goods sold on the domestic market). However, as other CGE models, the model only determines relative prices. The United States is specified as the "reference" economy, with both its aggregate price level and exchange rate fixed exogenously. That is, all relative world prices and trade balances are measured in terms of real U.S. dollars. In addition, the aggregate consumer price index is fixed exogenously in each region, which defines a "no inflation" benchmark. Because traded and non-traded goods are assumed to be imperfect substitutes by sectors, changes in relative world market prices are only partially transmitted to domestic markets. The model thus incorporates a realistic degree of insulation of domestic commodity markets from world markets, but the links are still important and provide the major mechanism by which external shocks are transmitted across regions.

It is important to stress that the exchange rate variable in the model is not a financial exchange rate. Under appropriate numeraire selection, however, it is closely related to the concept of "real exchange rate" in trade theory. In a multi-region, multi-sector setting with absence of assets, the real exchange rate can be defined as a ratio of a price index of all tradables (on world markets) to a price index of all nontradables (home output sold at domestic market in current model). As shown by de Melo and Tarr (1992), when the price index of home goods is selected as the numeraire, the percentage change in the real exchange rate is equal to the percentage change of the exchange rate variable under small country assumptions. But in a multi-region model where all the world market price are endogenous, the percentage change of real exchange rate equals the percentage change of the exchange rate variable plus the percentage change of price index of all tradables (the f.o.b. and c.i.f. prices in current model), so the two concepts are no longer the same[10]. An adjustable exchange rate in the model implies a change in domestic price index is sufficient to sustain a constant current-account balance measured at world prices.

For each region, the model includes three macro balances: savings-investment, balance of trade, and government expenditure-receipts (government deficit). The three balances are not independent and the determination of these macro balances is the subject of traditional macroeconomic models. In terms of our real trade model, which does not include financial markets or variables typical of macro models, the determination of these macro aggregates is specified by simple rules. The macro adjustment mechanism constitutes the macro "closure" of the model.

In the benchmark equilibrium, all three macro balances hold. The specification of a macro closure is to select rules by which macro balances are brought back to equilibrium when exogenous shocks disrupt the benchmark equilibrium during an experiment. Thus, a macro scenario is imposed on the CGE model, which then traces out the sectoral implications of the assumed macro behavior (Devarajan, Lewis and Robinson, 1990). Because the macro closure is not based on optimizing behavior by rational agents in the model, different assumptions about the macro adjustment rules may lead to different results.

Since the major purpose of this study is to evaluate the impact of economic integration among the East Asia Chinese economies (via trade liberalization) on the rest of the world, the savings-investment gap is held constant in each region for all the simulations conducted by the model. This is achieved by keeping the balance of trade, government real expenditure, and aggregate real investment in each region fixed. If government revenue changes because of a reduction in tariffs, the macro economic effect will be either a change in the exchange rate or a change in household savings, or both, since the induced government deficit is financed by foreign capital inflows or domestic borrowing.

By a macroeconomic identity, the fixed balance of trade implies that a constant sum of domestic savings and taxes in real terms is needed to finance the fixed real investment plus real government expenditures. Thus, any changes in real GDP in the model will go exclusively to changes in real consumption, thus, making it easy to compare the results from different simulations.

3.3 Dynamic Considerations

Three types of gains from trade liberalization are captured by the model: 1) the gains from more efficient utilization of resources, which lead to a one-time permanent increase in GDP and social welfare; 2) more rapid physical capital accumulation from a "medium-run growth bonus" which compounds the efficiency gain from trade liberalization and leads to higher saving and investment . The static efficiency gains induce higher income for economic agents and lower prices for capital goods, accelerate capital accumulation, and lead to more capital stock available in the economy. This in turn yields more output, leading to further savings and investment. As Francois et al. (1995) have pointed out, this type of midterm accumulation effect is different from any long run, permanent growth effect induced by human capital and technology improvements, since it will ultimately decline to zero over time; and 3) more rapid growth of total factor productivity (TFP) due to speeding technology transfer via expansion of capital and intermediate goods imports from other countries, especially from advanced industrial countries. Empirical evidences suggest that there is strong positive feedback between trade expansion and productivity growth. Trade liberalization increases the prevalence of technology transfer as trade barriers are reduced. Firms in the liberalized regions will import more capital and technology intensive goods as both investment and intermediate inputs from abroad at cheaper prices. Those goods are usually embodied with advanced technology from other countries, thus stimulate productivity growth for all production factors.

To quantify the first and second type of gains, two alternative capital market closures can be chosen in the model: one static, one steady state. Under the static capital market closure, the aggregate productive capital stock is fixed in each region, and the region-specific average rental rate adjusts to ensure that regional capital is fully utilized. It is the empirical analog of the comparative statics that is common in theoretical work. Under the steady-state capital market closure, the return of capital is held constant while the capital stock in each region is endogenously determined. This closure assumes that since each region's aggregate capital stock is at its steady-state level in the benchmark equilibrium, liberalized trade will increase capital returns due to more efficient allocation of resources. In a dynamic sense, this will lead to a higher savings and investment rate. More capital stock in the economy will drive down the marginal productivity of capital,

thus decreasing the return of capital until its initial level. Although it cannot provide information about the transition path of how the capital price in each region returns to its steady-state equilibrium after an external shock, it can shed some light on the approximate size of the accumulation effect from trade liberalization-induced investment growth in a classical Solow-type growth model at almost no additional implementation cost. The theoretical underpinnings of this approach are based on the concept of invariant capital stock equilibrium proposed by Hansen and Koopmans (1972), and it was introduced into CGE analysis to estimate the accumulation effects of trade liberalization by Harrision, et al. (1995).[11]

To capture the third type of gains, we introduce following equation into our model:

$$ITFP_{ir} = 1 + ims_{ir} \times \left(\frac{NX_{ir}}{NX_{ir} + VA_{ir}} \times \left[\frac{\sum_{j \in IM} \sum_{s \in R} X_{jsr}}{\sum_{j \in IM} \sum_{s \in R} X0_{jsr}} \right]^{Fip_{ir}} + \frac{VX_{ir}}{NX_{ir} + VA_{ir}} - 1 \right)$$

This equation links import embodied technology transfer (via imports of capital goods and intermediate inputs) and total factor productivity. Where $ITFP_{ir}$ is TFP shift variables in sector cost function, ims_{ir} is the share of intermediate inputs in sector i's total imports at region r, NX_{ir} and VA_{ir} are intermediate inputs and primary factor inputs respectively. $X0_{isr}$ is the base year trade flows, IM is a subset of I, refer to those products embodied with advanced technology (manufactured intermediates, machinery and equipment in this model). It operates through share parameters and elasticities. An elasticity ($Fip_{ir)}$ of 0.1 implies that a 10 percent increase in real imports of capital and technology intensive goods would result a no more than 1 percent increase in total factor productivity in that sector depending the share of imported intermediate inputs in the sector's total imports. As pointed by Lewis, Robinson and Wang (1995), while there is fairly widespread agreement that linkage between imports of intermediate inputs and TFP do exist, there is less evidence of the size of the feedback. In our simulation exercises, the elasticities used for developed countries are one third of the values used for developing countries. **4. Major Simulation Results and Their Policy Implications**

4.1 The Impact of a Chinese Free Trade Area

We first consider the impact of creating a free trade area among China, Taiwan and Hong Kong. This possibility require the elimination of all barriers to imports among the three Chinese economies, with each of them retaining their current level of protection with other regions. Since the model traces the bilateral import protection among all regions, a free trade area can be easily simulated by setting the bilateral protection rate among the member economies equal to zero. As described earlier, the model includes an international transportation sector by using the route-specific shipping margins from the GTAP database[12], therefore, part of the trade barrier caused by the current political situation across the Taiwan Straits could be captured as a special case of ad valorem equivalent non-tariff trade barriers. A free trade area among the three Chinese economies also implies a decrease in average bilateral transaction costs between Taiwan and China since their indirect trade via Hong Kong will dramatically decrease, even though possibly not decline to zero[13].

Table 4 presents the initial shipping margins as a ratio of f.o.b. values in the model and the estimated margin under direct trade across Taiwan Straits. Because there is no data available on the split of cross-Straits trade that currently is via Hong Kong and that is via other routines, we assume all current cross-Straits trade is via Hong Kong when we estimate those margins. To test the sensitivity of this assumption, an additional simulation was conducted without change in transaction cost for cross-Straits trade, i.e. the only shock applied was the elimination of all import protections within the three Chinese economies listed in Table 3.

(**Insert table 4 here**)

Table 5 presents the impact on macro and aggregate trade variables from this set of experiments. It is immediately apparent that a Chinese free trade area is beneficial to the regional economy. The social welfare measured by Hicksian equivalent variation increases in each of the three Chinese economies in both the static and steady-state simulations. Specifically, the comparative statics show that a Chinese free trade area would entail a net welfare gain of $7.5, $2.4, and $0.5 billion per year (or 2.7, 2.4 and 0.1 percent of their 1995 GDP) for Taiwan, Hong Kong, and China respectively, and $10.5 billion or 1 percent of its base year GDP for CEA as a whole. Taking the medium-term accumulation effects into consideration, the gains

would be much higher, ranging from 1.7 percent of base year GDP for China to 4.3 percent of base year GDP for Hong Kong, and 2.5 percent of base year GDP for CEA as a whole. Other countries would suffer a small welfare loss, especially for Japan and rest of the world. It is caused by the trade diversion effects.

(**Insert table 5 here**)

The results on trade performance clearly show mixed trade creation and diversion effects by a Chinese free trade area. Total real exports increase significantly for the three Chinese economies but decline slightly for other economies. The three Chinese economies trade more among each others. Trade flows across the Taiwan Straits increase nearly three times (Taiwan's real exports to China increase by more than 300 percent, while its import from China increase by more than 250 percent in both capital market closures) . The Chinese free trade area overwhelmingly satisfies the requirement that trade creation exceeds trade diversion -- new trade within CEA is much larger than the decline of trade with countries outside CEA, with a net trade expansion about $60 billion in the static simulation and $70 billion in the steady-state simulation.

It is interesting to note that although the real exports from other region to China drop quite significantly (ranging from 20 to 30 percent), but their exports to CEA as a whole only decline marginally (less or about 5 percent), total U.S. exports to CEA actually increase 1.3 percent if the medium-term accumulation effect from trade liberalization is also taken into account. In the same time, their imports from China increase dramatically(around 20 percent), but their imports from CEA as a whole decline slightly. For instance, the total U.S. import from CEA decline about $5 billion and $3.7 in the static and steady-state capital market closure respectively. In the meantime, U.S. exports to China decline by 24 percent (about $4 billion), but U.S. imports from China increase by about the same percent (about $11 billion). Those simulation results clearly suggest that U.S. trade deficit with China would increase on one hand, but U.S. trade deficit with CEA as a whole would decline on the other hand as the economic integration among the East Asia Chinese economies intensified. It is a continuation of Hong Kong and Taiwan shifting their trade surplus with industrial countries such as the United States to China started from the late 80's.

Results from the simulation without reduction in transaction cost for cross Taiwan Straits trade are reported at the bottom of Table 5. It shows very similar pattern in aggregate welfare change and trade performance as we discussed above. China and Taiwan will gain less while Hong Kong will gain slightly more as expected because Hong Kong benefits as a "commercial middleman" from the indirect trade between China and Taiwan. However, it seems that the aggregate results are not very sensitive to how large the portion of the cross-Straits trade was assumed via Hong Kong in our model simulations.

In general terms, these aggregate results are consistent with findings from other modeling efforts of impact of free trade area. As classical trade theory indicates, removing trade barriers leads to expansion of trade and increase of economic efficiency. However, assessing aggregate effects alone provides little insight in understanding the factors shaping these aggregate outcomes. Therefore, it is necessary to investigate the changes in bilateral trade at the sectoral level to find out the shift of trade patterns among regions induced by economic integration within CEA.

(**Insert table 6 here**)

Table 6 decomposes the aggregate trade performance by portraying change in export flows for each region by sector and destination. The numbers along the row provide changes in exports, while data down the column give changes in imports, both in billions of 1995 dollars measured by f.o.b. prices. It shows clearly that there is significant trade creation among the three Chinese economies. Products from Hong Kong and Taiwan sold to China increase dramatically, by 143 and 309 percent respectively, ranging from $25 billion for Hong Kong and $50 billion for Taiwan, and almost totally concentrated in manufacturing sectors. It reflects that Taiwan and Hong Kong have comparative advantage in up-level light manufactures, electronics and machinery. Whereas goods from China sold to Taiwan and Hong Kong increase by $7.5 (168 percent of the base) and $ 4.7 (35 percent of the base) billion respectively and are also concentrated in manufactures. The exports from Taiwan to Hong Kong decline by about $2 billion (about 25 percent of the base) because of the opening of direct trade across Taiwan Straits. However, both Hong Kong and Taiwan gain significantly from their trade expansion with China.

At the same time, trade diversion also occurs. While increasing their imports from other Chinese economies dramatically, China reduces its imports from other countries outside CEA, especially for manufactured products from industrial countries and rest of the world (see first three and last block of China column, table 6). This is because Taiwan and Hong Kong, as newly industrialized economies, are upgrading their industrial structure and becoming a strong competitor in the world market for manufactured goods, especially in low-end technology and capital intensive products and high-end labor-intensive goods. A preferential tariff arrangement with China will enable their products to enter the world's largest market at lower costs, thus enhancing the international competitiveness of firms from Taiwan and Hong Kong over firms from industrial countries, thus causing other regions to lose their market shares for manufactured goods in China. Despite the import expansion in China from Hong Kong and Taiwan reduce their exports to other regions outside CEA, but it increases their imports from industrial countries (see first three block of Taiwan and Hong Kong columns, table 6). This is because when Taiwan and Hong Kong increase their manufactured exports to China, their demand for high-end capital and technology intensive manufactured inputs and services from industrial countries also increases in order to meet the demand on upgrading their industrial structure and enlarge their production capacities.

Interestingly, when Taiwan and Hong Kong expand their exports to China, their exports to other regions decrease dramatically, however, when China increases its exports to Hong Kong and Taiwan, its exports to other countries outside the CEA do not decline but increase in all sectors except agriculture. There is no any trade diversion in manufactured products for China (see China block in table 6). There are two factors contribute to this interesting adjustment in trade pattern. First, the expansion of imports of machinery and equipment from Hong Kong and Taiwan increase the capacity of China exporting manufacturing good. Its imports of machinery and equipment from Taiwan and Hong Kong increase by $9.4 and $6.2 billion respectively (about 121 and 196 percent increase from the base) Second, the manufactured goods from Taiwan and Hong Kong to China usually contain a large portion of semi-processed products and parts for assembling or further processing operations in China, then re-export to industrial countries[14], especially for

labor-intensive manufactured goods. The dramatic increase of such products imported from Taiwan and Hong Kong($24.7 billion from Taiwan and $11.5 billion from Hong Kong, a 285 and 407 percent growth from the base respectively) further boost China's manufactured exports. Its exports of manufactured products increase more than $50 billion, a 30 percent growth from the base. To understand fully the factors underlying such shifting of trade pattens from the creation of a Chinese free trade area, we need look further at the sector structural adjustment and resource reallocation in each region based on their international comparative advantage.

Table 7 illustrate the extent of structure change occurring in each region by reporting the percent change in output, consumption, exports, and imports, as well as the reallocation of production factor and each region's export share in world market as a result of a Chinese free trade area. The results show that Hong Kong and Taiwan will experience much stronger structural adjustment than China because of their small size and high degree of trade dependence, indicated by the large percentage change of production factor allocations. Production expands in all sectors except for food and agriculture in China. Labor intensive manufactures and manufactured intermediates in Taiwan expand significantly (a 30 and 9.2 percent growth from base year) but at the expense of food processing and resource based sectors, which are unable hold onto factors that are bid away by the expanding sectors to meet domestic and external demands induced by the expansion of trade among the three Chinese economies. Hong Kong shrinks its service sector because it is assumed no longer play the role of "commercial middleman" in cross-Strait trade, but increase production in food processing and other manufacturing sectors. Agricultural production and exports also expand in both Hong Kong and Taiwan because the high protection level in China and Taiwan distort trade, enable the less efficient producers such as Taiwan take world market shares from the more efficient supplier such as the United States in the highly protected CEA market, which is a major negative impact on world production and trade pattern by forming a Chinese free trade area at their current protection levels. This adjustment pattern may be different after both China and Taiwan join the World Trade Organization (WTO) because they have

to lower their current barriers to trade substantially to meet WTO market access standard, but it is beyond the scope of this paper[15].

(**Insert table 7 here**)

The impacts on production structures in industrial countries are relatively small, but basically consistent with their international comparative advantages. The production and exports of labor-intensive manufactures shrink but imports of such products increase in all other regions outside CEA, which is the strongest structural adjust induced by a Chinese free trade area on rest of the world. The exports of labor intensive manufactures decline 4.2 percent in the United states, 2.8 percent in EU, 9.4 percent in Japan, and 4.7 percent in the rest of the world, thus enable CEA as a whole gain additional world market share and occupy more than one third of world export market in labor intensive manufactures.

It is evident that a Chinese free trade area has made the three Chinese economies stronger competitor of manufactured goods, especially labor-intensive products in the world market. Manufacturing exports increase in all the three Chinese economies, but decline in all other regions outside CEA, reflecting a Chinese free trade area raises comparative advantage in producing such goods for CEA as whole. Its export share in world market increase by nearly 8 percentage points for labor intensive manufactures, 3.2 percent point for manufactured intermediates, and nearly 1 percentage point for machinery and equipment (mainly electronic products). Economic integration among the three Chinese economies would allow the combination of Hong Kong and Taiwan's capital and know-how to efficient use of the huge reservoir of low-cost labor in China thus benefiting all the three Chinese economies.

The above simulation results have important implications for US trade policy towards East Asia. It indicates that the trade imbalance between US and China during recent years will grow for some time as the economic integration among the three Chinese economies continues. From an economic perspective, this is an unavoidable phenomena and is completely driven by market forces resulting from the production relocation process in East Asia based on changing comparative advantage in that region (Taiwan and Hong Kong transfered their down-stream labor-intensive production to China through direct investment since earlier

80s). A Chinese free trade area will accelerate this production relocation process. It will dramatically increase China's exports of labor intensive manufactures and electronic products to the United states by nearly 30 percent ($10.5 billion), but reduce the exports of such products from Taiwan and Hong Kong to U.S. market by about $11 billion (Table 6). Therefore, if one consider CEA as a whole, the US trade deficit with the region may decline as the simulation results shown. Thus, if we view the mounting U.S. trade deficit with China in recent years as a pure economic problem, it should not become a major issue in US-China economic relations, as long as US trade deficit with CEA stays constant.

The simulation results also indicate that if the United States does not have a proper trade policy in response to the economic integration among the three Chinese economies, which is an inevitable trend driven mainly by economic forces, the tension in its economic relations with Japan may increase. Results of changes in trade flows (table 6) also show that the exports from United States to Japan will decrease ($39 million) while the exports from Japan to the United States will increase ($1.26 billion). This implies that the US trade deficit with Japan will continue to grow as the economic integration among the three Chinese economies continues. This result motivates the simulations of a common tariff cut among CEA, Japan, European Union, and the United States, which are reported in the next section.

4.2 The Impact of a 50% Tariff Cut Among Chinese Free Trade Area and Different combinations of the Major Industrial Countries

What is the opportunity cost for the United States of isolating itself from East Asia and ignoring the importance of the emergence of CEA in that region? What role does the increasingly integrated Chinese economies may play in the economic relation between Japan and the United States? What is the impact on other countries if one major industrial country develops more close economic tie with CEA? In order to shed some light to those questions, we consider a 50 percent import protection level cut among the assumed Chinese free trade area and major industrial countries in following six different scenarios: (1) CEA and Japan; (2) CEA and the United States; (3) CEA, Japan, and the United States; (4) CEA, EU, and the United

States; (5) CEA, EU, and japan. Finally, a common tariff cut among CEA and all other regions in the model was also conducted as reference.

Table 8 summarizes the impact on economic efficiency and aggregate trade performance of these alternative scenarios. These results indicate that the gains from a common tariff cut among CEA and major industrial countries would be substantial for all regions involved and entail losses for countries left out. The higher aggregate welfare gains (in percent of base GDP) for the three Chinese economies, compared to Japan, EU, and the United States, is because their higher trade dependence, higher barriers to imports (not for Hong Kong), and their small size relative to the three largest economies in the world. The results clearly show that a close economic tie with any of the industrial countries will greatly benefit the CEA as a whole. The welfare gain for CEA is much larger than its gain from a Chinese free trade area in all the simulations reported here, ranging from 26 to 100 percent higher depending on which industrial countries allied with CEA. The opportunity cost for isolating US from East Asia is high for both the United States and the Chinese economies in that region[16]. The simulation results indicate that a common tariff cut between CEA and Japan or among CEA, Japan and the EU will entail a welfare loss for the United States, and in the same time bring smaller gains for the CEA. The net welfare gain for CEA is 31 percent higher when they have a common tariff cut with the United States than with Japan ($43.8 billion over $33.4 billion), and about 15 or 23 percent higher when they have a common tariff cut with US and Japan or US and EU than with Japan and EU ($49.6 and $53.1 billion over $43.2 billion). Japan will gain more when it acts with the United States to reduce tariffs with CEA than it acts with EU ($66.2 over 15.9 billion). Within CEA, a common tariff cut with the United States accounts most of the welfare gains for Hong Kong and Taiwan, including Japan and EU even rest of the world does not bring very much additional gains for them ($5.3 to $ 6 billion for Hong Kong's and $14.1 to $15 billion for Taiwan). While a common tariff cut with industrial countries involving the United States also entails more welfare gain for China compare to the scenarios with Japan and EU, although including more countries and rest of the world will bring substantial additional gain for China. This is because US is the largest trade partner for Hong Kong and Taiwan, while China's trade is more diversified. As

indicate by the results, a common tariff cut among CEA, US, and Japan accounts the largest portion of gains from global trade liberalization. It is 66 percent for Japan, 69 percent for the United States, 54 percent for China, 88 percent for Hong Kong , and almost 95 percent for Taiwan.

(**Insert table 8 here**)

Results for aggregate trade performance reported in table 8 show that trade liberalization within CEA and major industrial countries, effectively prevent trade diversion from forming a Chinese free trade area, all industrial countries involved in the common tariff cut with CEA would substantially increase their exports to the three Chinese economies. However, the growth pattern of trade are quite similar to that in the Chinese free trade area experiment. In all the common tariff cut scenarios include the United States, the growth rates of U.S. import from China are much higher than the growth rates of U.S. export to China, implies an enlarging U.S. trade deficit with China. In the same time, U.S. export to CEA increase faster than its import from CEA, which is 21 percent higher in the CEA and U.S. scenario, 12 percent higher in the CEA, US, and Japan scenario, 20 percent higher in the CEA, US, and EU scenario, and 17 percent higher in the global liberalization scenario, implying a slower growing or actual declining U.S. trade deficit with CEA as a whole under those alternative trade liberalization scenarios.

Those results have important policy implications for the United states. It shows that an economically integrated CEA including China, Taiwan, and Hong Kong is in the long term strategic interest of the United States. After successfully establishing the North America Free Trade Area, the results of above simulations suggest that the United States should actively pursue regional agreements with East Asia, especially with Japan and the CEA, which accounts nearly 70 percent US gains from global trade liberalization. The tremendous economic stake from such agreement for the three Chinese economies (account 65 percent their total gains from global trade liberalization) would provide adequate incentives for them to strongly support such an US initiative.

5. CONCLUSIONS

This study constitutes the first major attempt to analyze the impact of economic integration among the East Asia Chinese economies, which are becoming more and more important players in world economy, in a numerical general equilibrium framework. The results obtained show that the three Chinese economies each has much to gain from greater integration by means of liberalizing trade policies. Each Chinese economy would experiences welfare gains ranging from 1.7 to 4.3 percent of their base year GDP (1995) by forming a free trade area. Other countries in the World would be slightly adversely affected because of trade diversion effects.

The opportunity cost of isolating the US from East Asia is high for both the United States and the three Chinese economies. As shown by the simulation results, a common tariff cut between CEA and Japan or among CEA, Japan and the EU will entail a welfare loss for the United States, and in the same time bring smaller gains for the CEA. While a common tariff cut between CEA and US account the largest portion of the gain from global trade liberalization for CEA as a whole (65 percent). Both Japan and the United States would gain more when they reduce trade barriers with CEA. Therefore, the modeling results suggest that a economically integrated CEA is in the long run strategic interest of the United States. One of the best trade policy options for the United States is to actively pursue a regional agreement with East Asia, especially with Japan and CEA, after having successfully negotiated the NAFTA. It will tie China more closely with United States economically and may help the United States persuade Japan to make more concessions to open its domestic market[17].

The results of this study provide useful insights in understanding the impact of economic integration among East Asia Chinese economies. However, several limitations need to be mentioned. First, this study uses a free trade area to simulate the economic integration among the three Chinese economies (reduction in barriers to merchandise trade), it does not take into account for the impact of other factors that may drive economic integration, such as the reduction in barriers to investment and service trade, the effect of geographical proximity and culture affinity, and economy of scale. Therefore, our analysis at best captures only one aspect of the issue. Second, the initial protection level are very important to determine the size and distribution of efficiency gain and the pattern of adjustment. However, there are uncertainties on the base

year protection rate in Taiwan and China, especially China's pervasive non-tariff barriers. Third, this paper only analysis the long term implications of the economic integration among the three Chinese economies, it does not consider the adjust cost and the impact of recent Asia financial crisis on the three Chinese economies and the prospective of economic integration among them[18]. Fourth, the CGE model used in this study is a highly stylized simplification of the world economy, and is far from perfect (Wang, 1997). Finally, there are uncertainties about the size of parameters, especially elasticities of substitution of products from different regions and elasticities between imported intermediate inputs and TFP growth, while the actual size of the impact from economic integration will be sensitive to those key parameters [19]. Therefore, the results reported in this paper need to be interpreted with caution: they can be viewed as indicative but not as precise real outcomes.

Footnotes:

1. Calculated from IMF Direction of International Trade, 1991-1997, International Monetary Fund.

2. Based on *Monthly Report of Cross-Straits Economic Statistics*, Junuary, 1998, p.24. Council for Mainland Affairs, Taipei, ROC.

3. *Monthly Report of Cross-Straits Economic Statistics*, Junuary, 1998, p.28. Council for Mainland Affairs, Taipei, ROC.

4.Mr. Koo Chen-fu, Chairman of the Straits Exchange Foundation visited China from October 14 to 20, 1998, and Mr. Wang Dao-han, the Chairman of Association of Relations Across the Taiwan Straits will visit Taiwan sometime in spring 1999, indicating governments on both sides of the Straits are willing to change from political confrontation to negotiation.

5. Since a large portion of current Taiwan/China trade is via Hong Kong, direct trade between China and Taiwan will lower the transportation cost.

6. This refers to the trade between industries which produce commodities with similar input requirements and high substitutability in use, such as cars with similar characteristics, but manufactured by different producers.

7. RCA is the share of each commodity group in an economy's total exports divided by that commodity group's share of world exports (See Balassa, 1965). If the economy's export specialization has not been

distorted by government policies, the ranking of RCA values indicates comparative advantage relative to the rest of the world. Formally, denoting E_{ij} to be the export of good i of country j, and assuming that there are n commodities and m countries engaged in trade, then the RCA can be defined as:

$$RCA_{ij} = (E_{ij}/\sum^{n}_{i=1} E_{ij}) / (\sum^{m}_{j=1}E_{ij}/\sum^{n}_{i=1}\sum^{m}_{j=1}E_{ij})$$

Share of good i in country j's total exports

Good i's share in world exports

In practice, the ranking of the RCA index usually not only reflects fundamental comparative advantage, but also government policy distortions, which may subsidize or restrict exports of particular commodities.

8. Professionals include International Labor Office (ILO) occupation ground group 0-2, (Professional, technical and related workers; Administrative and managerial workers); production laborers are the aggregation of ILO occupation ground group 3-5, (Clerical and related workers; Sales workers; Service workers) and 7-9, (Production and related workers, Transport equipment operators and Laborers) plus agricultural labor.

9. The CET function can be partially or entirely turn off in the model, in such case, exports and domestic sales become perfect substitutes.

$$RER_r = \left(\frac{\sum_{i\in I}\sum_{s\in R} PWE_{ir} \times ER_r}{\sum_{i\in I} PD_{ir}}\right) \times \left(\frac{\sum_{i\in I}\sum_{s\in R}\left(\eta_{isr} PWE_{isr} + \nu_{isr} PWM_{isr}\right)}{\sum_{i\in I}\left(\eta_{ir} PWE_{ir} + \nu_{ir} PWM_{ir}\right)}\right)$$

$$\Delta RER_r = \left(\frac{\sum_{i\in I}\sum_{s\in R} PWE_{ir} \times \Delta ER_r}{\sum_{i\in I} PD_{ir}}\right) \times \left(\frac{\sum_{i\in I}\sum_{s\in R}\left(\eta_{isr} PWE_{isr} + \nu_{isr} PWM_{isr}\right)}{\sum_{i\in I}\left(\eta_{ir} PWE_{ir} + \nu_{ir} PWM_{ir}\right)}\right)$$

10. Based on the definition above, the real exchange rate in region r (RER_r) is:

where $\sum_I \sum_s(\theta_{irs}+\lambda_{isr}) = \sum_i \beta_{ir} = 1$, and all the index weights in the sums are non-negative. Rearrange terms,

When $\sum_i \beta_{ir}$ PD_{ir} be chosen as numeraire and set to unity, the percentage change in the real exchange rate equal to the percentage change in the exchange rate variable ER_r plus the percentage change in the price index of all tradables. That is:

it is clear that only when all international prices (the f.o.b. and c.i.f. prices in current model) are constant, the percentage change in ERE_r equals the percentage change in ER_r, otherwise they are not the same.

11.The increased capital stock from simulations under such a capital market closure may be interpreted as trade liberalization induced additional capital stock accumulation over a medium term.

12.These international shipping margins are generated by an estimated margin function with the ratio of c.i.f. and f.o.b. value as dependent variable and world freight rates index, route distances, volume of trade and country-specific dummy variables as explanatory variables. The detailed methodology for determining these estimates was documented by Gehlhar (1993).

13. As Sung (1992) has argued, because of the significant economies of scale and economies of agglomeration in trading activity, Hong Kong as the established center for China's trade, will continue to play a "middleman" role and will still be important even if Taiwan and China establish official relation. Historical data show that after the United State, Canada and Indonesia established direct commercial or diplomatic relations with China there was a sharp and once for all decline in their dependence on Hong Kong. Their dependence on Hong Kong rose again, however, as China decentralized its trading system. In the case of China's exports to US, the share of indirect exports via Hong Kong fell Sharply from 100% to 15% in 1975. However, the share rose in 1979 with the decentralization of China's trade, and increased to over 62% in 1990. In the case of China's exports to Canada, the share of indirect exports via Hong Kong also fell sharply to 7%. But it also rose in 1978, and it increased to 59% in 1990. In the case of China's exports to Indonesia, the share of indirect exports via Hong Kong fell to below 50% in 1988, but rose slowly thereafter.

14.The processing trade (processing and assembling, processing with import materials) was 46.7 percent of China’s total exports in 1995, and more than a half of its exports (55.8 percent) in 1996.

15. Readers interested in such issue may refer to an economic report by one of the author, “The impact of China’s WTO accession on cross-Straits Trade Relations”, published by the Chung-Hwa Institution for Economic Research, Taipei, October, 1998.

16. Although Japan has not yet moved to establish a regional trade pact, some countries such as Malaysia have advocated the formation of an East Asia Free Trade Area that would exclude the United States in response to the growing regionalism around the world.

17. On the other hand, when the United States and Japan act jointly, they also can force China to make more concessions on trade and other international issues. The game is an analogy with playing the China card in the Cold War period, but in a completely different context, for different purposes, and in a different environment.

18. Readers are interested in such subject may refer to “Global Economic Effects of the Asian Currency Devaluations” coauthored by one of the author with Marcus Noland and published by Institute of International Economics, Washington DC, July 1998.

19. The major conclusions from this study are robust. There are similar studies conducted by the authors by using an earlier version of the model and version 1 and version 3 GTAP database (Wang, 1994 and Wang and Schuh, 1998). Although there are substantial changes in base year data, initial protection rate, and model structures, the basic results obtained from this paper are quite similar to previous studies, in spite of variation in the numerical size of estimated impact. For sensitivity of simulation results due to variations in elasticities, see section 8.5 in Wang(1994).

Table 1--Factor endowment, intensity, and relative size of model regions, 1995

Item	United States	EU15	Japan	Taiwan	Hong Kong	China	Rest of The World
GDP and trade flows:			*billion U.S. dollars*				
GDP	7126.4	8209.8	5091.7	276.3	101.4	712.0	6796.8
Exports	717.7	895.0	484.1	129.8	74.5	210.3	1253.4
Imports	883.3	883.4	435.3	108.8	112.4	167.3	1323.0
Relative size in the world:			*percent*				
GDP	25.2	29.0	18.0	1.0	0.4	2.5	24.0
Exports	19.1	23.8	12.9	3.5	2.0	5.6	33.3
Imports	22.6	22.6	11.1	2.8	2.9	4.3	33.8
Share in world factor endowment:			*percent*				
Land	12.4	5.7	0.3	0.1	0.0	9.2	72.4
Unskilled labor	3.9	5.3	2.3	0.3	0.1	27.7	60.4
Skilled labor	14.1	15.2	3.5	0.4	0.2	17.0	49.6
Total labor	5.0	6.4	2.4	0.3	0.1	26.5	59.2
Capital	19.3	30.7	22.7	0.6	0.5	2.0	24.2
Factor share in value added:			*percent*				
Land	0.4	0.3	0.5	1.1	0.3	6.1	3.1
Unskilled labor	38.4	41.3	36.3	36.8	26.2	36.6	35.8
Skilled labor	26.0	25.7	21.8	25.9	20.3	7.9	14.8
Total labor	64.4	67.0	58.0	62.7	46.4	44.6	50.6
Capital	35.2	32.7	41.5	36.1	53.3	49.4	46.3
Skill distribution of regional labor force:			*percent*				
Unskilled labor	69.3	74.1	84.2	86.7	81.5	93.0	90.9
Skilled labor	30.7	25.9	15.9	13.3	18.5	7.0	9.1
Annual wages:			*US$1,000 per worker*				
Unskilled labor	26.5	24.3	30.5	11.6	10.1	0.3	1.4
Skilled labor	40.6	43.5	97.2	53.2	34.4	0.8	6.0
Average wages	30.8	29.3	41.1	17.2	14.6	0.3	1.9
Land rent:			*US$1,000 per hectare*				
Av. land return	0.14	0.27	4.98	3.29	42.93	0.23	0.17
Capital return:			*percent of capital stock*				
Av. capital return	14.5	9.9	10.4	18.6	14.5	16.3	13.9
Capital (Land) intensity:			*US$1,000 per worker*				
Capital/labor	115.6	144.2	281.9	53.1	115.6	2.2	12.2
			Hectares per worker				
Land/labor	1.4	0.5	0.1	0.1	0.0	0.2	0.7
Relative factor price:			*Ratio*				
Rental/wage	0.5	0.3	0.3	1.1	1.0	49.7	7.5
Land rent/wage	0.5	0.9	12.1	19.2	293.8	70.6	9.0
Rental/land rent	1.0	0.4	0.0	0.1	0.0	0.7	0.8

Data source: Calculated from the 1995 multi-regional SAM estimated by the author from Version 4 GTAP Database. Additional factor endowment data collected by the author: Land and total labor endowment data are from the FAO *Statistical Year Book, 1997*. China's arable land number is based on ERS estimate (Crook, 1993). The disaggregation between skilled and unskilled labor was based on International Labor Office *Year Book of Labor Statistics, 1995*, and various statistical publications from various countries.

Table 2 **Structure of Production, Factor Income, Demand and Trade Patterns for Economic Regions**

1995

	Share of								Factor Share in value-added			
	Output	Value -added	Demand	Exports	Imports	Export/ Output	Import/ Absorption	RCA	Unskilled Labor	Skilled labor	Capital	VA/ output
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA												
Agriculture	10.6	20.2	15.3	2.2	4.5	2.4	3.9	0.7	58.5	0.5	12.0	58.5
Processed food	5.4	2.2	9.6	3.2	3.5	6.8	6.0	0.7	24.7	4.6	70.7	12.4
Resource based products	9.1	11.6	2.9	4.5	4.2	5.7	4.3	0.6	33.1	2.5	36.4	39.1
Labor intensive manufactures	13.2	7.0	6.5	45.5	17.5	40.3	16.6	3.1	38.0	5.8	56.2	16.2
Manufactured intermediates	15.1	8.7	3.3	12.9	24.0	9.9	14.2	0.9	23.6	4.5	71.9	17.6
Machinery and equipment	12.9	8.3	16.1	23.7	36.2	21.3	25.1	0.7	30.8	6.2	63.0	19.8
Service	33.6	42.0	46.3	8.1	10.1	2.8	2.8	0.4	28.5	14.0	57.5	38.3
Total	100.0	100.0	100.0	100.0	100.0	11.7	9.5	0.0	35.5	7.7	47.8	30.7
HONG KONG												
Agriculture	0.6	0.8	2.0	0.2	2.4	6.8	63.4	0.1	50.9	3.1	8.0	46.9
Processed food	1.5	1.7	4.2	1.0	4.4	17.8	59.7	0.2	26.0	12.6	61.4	41.5
Resource based products	2.6	1.0	1.2	0.3	5.4	3.7	47.4	0.0	13.4	4.5	49.2	14.5
Labor intensive manufactures	9.7	7.2	16.4	20.6	20.4	57.2	65.0	1.4	42.5	18.6	38.9	27.1
Manufactured intermediates	2.9	1.7	3.9	3.8	13.7	35.1	74.9	0.2	35.4	19.9	44.7	21.1
Machinery and equipment	5.7	6.0	15.1	15.5	36.6	74.2	91.1	0.4	29.8	24.5	45.7	38.4
Service	77.0	81.7	57.2	58.7	16.9	20.6	10.2	3.1	24.1	20.5	55.4	38.7
Total	100.0	100.0	100.0	100.0	100.0	27.1	35.9	0.0	26.1	20.2	53.1	36.5
TAIWAN												
Agriculture	3.1	3.0	2.2	0.5	3.3	3.6	16.8	0.2	52.4	1.6	8.0	41.6
Processed food	5.1	1.7	8.4	2.6	3.3	11.5	11.9	0.6	45.8	16.8	37.4	14.5
Resource based products	2.4	2.4	1.0	1.3	4.9	11.8	30.3	0.2	40.7	8.9	35.2	43.1
Labor intensive manufactures	10.0	6.7	3.7	22.4	8.8	49.5	24.4	1.6	57.7	14.9	27.4	28.7
Manufactured intermediates	16.6	10.1	1.9	18.1	22.3	23.9	24.5	1.2	44.4	13.3	42.3	26.2
Machinery and equipment	16.4	10.5	16.3	48.2	41.6	64.7	57.0	1.3	48.7	22.4	28.9	27.4
Service	46.4	65.6	66.4	6.9	15.9	3.3	6.2	0.4	30.3	31.4	38.3	60.6
Total	100.0	100.0	100.0	100.0	100.0	22.0	19.2	0.0	36.7	25.8	36.0	42.9
JAPAN												
Agriculture	2.0	2.6	1.1	0.1	4.0	0.2	8.3	0.0	50.2	0.8	31.0	61.9
Processed food	6.4	2.6	8.6	0.4	8.1	0.3	5.4	0.1	38.2	18.1	43.8	19.9
Resource based products	2.4	2.1	0.4	1.3	16.3	2.7	23.7	0.2	33.4	12.7	39.1	41.6
Labor intensive manufactures	6.7	4.7	4.9	6.3	14.5	4.7	9.3	0.5	45.6	22.4	31.9	33.7
Manufactured intermediates	11.5	7.8	2.4	14.1	12.4	6.1	4.9	0.9	31.4	18.3	50.3	32.9
Machinery and equipment	12.9	9.7	14.0	66.1	19.2	25.6	8.2	1.8	35.2	22.1	42.7	36.4
Service	58.0	70.5	68.6	11.7	25.4	1.0	2.0	0.6	35.7	23.1	41.2	58.9
Total	100.0	100.0	100.0	100.0	100.0	5.0	4.5	0.0	36.2	21.7	41.4	48.5
UNITED STATES												
Agriculture	2.1	1.5	0.5	4.9	1.9	13.5	7.1	1.7	35.3	2.7	34.0	37.4
Processed food	4.5	2.8	5.0	3.9	2.6	5.1	4.2	0.9	31.7	10.4	57.9	33.7
Resource based products	2.3	2.3	0.2	2.3	8.5	5.7	21.6	0.3	25.0	8.8	42.5	53.5
Labor intensive manufactures	6.0	4.6	5.4	8.3	16.1	8.1	17.5	0.6	44.5	16.9	38.6	41.6
Manufactured intermediates	8.6	5.8	3.1	14.4	13.2	9.9	11.0	0.9	37.9	19.9	42.2	36.8
Machinery and equipment	11.4	9.3	13.6	41.0	43.0	21.2	25.7	1.1	38.1	30.7	31.1	44.2
Service	65.1	73.6	72.3	25.3	14.7	2.3	1.7	1.3	38.5	27.9	33.6	61.1
Total	100.0	100.0	100.0	100.0	100.0	5.9	7.2	0.0	38.2	25.9	35.0	54.0
EU(15)												
Agriculture	2.0	2.5	1.1	1.3	4.4	3.7	11.3	0.5	62.9	4.1	20.7	58.7
Processed food	5.4	3.1	6.7	4.8	3.6	4.9	3.7	1.4	45.4	17.2	37.4	27.1
Resource based products	2.3	2.3	0.5	3.7	11.7	8.9	23.6	0.5	35.1	12.5	36.2	47.8
Labor intensive manufactures	6.8	5.5	6.3	11.6	15.2	9.3	11.7	0.8	56.3	20.7	23.1	37.9
Manufactured intermediates	10.2	6.9	4.4	18.3	14.6	9.9	7.9	1.2	49.6	25.1	25.3	31.8
Machinery and equipment	10.5	8.4	11.3	36.9	27.2	19.3	14.8	1.0	50.6	29.3	20.1	37.6
Service	62.9	71.3	69.7	23.5	23.2	2.0	2.0	1.2	37.2	27.2	35.6	53.3
Total	100.0	100.0	100.0	100.0	100.0	5.5	5.4	0.0	41.1	25.6	32.6	47.0
Rest of the World												
Agriculture	7.1	9.6	5.6	4.6	2.3	6.2	3.5	1.5	44.6	0.7	23.3	64.0
Processed food	7.6	4.1	10.4	5.1	3.9	6.6	5.4	1.3	32.3	7.3	60.4	25.3

Resource based products	6.9	8.4	1.2	17.3	2.9	24.5	5.4	2.3	17.9	3.2	51.6	57.5
Labor intensive manufactures	8.7	6.2	7.1	15.9	11.9	18.0	14.7	1.1	42.2	9.1	48.6	34.0
Manufactured intermediates	12.3	7.2	4.8	15.7	18.3	12.5	15.0	1.0	36.4	10.5	53.1	28.0
Machinery and equipment	8.5	5.7	11.3	24.2	42.8	27.9	41.9	0.7	40.9	14.9	44.2	31.7
Service	48.9	58.9	59.5	17.2	17.8	3.4	3.8	0.9	34.4	19.9	45.7	57.2
Total	100.0	100.0	100.0	100.0	100.0	9.8	10.3	0.0	34.9	14.5	45.3	47.5

Data source: Calculated from the 1995 multi-regional SAM estimated by the author from Version 4 GTAP Database.

Table 3--Ad valorem import protection rate by regions, 1995

	United States	European Union	Japan	Taiwan	Hong Kong	China	Rest of The World	
				percent				
Agriculture	4.6	10.3	116.7	56.3	0.0	69.5	23.7	
Processed food	9.8	26.1	30.9	7.8	0.0	11.5	21.3	
Resource based products	0.8	0.4	0.5	4.7	0.0	4.5	6.0	
Labor intensive manufactures	5.6	5.9	4.0	4.7	0.0	22.0	11.6	
Manufactured intermediates	2.6	2.8	1.7	5.9	0.0	10.3	8.2	
Machinery and equipment	1.7	3.8	0.7	3.7	0.0	17.3	8.6	
Total	2.8	5.0	11.1	6.6	0.0	18.0	9.9	

Data source: Calculated from the 1995 multi-regional SAM estimated by the author from Version 4 GTAP Database except China. China's import protection rates were estimated by the authors based on China's recent tariff cuts. Data on China's recent tariff cuts were aggregated from the Harmonized Commodity Description and Coding System (HS) tariff schedules published by China's Customs Administration and weighted by 1995 trade data from China's custom statistics. The data were provided by the Development Research Center, State Council of People's Republic of China. China's import protection rate on agriculture includes tariff equivalence of non-tariff barriers based on (Zhang,Zhang and Wan, 1998).

Table 4

Shipping Margins Before and After Opening Direct Trade Between Taiwan and China

Sectors	Initial Margins		Resuming Direct Trade	
	China Export to Taiwan	Taiwan Export to China	China Export to Taiwan	Taiwan Export to China
Agriculture	19.9	22.1	6.7	7.2
Processed food	13.7	10.8	6.0	7.9
Resource based products	28.8	30.0	21.5	11.0
Labor intensive manufactures	10.5	10.3	5.0	5.2
Manufactured intermediates	13.8	10.1	8.3	4.9
Capital intensive	6.5	6.4	3.4	3.2

Data source: Estimate from version 4 GTAP database. The initial bilateral shipping margins are shipping margin for goods via Hong Kong to China or Taiwan, including fright and insurance.

Table 5 Impact of Chinese Free Trade Area: Macro and Trade Performance[a]

	United States	EU 15	Japan	Taiwan	Hong Kong	China	CEA	Rest of The World	World Total
Static capital market closure with cross Strait transport cost reduction									
					Changes from base: Billion US Dollars				
Social welfare (EV)	-0.4	-0.2	-2.1	7.5	2.4	0.5	10.5	-1.2	6.5
Total real exports	-1.2	-0.6	-1.0	15.0	8.8	48.7	72.5	-3.7	66.0
Real export to CEA	0.0	-1.6	-4.4	47.3	23.8	11.5	82.7	-6.1	70.5
Real export to China	-4.2	-5.4	-9.3	49.4	23.5	-	72.9	-15.1	38.8
Total real imports	-0.4	0.0	-0.7	21.6	11.9	43.6	77.1	-3.3	72.7
Real imports from CEA	-5.0	-0.8	-0.1	8.5	2.4	79.3	90.2	-4.1	80.2
Real import from China	10.8	9.3	7.4	8.1	4.5	-	12.6	11.5	51.6
					Percent change from base				
EV As percent of base GDP	0.0	0.0	0.0	2.7	2.4	0.1	1.0	0.0	0.0
International terms of tr	0.0	0.0	-0.1	5.6	3.4	-1.3	2.6	-0.1	-
Total real exports	-0.2	-0.1	-0.2	12.3	11.8	22.7	17.7	-0.3	1.8
Real export to CEA	0.0	-2.8	-5.3	196.9	121.3	69.7	137.3	-5.2	19.1
Real export to China	-25.7	-19.9	-27.8	302.6	135.5	-	216.6	-32.0	24.6
Total real imports	0.0	0.0	-0.2	20.1	10.5	26.4	20.0	-0.3	1.9
Real imports from CEA	-5.0	-1.0	-0.1	152.0	10.5	223.9	142.3	-3.6	18.7
Real import from China	21.9	18.8	16.6	252.5	31.5	-	71.9	18.0	22.9
Steady-state capital market closure with cross Strait transport cost reduction									
					Changes from base: Billion US Dollars				
Social welfare (EV)	-0.4	0.3	-1.8	10.4	4.4	11.7	26.5	-1.6	23.1
Total real exports	-1.0	-0.4	-0.8	16.2	11.0	52.8	80.0	-3.5	74.2
Real export to CEA	0.7	-1.0	-3.8	48.5	25.2	12.2	85.8	-4.5	77.2
Real export to China	-4.0	-5.2	-9.2	50.5	24.7	-	75.2	-14.4	42.3
Total real imports	0.0	0.4	-0.5	22.9	13.9	47.3	84.2	-2.7	81.3
Real imports from CEA	-3.7	0.4	0.5	8.8	2.8	81.8	93.5	-2.6	88.0
Real import from China	11.9	10.3	7.9	8.4	4.9	-	13.3	12.6	56.0

Percent change from base

EV As percent of base GDP	0.0	0.0	0.0	3.8	4.3	1.7	2.5
0.0	0.1						
International terms of tr	0.0	0.0	-0.1	5.7	3.3	-1.1	2.6
-0.1	-						
Total Real exports	-0.1	0.0	-0.2	13.3	14.7	24.7	19.5
-0.3	2.0						
Real export to CEA	1.3	-1.8	-4.5	201.8	128.1	73.5	142.5
-3.8	20.9						
Real export to China	-24.4	-19.3	-27.3	309.1	142.7	-	223.4
-30.7	26.8						
Total Real imports	0.0	0.0	-0.1	21.3	12.4	28.6	21.8
-0.2	2.1						
Real imports from CEA	-3.7	0.5	0.7	158.5	12.7	230.9	147.6
-2.3	20.5						
Real import from China	24.0	20.9	17.5	261.1	34.3	-	75.7
19.7	24.9						
Increase of capital stock	0.0	0.0	0.0	3.4	5.4	4.1	4.2
0.0	0.1						

Steady-state capital market closure without cross Strait transport cost reduction

Changes from base: Billion US Dollars

Social welfare (EV)	-0.3	0.5	-1.4	9.3	4.4	9.0	22.7
-1.1	20.4						
Total Real exports	-1.0	-0.4	-0.6	13.6	11.1	50.7	75.4
-3.4	70.0						
Real export to CEA	0.7	-0.8	-3.2	43.2	25.2	10.4	78.8
-3.6	71.9						
Real export to China	-3.7	-4.8	-8.2	44.9	24.9	-	69.8
-13.2	39.8						
Total Real imports	0.1	0.5	-0.1	19.4	14.0	41.8	75.2
-2.1	73.6						
Real imports from CEA	-3.0	0.8	1.0	6.5	3.1	73.2	82.8
-1.8	79.8						
Real import from China	11.7	10.2	7.9	6.1	4.9	-	11.0
12.5	53.3						

Percent change from base

EV As percent of base GDP	0.0	0.0	0.0	3.4	4.4	1.3	2.1
0.0	0.1						
International terms of tr	0.0	0.0	-0.1	5.1	3.3	-1.6	2.3
-0.1	-						
Total Real exports	-0.1	0.0	-0.1	10.5	14.9	23.8	18.1
-0.3	1.9						
Real export to CEA	1.4	-1.4	-3.8	133.9	130.2	57.8	113.3
-3.2	19.1						
Real export to China	-23.0	-17.9	-25.3	183.1	145.4	-	167.6
-28.8	24.4						
Total Real imports	0.0	0.1	0.0	17.8	12.5	24.6	19.2
-0.2	1.9						
Real imports from CEA	-3.0	1.0	1.4	91.1	13.9	170.1	114.5
-1.6	18.4						
Real import from China	23.9	21.0	17.9	127.3	34.6	-	58.0
19.9	23.8						
Increase of capital stock	0.0	0.0	0.0	2.8	5.4	3.9	3.9
0.0	0.1						

Data Source: Simulation results. The calculation of changes in real exports is based on base year f.o.b. prices, while the calculation of changes in real imports is based on base year c. i.f. prices.

Table 6 Impact of Chinese Free Trade Area: Changes in Sectoral Exports by Destination

Stated-state capital market closure

	United States	EU 15	Japan	Taiwan	Hong Kong	China	Rest of the world	World Total
				Change from base: Billion US dollars				
United States								
Agriculture	-	-0.03	0.00	0.69	0.12	-0.40	-0.05	0.34
Processed food	-	-0.01	0.11	0.14	0.11	-0.25	-0.03	0.07
Resource based products	-	-0.01	-0.01	0.05	0.03	-0.01	-0.01	0.05
Labor intensive manufactures	-	-0.31	-0.46	0.30	0.09	-1.15	-0.95	-2.48
Manufactured intermediates	-	-0.10	-0.05	0.48	0.28	-0.96	-0.21	-0.55
Machinery and equipment	-	-0.04	-0.03	0.23	0.39	-1.34	-0.08	-0.87
Services	-	0.27	0.04	1.47	0.29	0.09	0.26	2.43
Total	-	-0.23	-0.39	3.37	1.32	-4.02	-1.07	-1.01
European Union								
Agriculture	0.00	-	0.00	0.03	0.05	-0.09	0.03	0.03
Processed food	0.02	-	0.06	0.25	0.10	-0.17	0.05	0.32
Resource based products	0.00	-	0.00	0.07	0.07	-0.02	0.02	0.14
Labor intensive manufactures	-0.24	-	-0.48	0.38	0.27	-1.25	-1.59	-2.92
Manufactured intermediates	0.06	-	-0.02	0.37	0.45	-0.91	-0.04	-0.08
Machinery and equipment	0.35	-	0.05	0.19	0.54	-3.14	0.65	-1.37
Services	0.81	-	0.07	0.94	0.49	0.33	0.81	3.45
Total	1.01	-	-0.33	2.23	1.97	-5.25	-0.07	-0.43
Japan								
Agriculture	0.00	0.00	-	0.03	0.01	0.00	0.00	0.03
Processed food	0.00	0.00	-	0.09	0.03	-0.05	0.00	0.08
Resource based products	0.00	0.00	-	0.12	0.04	-0.01	0.01	0.16
Labor intensive manufactures	-0.03	-0.06	-	0.43	0.28	-3.41	-0.12	-2.92
Manufactured intermediates	0.07	0.02	-	0.97	0.49	-2.08	0.10	-0.45
Machinery and equipment	0.99	0.40	-	0.59	0.81	-3.62	0.92	0.08
Services	0.22	0.15	-	0.98	0.53	0.03	0.29	2.20

Total	1.26	0.50	-	3.20	2.17	-9.15	1.20
-0.82							
Taiwan							
Agriculture	-0.03	-0.03	-0.19	-	-0.01	4.29	-0.08
3.95							
Processed food	-0.11	-0.02	-1.05	-	-0.04	-0.01	-0.18
-1.41							
Resource based products	-0.11	-0.07	-0.13	-	-0.03	0.61	-0.15
0.12							
Labor intensive manufactures	-3.34	-1.30	-1.26	-	-0.67	24.73	-3.11
15.04							
Manufactured intermediates	-1.11	-0.66	-0.64	-	-0.18	11.44	-1.90
6.95							
Machinery and equipment	-4.90	-3.04	-1.56	-	-0.86	9.41	-4.27
-5.23							
Services	-0.62	-0.69	-0.86	-	-0.18	-0.01	-0.90
-3.26							
Total	-10.23	-5.81	-5.69	-	-1.98	50.45	-10.58
16.17							
Hong Kong							
Agriculture	0.00	-0.01	-0.03	0.00	-	0.41	0.00
0.36							
Processed food	-0.02	-0.01	-0.02	0.00	-	5.06	-0.09
4.93							
Resource based products	-0.01	0.00	-0.01	0.00	-	0.20	-0.01
0.18							
Labor intensive manufactures	-1.85	-1.35	-0.24	0.09	-	11.46	-0.73
7.38							
Manufactured intermediates	-0.03	-0.05	-0.03	0.08	-	2.98	-0.11
2.84							
Machinery and equipment	-0.48	-0.48	-0.13	0.05	-	6.18	-0.62
4.52							
Services	-2.41	-1.84	-0.99	0.23	-	-1.57	-2.61
-9.19							
Total	-4.79	-3.75	-1.45	0.45	-	24.72	-4.16
11.02							
China							
Agriculture	-0.02	-0.07	-0.09	0.47	0.06	-	-0.16
0.19							
Processed food	0.02	0.02	0.13	0.08	0.22	-	0.06
0.52							
Resource based products	0.00	0.00	0.00	0.35	0.05	-	0.01
0.42							
Labor intensive manufactures	7.86	6.40	5.51	2.86	3.01	-	7.50
33.14							
Manufactured intermediates	0.73	0.86	0.61	2.24	0.55	-	1.62
6.60							
Machinery and equipment	2.63	2.34	1.16	1.38	0.53	-	2.86
10.89							
Services	0.11	0.26	0.18	0.10	0.27	-	0.17
1.09							
Total	11.32	9.81	7.50	7.48	4.68	-	12.05
52.85							
Rest of the world							
Agriculture	0.11	0.14	0.08	0.26	0.17	-0.68	-
0.07							
Processed food	0.09	0.05	0.32	0.48	0.23	-1.59	-
-0.41							

Resource based products	0.09	0.07	0.03	0.49	0.25	-0.16	-0.78
Labor intensive manufactures	-0.82	-1.56	-1.08	0.83	0.59	-7.30	-9.35
Manufactured intermediates	0.22	-0.02	-0.01	0.76	1.17	-3.42	-1.30
Machinery and equipment	1.05	0.32	0.07	0.24	1.01	-1.49	-1.21
Services	0.61	0.73	0.41	1.72	1.82	0.18	-5.46
Total	1.35	-0.26	-0.18	4.77	5.23	-14.45	-3.55

Data source: Simulation results from the steady-state capital market closure.

Table 7 **Impact of Chinese Free Trade Area: Structure Change**

Stated-state capital market closure

Changes in world Market share	Structure Change				Factor Reallocation		
	Production	Consumption	Exports	Imports	Unskilled labor	Skilled Labor	Capital
	Percent change from base						
United States							
Agriculture	0.1	0.0	1.0	0.3	0.2	0.2	0.2
-1.1							
Processed food	0.0	0.0	0.2	0.0	0.0	0.0	0.0
-0.5							
Resource based products	-0.1	0.0	0.3	0.0	-0.1	-0.1	-0.1
0.0							
Labor intensive manufactures	-0.7	0.0	-4.2	1.0	-0.7	-0.7	-0.7
-1.2							
Manufactured intermediates	-0.1	0.0	-0.5	-0.1	-0.1	-0.1	-0.1
-0.5							
Machinery and equipment	0.0	0.0	-0.3	-0.1	0.0	0.0	0.0
-0.2							
Services	0.1	0.0	1.4	-1.0	0.1	0.0	0.0
0.3							
European Union (15 members)							
Agriculture	0.0	0.0	0.2	0.0	0.0	0.0	0.0
-0.4							
Processed food	0.1	0.0	0.7	0.1	0.1	0.0	0.1
-0.6							
Resource based products	0.0	0.0	0.4	0.0	0.0	0.0	0.0
0.0							
Labor intensive manufactures	-0.6	0.0	-2.8	1.4	-0.6	-0.6	-0.6
-1.8							
Manufactured intermediates	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1
-0.7							
Machinery and equipment	-0.1	0.0	-0.4	-0.2	0.0	-0.1	-0.1
-0.3							
Services	0.1	0.0	1.6	-0.6	0.1	0.0	0.1
0.4							
Japan							
Agriculture	0.2	0.0	7.5	-0.6	0.3	0.3	0.2
0.0							
Processed food	0.2	0.0	4.2	-1.7	0.2	0.2	0.2
0.0							
Resource based products	0.1	-0.2	2.6	-0.2	0.2	0.2	0.1
0.0							
Labor intensive manufactures	-1.1	0.0	-9.4	3.2	-1.0	-1.0	-1.1
-0.9							
Manufactured intermediates	-0.1	-0.1	-0.7	-0.3	0.0	0.0	-0.1
-0.4							
Machinery and equipment	0.0	-0.1	0.0	-0.6	0.1	0.1	0.1
-0.2							
Services	0.0	-0.1	3.9	-1.1	0.0	0.0	0.0
0.3							
Taiwan							
Agriculture	10.1	2.2	633.9	41.1	10.7	12.1	15.5
3.4							

Processed food	-6.1	1.7	-41.5	31.2	-8.8	-7.7	-4.9
-1.0							
Resource based products	-4.6	9.9	8.0	23.2	-7.7	-6.5	-3.7
0.0							
Labor intensive manufactures	29.3	5.7	58.8	55.4	23.6	25.2	29.0
2.3							
Manufactured intermediates	6.2	10.1	33.1	22.3	0.7	2.0	5.1
1.1							
Machinery and equipment	-9.5	7.3	-8.6	6.1	-14.4	-13.3	-10.6
-0.4							
Services	1.5	8.6	-36.7	30.9	-0.9	0.4	3.4
-0.4							
Hong Kong							
Agriculture	7.1	0.9	309.2	16.2	4.8	7.3	13.0
0.3							
Processed food	120.6	0.8	695.4	13.9	107.5	112.3	123.7
3.2							
Resource based products	1.7	7.8	68.2	7.4	-4.0	-1.8	3.5
0.1							
Labor intensive manufactures	25.0	0.7	52.3	16.0	16.6	19.3	25.7
1.1							
Manufactured intermediates	39.5	7.9	98.7	18.6	30.1	33.1	40.2
0.5							
Machinery and equipment	27.4	5.9	38.7	6.0	18.9	21.7	28.2
0.3							
Services	-2.8	10.4	-21.1	16.8	-7.7	-5.6	-0.5
-1.3							
China							
Agriculture	0.0	2.5	3.0	37.7	-1.6	-2.2	2.0
0.0							
Processed food	-0.5	3.7	7.3	66.8	-3.3	-3.9	0.2
0.2							
Resource based products	3.4	4.0	4.6	11.4	1.9	1.3	5.6
0.1							
Labor intensive manufactures	5.6	6.2	33.9	82.5	0.4	-0.2	4.1
4.6							
Manufactured intermediates	4.3	8.2	24.3	19.3	-0.2	-0.8	3.4
1.0							
Machinery and equipment	6.3	8.2	21.9	8.4	1.5	0.9	5.2
0.8							
Services	3.1	5.9	6.3	-5.8	0.6	0.0	4.3
0.1							
Rest of the World							
Agriculture	0.0	0.0	0.1	-0.9	0.0	-0.1	-0.1
-2.2							
Processed food	-0.1	0.0	-0.8	-0.4	0.0	-0.1	-0.1
-1.4							
Resource based products	0.0	-0.1	0.4	-0.4	0.1	0.0	0.0
-0.2							
Labor intensive manufactures	-1.3	0.0	-4.7	0.6	-1.3	-1.4	-1.3
-4.1							
Manufactured intermediates	-0.1	-0.1	-0.7	-0.2	-0.1	-0.2	-0.1
-1.0							
Machinery and equipment	0.2	-0.1	0.4	-0.1	0.3	0.2	0.2
-0.1							
Services	0.1	-0.1	2.5	-0.9	0.1	0.1	0.1
0.7							

Data source: Simulation results from the steady-state capital market closure.

Table 8 The Impact of a 50% Tariff Cut among CEA and Major Industrial Countries[a] --Social Welfare and Aggregate Trade Performance

	CEA Along	CEA + Japan	CEA + US	CEA+US +Japan	CEA+US + EU	CEA+EU +Japan	CEA+all others	CEA Along	CEA + Japan	CEA + US	CEA+US +Japan	CEA+US + EU	CEA+EU +Japan	CEA+all others
	Changes from base in billion US dollars							*Percent change from base*						
United States														
Social welfare (EV)	-0.4	-1.2	4.4	14.5	10.6	-2.5	20.9	0.0	0.0	0.1	0.2	0.1	0.0	0.3
Total exports	-1.0	-2.3	13.2	28.3	26.5	-4.9	48.3	-0.1	-0.3	1.8	3.9	3.7	-0.7	6.7
Export to CEA	0.7	-0.5	21.0	17.0	18.9	-1.2	13.2	1.3	-0.9	41.9	33.8	37.7	-2.4	26.3
Export to China	-4.0	-4.8	8.1	5.8	6.8	-5.3	2.8	-24.4	-29.2	49.6	35.3	41.6	-32.5	17.3
Total imports	-0.3	-1.3	14.2	30.2	28.0	-3.5	54.5	0.0	-0.1	1.6	3.4	3.2	-0.4	6.2
Imports from CEA	-3.6	-3.3	20.9	21.8	17.8	-4.4	9.2	-3.5	-3.3	20.8	21.7	17.7	-4.3	9.2
Import from China	10.7	10.5	28.3	28.7	25.8	9.6	19.2	21.6	21.3	57.3	58.2	52.2	19.4	39.0
European Union (15 members)														
Social welfare (EV)	0.3	-0.4	-0.2	-1.2	16.1	13.5	43.6	0.0	0.0	0.0	0.0	0.2	0.2	0.5
Total exports	-0.8	-2.0	-2.9	-8.5	28.7	27.0	92.0	-0.1	-0.2	-0.3	-0.9	3.2	3.0	10.3
Export to CEA	-1.1	-3.7	-1.2	-4.1	18.2	15.5	12.4	-1.8	-6.1	-2.0	-6.9	30.5	26.1	20.8
Export to China	-5.3	-7.3	-5.2	-7.3	11.9	9.5	7.8	-19.3	-26.7	-19.2	-26.9	44.0	35.0	28.6
Total imports	-0.2	-1.3	-2.1	-7.0	29.9	28.2	96.9	0.0	-0.1	-0.2	-0.8	3.4	3.2	11.0
Imports from CEA	0.2	0.1	-1.3	-0.8	21.0	23.1	11.7	0.3	0.2	-1.5	-1.0	25.4	27.9	14.2
Import from China	9.2	8.9	8.3	8.5	26.5	27.6	18.7	18.7	18.1	16.9	17.3	53.7	56.1	38.0
Japan														
Social welfare (EV)	-1.8	9.4	-3.5	66.2	-7.0	15.9	100.4	0.0	0.2	-0.1	1.3	-0.1	0.3	2.0
Total exports	-1.2	14.6	-2.4	33.9	-5.8	24.7	69.1	-0.3	3.0	-0.5	7.0	-1.2	5.1	14.2
Export to CEA	-3.8	19.5	-4.0	20.7	-6.0	16.2	11.9	-4.6	23.4	-4.8	24.8	-7.2	19.4	14.2
Export to China	-9.2	10.7	-9.0	11.6	-10.9	7.8	6.5	-27.3	31.9	-26.9	34.5	-32.4	23.3	19.4
Total imports	-0.9	15.1	-1.8	34.9	-5.0	25.5	72.3	-0.2	3.5	-0.4	8.0	-1.2	5.8	16.6
Imports from CEA	0.2	19.3	0.2	14.4	-1.4	14.6	8.1	0.3	28.7	0.3	21.3	-2.0	21.7	12.0
Import from China	7.0	19.6	6.2	14.7	4.8	16.0	10.5	15.6	43.6	13.8	32.8	10.6	35.5	23.3
Taiwan														
Social welfare (EV)	10.4	11.2	14.1	14.4	14.2	11.2	15.0	3.8	4.1	5.1	5.2	5.1	4.1	5.4
Total exports	22.2	24.2	27.8	29.0	28.5	25.2	33.0	18.2	19.9	22.9	23.8	23.4	20.7	27.1
Export to CEA	51.8	47.5	53.1	48.7	52.0	47.0	46.3	215.5	197.6	221.0	202.8	216.4	195.9	192.8
Export to China	53.5	49.2	54.8	50.4	53.7	48.7	48.0	328.0	301.4	335.9	309.0	329.0	298.6	294.3
Total imports	22.2	24.2	27.9	29.1	28.6	25.3	33.4	20.6	22.5	25.9	27.0	26.6	23.5	31.0
Imports from CEA	8.2	7.7	7.5	7.0	7.1	7.4	6.1	147.0	138.8	133.6	126.3	127.4	132.5	110.2
Import from China	7.6	7.2	7.0	6.6	6.7	6.9	5.8	238.3	225.5	216.7	205.9	207.7	216.4	181.3

Hong Kong													
Social welfare (EV)	4.4	4.2	5.3	5.3	5.6	4.5	6.0	4.3	4.2	5.2	5.3	5.5	4.4
5.9													
Total exports	13.8	13.0	15.2	14.0	15.4	13.5	15.2	18.4	17.3	20.3	18.7	20.6	18.1
20.3													
Export to CEA	26.5	24.8	26.2	24.1	25.0	24.0	22.4	135.1	126.4	133.2	122.6	127.4	122.1
113.9													
Export to China	26.0	24.3	25.7	23.7	24.6	23.6	22.1	150.2	140.5	148.3	136.6	142.0	136.0
127.4													
Total imports	13.8	13.0	15.2	14.0	15.4	13.6	15.3	12.3	11.5	13.5	12.5	13.7	12.1
13.6													
Imports from CEA	2.8	2.5	2.9	2.8	2.7	2.4	2.4	12.4	11.3	13.0	12.3	11.9	10.9
10.6													
Import from China	4.6	4.3	4.7	4.5	4.5	4.2	4.2	32.0	30.1	32.9	31.6	31.0	29.1
29.0													
China													
Social welfare (EV)	11.7	18.0	24.3	29.9	33.4	27.5	55.5	1.7	2.6	3.5	4.3	4.8	4.0
8.0													
Real exports	48.1	58.5	61.7	70.4	73.5	70.7	103.3	22.5	27.3	28.8	32.9	34.3	33.0
48.2													
Export to CEA	11.7	11.0	11.2	10.7	10.6	10.6	9.6	70.6	66.7	67.4	64.4	64.3	64.3
57.8													
Total imports	48.2	58.6	61.8	70.6	73.7	70.9	104.0	29.1	35.5	37.4	42.7	44.6	42.9
62.9													
Imports from CEA	82.7	76.5	83.8	77.1	81.5	75.2	72.9	233.4	215.8	236.3	217.5	230.0	212.2
205.7													
CEA Total													
Social welfare (EV)	26.5	33.4	43.8	49.6	53.1	43.2	76.5	2.5	3.1	4.1	4.6	4.9	4.0
7.1													
Total exports	84.0	95.7	104.7	113.4	117.4	109.5	151.4	20.5	23.3	25.5	27.6	28.6	26.7
36.9													
Export to CEA	90.0	83.3	90.4	83.5	87.6	81.7	78.3	149.5	138.4	150.1	138.6	145.5	135.7
130.0													
Export to China	79.5	73.5	80.5	74.1	78.3	72.3	70.1	236.4	218.6	239.3	220.2	232.7	214.9
208.3													
Total imports	84.2	95.9	104.9	113.7	117.8	109.8	152.7	21.8	24.9	27.2	29.5	30.5	28.5
39.6													
Imports from CEA	93.7	86.8	94.1	86.9	91.3	85.1	81.4	147.8	136.9	148.5	137.1	144.0	134.2
128.4													
Import from China	12.2	11.6	11.7	11.1	11.1	11.1	10.0	69.7	65.8	66.5	63.5	63.3	63.4
56.8													

Data source: Simulation results from the steady-state capital market closure. The calculation of changes in exports is based on current f.o.b. prices, while the calculation of changes in imports is based on current c. i.f. prices.

APPENDIX A

Sector Classification in the Model and Their SALTER-ISIC Concordance

Sectors in the Model	GTAP[a] 4 Sector Number and Description	ISIC[b] Rev. 3 CODE
Agriculture	*1 Paddy rice, 2 Wheat, 3 Cereal grains n.e.c., 4 Vegetables, fruit, nuts, 5 Oil seds, 6 Sugar cane, sugar beet, 7 Plant-based fibers, 8 Crop n.e.c.*	*01111, 15311, 01301, 01401, 01112, 01302, 01402, 01113, 01303, 01403, 01116,01307, 01407, 01114, 01115, 01117, 01121, 01122,01304, 01305, 01306,01308,*
	9 Bovine cattle, sheep and goats, houses, 10 Animal products, n.e.c. 11 Raw milk, 12 Wool, silk-worn cocoons	*01404,01405, 01406, 01408, 01211, 01212, 01213,0122, 01309, 013010, 013011, 013012, 01409, 014010, 014011, 014012*
Processed Food	*19 Bovine cattle, sheep and goats, houses meat products, 20 Meat products, n.e.c. 21 Vegetable oils and fats, 22 Dairy products, 23 Processed rice, 24. Sugar, 25 Food products n.e.c. 26 Beverages & tobacco*	*1511-14,1520, 15312, 1532,1533,1541-44,1549,1551-54,1600*
Natural Resource based products	*13 Forestry, 14 Fishing, 15 Coal, 16 Oil, 17 Gas, 18 Minerals n.e.c, 34 mineral products, n.e.c.*	*0150, 0200,0500, 1010,1020,1030, 1110, 1120,1200,1310,1320,1410,1421,1422,1429 ,2310,2320,2610,2691-96,2699*
Labor intensive manufacture	*27 Textiles, 28 Wearing apparel, 29 Leather products, 30 wood products, 31 paper products, publishing, 42 manufactures n.e.c.*	*1711-12,1721-23,1729-30, 1810,1820,2430 1911-12,1920,2010,2021,-23,2029,2101-02,2109,2211-13,2219,2221-22, 3610, 3691-94,3699*
Manufacture Intermediates	*32 Petroleum, coal products, 33 Chemicals, rubber and plastic products, 35 Ferrous metals, 36 metals n.e.c., 37 Metal products*	*2330,2411-13,2421-24,2429,2511,2519-20,2710,2720,2731-32,2811-13,2891-93, 2899*
Capital (human and physical) Intensive Products	*38 Motor vehicles and parts, 39 Transport equipment n.e.c., 40 Electronic equipment, 41 Machinery and equipment n.e.c.*	*3410,3420,3430, 3000,3210,3220,3230,3511, 3512,3520,3530,3591,3592,3599,2213,2230 ,2911-15,2919,2921-27,2929-30, 3110, 3120, 3130,3140,3150,3190, 3311-13, 3320,3330*

Sectors in the Model	GTAP[a] 4 Sector Number and Description	ISIC[b] Rev. 3 CODE
Services	*43 Electricity, 44 gas manufacture, distribution, 45 Water, 46 Construction, 50 dwellings* *47 Trade, transport, 48 Financial, business, recreational services, 49 Public administration and defense, education, health services*	*4010,4020,4030,4510,4520,4530,4540,4550 ,3710,3720,4100,4510,50105020,5030,5040 ,5050,5110,5121-22,5131,5139, 5141-43,5149-50,5190,5220,5231-34, 5239-40,5251-52,5259-60, 5510,5520, 6010,6021-23,6030,6110,6120,6210, 6220,6301--04,6309,6411-12,6420, 6511,6519,6591-92,6599,6601-03,6711-12,6719-20,7010,7020,7111-13,7121-23,7129,7130,7210,7220,7230, 7240, 250,7290,7310,7320,7411-14,7421-22, 7430,7491-95,7499,7511-14, 7521-23,7530,8010,8021-22,8030,8090, 8511-12,8519-20,8531-32,9000,9111-12,9120,9191-92,9199,9211,-14,9219-20,9231-33,9241,9249,9301-03,9309, 9500,9900*

a. Global Trade Analysis Project, vesion 4 (Hertel, 1997).

b. International Standard Industry Classification.

REFERENCES

Balassa, B. (1965) "Trade Liberalization and Revealed Comparative Advantage," *The Manchester School of Economics and Social Studies* 33:99-124.

Brooke, A., David Kendrick and Alexander Meeraus (1988) *GAMS: a User's Guide,* New York: The Scientific Press.

Cheng Chu-yan (1998) "Economic Relations across the Taiwan Straits: Interdependence and Conflicts," Paper presented on the 40th Annual Conference of the American Association for Chinese Studies, October 31, New York City.

Crook, Frederick W. (1993) "Underreporting of China's Cultivated Land Area: Implications for World Agricultural Trade," *International Agriculture and Trade Reports: China,* United States Department of Agriculture, Economic Research Service, Washington, D.C.

Devarrajan, Shantayanan, Jeffrey D. Lewis and Sherman Robinson (1990) " Policy Lesson From Trade-Focused, Two-Sector Models," *Journal of policy modeling* 12, 25-657.

de Melo, J. and David Tarr (1992) *A General Equilibrium Analysis of US Foreign Trade Policy,* Cambridge:The MIT Press.

Francois, Joseph, Bradley McDonald, and Hakan Nordstrom (1995) " Assessing the Uruguay Round," in: Martin, Will, and Alan Winters eds, *The Uruguay Round and the Developing Economies,* World Bank Discussion Paper 307. The World bank, Washington, D.C.

Gehlhar Mark J.(1993) "Development and Reconciliation of Trade Data to Complement the Salter Regional IO Tables for Use in the Global Trade Analysis Project." Department of Agricultural Economics, Purdue University.

Hansen, Terje, and Tjalling, Koopmans (1972) " On the Definition and Computation of a Capital Stock Invariant Under Optimization," *Journal of Economic Theory* 5, 487-523.

Harrison Glenn W., Thomas F. Rutherford, and David G. Tarr (1995) "Quantifying the Uruguay Round," in Martin, Will, and Alan Winters eds., *The Uruguay Round and the Developing Economies,* World Bank Discussion Paper 307. The World Bank, Washington, D.C.

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

Howe, H. (1975) “Development of the Extended Linear Expenditure System from Simple Savings Assumptions,” *European Economic Review* 6, 305-310.

Lewis, Jeffrey D., Sherman Robinson, and Zhi Wang (1995) “Beyond the Uruguay Round: The Implication of an Asian Free Trade Area,” *China Economic Review - An International Journal* 7, 35-90.

Sung, Yun-Wing (1991) *Explaining China's Export Drive: The Only Success Among Command Economies*, Institute of Asia-Pacific Studies, the Chinese University of Hong Kong, Hong Kong.

Sung, Yun-Wing (1992*) Non-institutional Economic Integration Via Cultural Affinity: The Case of Mainland China, Taiwan and Hong Kong*, Institute of Asia-Pacific Studies, the Chinese University of Hong Kong.

Wang, Zhi (1994) “The Impact of Economic Integration Among Taiwan, Hong Kong and China -- A Computable General Equilibrium Analysis,” Department of Applied Economics, Ph.D Dissertation, University of Minnesota.

Wang, Zhi and Jean Kinsey (1994) “Consumption and Saving Behavior under Strict and Partial Rationing,” *China Economic Review - An International Journal*.5, 83-100.

Wang, Zhi (1996) “The Trade Triangle in East Asia," Chapter 9 in Pitou van Dijck, and Gerrit Faber eds., *The Challenges to the New World Trade Organization*, the Hague: Kluwer Law International.

Wang, Zhi and James Slagle (1996) “ An Object-oriented Knowledge-based Approach for Formulating Applied General Equilibrium Models,” *Journal of Economic Dynamics and Control* 20, 209-236.

Wang, Zhi (1997). "The Impact of China and Taiwan Joining the World Trade Organization on U.S. and World Agricultural Trade: A computable General Equilibrium Analysis" Technical Bulletin, No. 1858, U.S. Department of Agriculture, Economic Research Service.

Wang, Zhi and Edward Schuh (1998) "The Emergence of a ‘Create China’ and its Impact on World Trade -- a Computable General Equilibrium Analysis" Paper presented on the 40th Annual Conference of the American Association for Chinese Studies, October 31, New York City.

Whalley, J. (1985) Trade Liberalization among Major World Trading Areas, Cambridge: The MIT press.

Zhang Shuguang, Zhang Yansheng, and Wan Zhongxin (1998). “*Measuring the Costs of Protection in China*” Institute for International Economics, Washington, D.C