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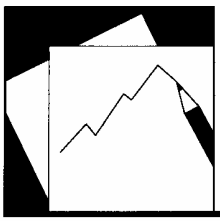

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Crouching Tiger, Hidden Dragon: What Are the Consequences of China's WTO Entry for India's Trade?

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Crouching Tiger, Hidden Dragon: What Are the Consequences of China's WTO Entry for India's Trade?

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Abstract

One of the most significant recent developments in world trade has been the entry of China into the World Trade Organization (WTO). This paper examines the implications of China's WTO accession for India's trade, using both econometrics and computable general equilibrium (CGE) models. The paper analyzes how India stands to lose or gain from China's WTO entry in terms of both the direct and competitive channels.

JEL Classification Numbers: F14

Keywords: China; India; Trade; World Trade Organization (WTO); CGE models

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I. INTRODUCTION

China became the one hundred forty-third member of the World Trade Organization (WTO) on December 11, 2001 after having negotiated the terms of its entry for 15 years.[2] Given the potential size of the Chinese market, this may have been a watershed event in the history of world trade. The world reaction to the Chinese entry into the WTO has been mixed. While most countries welcome the opportunities for access to China's large domestic markets, developed countries fear that inexpensive Chinese imports will flood their domestic markets, and developing countries are concerned that China will undercut their export markets in the West and shrink their receipts of foreign direct investment (FDI).[3] While the overall welfare effects are generally assessed to be positive, the expected effects vary by country, depending on the similarity of its trade structure to China's.

This paper focuses on the effect of China's entry into the WTO on India's trade. The two neighbors are heavily populated, with over a billion people each. The Indian economy competes with China in exports of many products, especially labor-intensive manufactured goods, such as textiles, garments, leather goods, and light machinery, and in attracting FDI (Agarwal and Sahoo, 2003). The United States is the largest export destination for both countries, accounting for about 20–22 percent of their exports. Thus, India may be one of the countries most likely to experience trade diversion to China. Conversely, India may gain from opportunities to access the Chinese market as a result of China's commitments to reduce trade barriers.[4]

The paper addresses the question of the effect of China's WTO entry on India's trade through several complementary approaches, following the provision of some summary information on the protocol of China's WTO entry in Section II. We compare the two countries' current structure—indicating opportunities for bilateral trade expansion—and measure the extent to which the two countries compete in third markets (Section III). China's trade liberalization raises the specter that trade in third markets could be diverted from India to China. Econometric analysis of historical patterns of trade is examined in Section IV to gauge the extent to which this trend prevailed during the past decade. In addition to presenting the current and historical evidence on Chinese and Indian trade patterns, we conduct simulation analysis using a static computational general-equilibrium model in Section V. Specifically, we use an aggregation from the Global Trade Analysis Project (GTAP) data base and model

[2] India was an original member of the GATT (General Agreement on Tariffs and Trade).

[3] Shafaeddin (2003) argues that the competitive effects of China's accession on developing countries are exaggerated in the literature.

[4] China will have to open up the domestic economy; reduce tariffs, including quantitative restrictions on imports, and nontariff barriers; and eliminate price controls in domestic market (Agarwal and Sahoo, 2003).

to investigate the global effects of China's WTO accession on India's trade. Section VI concludes.

II. CHINA'S WTO ACCESSSION PROTOCOL

Accession will require China to substantially reduce tariffs on agricultural and industrial goods (WTO, 2001), to limit subsidies for agricultural production, and to forgo state monopolization of international trade in grain (Lin, 2001). China has agreed to phase out all quantitative restrictions on industrial products, to remove mandatory requirements for foreign investment, and to enforce property rights for intellectual property. In addition, China has promised to open up its services sector (including telecom and financial services) to foreigners, and remove restrictions on trading and distribution for most products (Rumbaugh and Blancher, 2004). Chinese entry into the WTO is widely expected to provide continued impetus to trade growth. Accession is expected to help accelerate China's integration into world agricultural trade patterns (Huang, Rozelle, and Zhang, 2001), spur continued domestic reforms (Bajona and Chu, 2002), and help tear down the existing interregional trade barriers (Li, Qiu, and Sun, 2002).

In return, China will receive permanent most-favored-nation status with the United States; its partners will lift most quantitative restrictions on a range of products and phase out quotas on textiles and clothing. China also gains access to the WTO dispute-settlement mechanism to protect its trade interests and can participate in multilateral negotiations on trade rules and future trade liberalization.

However, there are several discriminatory provisions which could limit China's access to world markets (Adhikari and Yang, 2002):

- Under the transitional product-specific safeguard mechanism, China's trading partners may impose restrictions on Chinese imports based on "market disruption or the threat of market disruption." This provision will last 12 years after accession and contrasts with the normal WTO standard under which restrictions can be imposed on imports only if there is a more stringent test of "serious injury" or a "threat of serious injury." In addition, the transitional safeguard mechanism can be taken by a third country—without establishing evidence of market disruption—to prevent diversion of Chinese exports due to the action of the first country.

- A special safeguard mechanism will be in place until the end of 2008 on China's textiles and clothing exports, even though all quotas were phased out on January 1, 2005. This mechanism will allow importing countries to restrict imports from China when they result in market disruption.

- WTO members can invoke antidumping and subsidy charges based on prices or costs that prevail in other nonmarket economies.

III. INDIA AND CHINA: TRADE STRUCTURE

The current structure of trade and recent trends in trade patterns may suggest whether India will likely benefit from China's further integration with the rest of the world. In this section, we construct several indices for India and China. The Herfindahl index of specialization, indices of revealed comparative advantage, and our own measure of third-market competition provide information about current patterns of trade specialization. The Grubel-Lloyd index measures the extent of intra-industry trade, and the COS index measures the potential for direct trade. Data on trade by 6-digit HS industry subheadings was obtained from the United Nations' COMTRADE database, as reported by the World Bank's World Integrated Trade Solutions.

A. Herfindahl Index of Specialization

The Herfindahl index is a measure of concentration that was originally developed to describe an industry's structure, that is, whether a particular industry is characterized by one large monopoly firm or many small firms. The Herfindahl index then has been used in the trade literature to measure the extent to which exports (or imports) are diversified or specialized.

The index is constructed as follows:

$$H_j \equiv \sum_i \left(s_i^j\right)^2 \text{ where } s_i^j = \frac{x_i^j}{\sum_i x_i^j} \ .$$

where x_i^j denotes country j's exports of HS subgroup i, s_i^j is the share of good i in country j's exports, where the summation is taken over all HS subgroups. H is bounded by (0,1). A high value of H indicates that the country is specialized in the production of a few goods.

The Herfindahl indices, shown in Table 1, suggest that exports of India, China, and the United States are relatively diversified at the subheading level.[5] The degree of specialization shows no significant trends over the 1990s for any of the countries. India is least diversified of the three countries, and China is surprisingly more diversified than the United States [6]

[5] Given the nature of the index, trade would typically be more diversified for a finer classification than for broad industry groups. For example, at the one-digit level, India's Herfindahl index is 0.13, or roughly five times larger than at the six-digit level.

[6] The trade statistics do not contain information about service exports.

B. Revealed Comparative Advantage

Although the Herfindahl index is a useful simple measure to describe the degree of specialization, it does not indicate product categories of specialization. In contrast, indices of revealed comparative advantage (RCA) indicate the goods or groups of goods in which a country has "revealed" its comparative advantage relative to the world on the basis of actual trade.[7]

$$RCA_{ij} \equiv \frac{s_i^j}{s_i^w}$$

The index measures the share of good *i* in the exports of country *j* relative to the share of good *i* in the world's total exports. $RCA_{ij} > 1$ implies that country *j* has a comparative advantage in the product *i* relative to the world. In other words, if a country's RCA for a particular good (or category of goods) is greater than 1, then the country tends to export more of the good as a share of its total exports than other countries in the world on average.

We compare the RCAs of China and India by broad industry groups to look for areas of common specialization. Figures 1–3 display the revealed comparative advantages of India and China in each of the one-digit HS groupings.

- India, but not China, has some revealed comparative advantage (RCA) in agricultural products (industries 0&1).

- Neither China nor India has much RCA in beverages, fuels, and chemicals (industry 2), chems & pharmaceuticals (industry 3), hides and forest products (industry 4), and in articles of metal and transport vehicles (industry 8), although China has been growing fast toward the average in the latter category.

- India has RCA in metals (industry 7), while China has RCA in manufacturing of instruments, arms, toys, and other products (industry 9).

Textiles and clothing represent the area in which India and China have the predominant revealed comparative advantage (Figure 3). Exports from this sector have averaged about 30 percent of total exports for both countries over the period 1992–2001. Even within this sector, there are areas of specialization. India has relatively higher comparative advantage in basic materials (industry 5), while China has a stronger comparative advantage in produced articles of clothing using textiles (industry 6). This pattern has been noted by other researchers. Shafaeddin (2004) points out that China and India compete in textiles and clothing, but only in limited items. India concentrates on exporting undergarments and

[7] This measure, and others, must be interpreted cautiously due to the fact that actual trade partly reflects the outcome of trade distorting policies such as tariffs and nontariff barriers.

miscellaneous textile items and China in outer-garments. India has gained comparative advantage in textiles and non-knitted undergarments, while China is strong in headgear and knitted undergarments.

This pattern of specialization in textiles and clothing provides an opportunity for India to expand its trade with China. India is the world's third-largest cotton producer (after the United States and China) with 25 percent of the world cotton area and 15 percent of the world cotton output. India also ranks second in textile production (after China) and third in the production of filament yarn (Elbehri, Hertel, and Martin 2003). Shafaeddin (2004) shows that China has been a growing importer of high-quality textiles—mainly from Japan and the newly industrialized economies—for the sale of clothing items in foreign markets. However, India has not been able to take advantage of this opportunity, in part because India's textile industry has operated under a variety of government-imposed restrictions such as export quotas on cotton and cotton yarn, and restrictions on firm size, labor utilization, and importation of production materials (Elbehri, Hertel, and Martin 2003). These policies have discouraged cotton exports and protected the domestic textile industry, which is the second-largest employer after agriculture.

C. Index of Trade Competition

Although the Herfindahl index measures the degree of specialization in trade, it does not indicate whether two countries are specialized in the same or different products. RCAs are computed on a good by good basis or by taking some other subcomponent shares of total exports. However, the RCA cannot be computed for a country's total exports, which would divide the aggregate by itself for all countries.

We have constructed a new index based on Cerra (2004) that measures the extent to which two countries compete in world markets based on the similarity of the composition of their trade. This index aggregates the information about export shares by product and measures the extent to which the countries are exporting the same products in world markets. Thus, it indicates how much they compete against each other in terms of products.

$$V_t = 1 - \frac{\sum_i \left| s_i^j - s_i^k \right|}{2}$$

s_i^j is the share of good *i* in country *j*'s exports. *V* measures the portion of trade of two countries, *j* and *k*, that compete in world markets. If *V* is equal to zero, the two countries export entirely different goods. If *V* is equal to one, they export the same goods in identical shares of their total trade.

An alternative measure would subtract off direct trade between countries j and k to get competition in third markets:

$$z_i^j = \frac{\left(x_i^{jw} - x_i^{jk}\right)}{\sum_i \left(x_i^{jw} - x_i^{jk}\right)}$$

According to calculations presented in Table 1, India and China compete in only 25 percent of their products exported to world markets. Direct trade between the two countries is relatively small, thus the indices excluding direct trade are very similar. Moreover, there are no apparent trends over the decade 1992–2001 in the degree of trade competition.

D. Grubel-Lloyd Intra-Industry Trade

Ricardian trade theory predicts that countries would trade on the basis of their comparative advantage in different products. Thus, trade would be inter-industry. However, much actual trade between countries consists of differentiated goods within the same industry. This pattern would be consistent with new trade theory involving product differentiation. The Gruber-Lloyd intraindustry trade index measures the proportion of total trade comprised by intraindustry trade.[8]

$$IIT_i \equiv \frac{\left[\left(x_i + m_i\right) - \left|x_i - m_i\right|\right]}{\left(x_i + m_i\right)}$$

If there is no intra-industry trade, then either x_i or m_i will be zero and the IIT_i index will be zero. If all trade is intra-industry, then x_i=m_i and the IIT_i will be one for good i. The aggregate index for each country uses the weighted mean:

$$AIIT_i \equiv \frac{\sum_i \left(x_i + m_i\right) - \sum_i \left|x_i - m_i\right|}{\sum_i \left(x_i + m_i\right)}$$

According to calculations (Table 1), about half of U.S. trade has been intra-industry trade since 1992. China and India have less intra-industry trade. In 2001, for instance, China's and India's intraindustry trade accounted for 31 percent and 18 percent of the total, respectively. However, intraindustry trade has grown for both countries since 1992. Intraindustry trade between China and India has been less than 10 percent, in line with intraindustry trade between each of the countries and the US.

E. Potential for Trade Using COS Measure

The *COS* index, developed by Linnemann (1966), measures the degree of commodity correspondence between the exports of one country and the imports of another country. The measure gives information about the potential for direct trade between the two countries,

[8] The index can be biased when a country is running a trade deficit or surplus.

although it doesn't measure the extent to which the countries are taking advantage of that potential. The index varies between zero (no similarity or correspondence at all) and one (perfect similarity) and is the cosine of the angle between the vector of country *j* exports *x*, and the vector of country *k* imports, *m*. If the subscripts *i*, *j* and *k* refer to the commodity class, the exporting country, and the importing country respectively, the measure is defined as (Beers and Linnemann, 1992):

$$COS_{ijk} = \frac{\sum_i x_{ij} . m_{ik}}{\sqrt{(\sum_i x_{ij}^2 . \sum_i m_{ik}^2}}$$

India's potential to export articles of metal and transport vehicles (industry 8) has been growing. The other industry groups with the greatest potential for export are beverages, fuels, chemicals, and pharmaceuticals. In addition, there seems to be scope for India to import metals and transport vehicles, and other manufacturing goods (industry 9) from China.

This section has provided a snapshot of the two countries' current trade structure, exploring product groups that overlap and areas for potential increased trade. In particular, we find that India and China compete in third markets with a roughly one quarter overlap of products. They both have strong comparative advantage in textiles and clothing, but tend to specialize in different subgroups. Thus, there is potential for trade in these and a few other categories. In the next section, we ask whether the historical data show any signs that India could be vulnerable to trade diversion as China further liberalizes its trade regime.

IV. Econometric Analysis

China's accession to the WTO represents a continuation of its integration into world trade. China's trade has increased from about 10 percent of GDP in the early 1980s to 40 percent in the late 1990s (Adhikari and Yang, 2002), with exports and imports growing at roughly parallel rates. Chinese trade and foreign exchange systems have undergone several rounds of reform since 1978 (Cerra and Dayal-Gulati, 1999) and Chinese exports (especially the manufacturing exports) have become more market-oriented in the recent past (Cerra and Saxena, 2003). Therefore, an empirical examination of past liberalization may shed light on the degree of trade creation or trade diversion from India that may result as China gains greater market access as part of its WTO accession.

A. Methodology

The econometric test estimates how changes in tariff rates on U.S. imports of Chinese and Indian goods impact the volume of Indian goods imported in the US. The equation is specified as follows:

$$D(M_{i,US,India}) = \beta_1 * D\,(T_{i,US,India}) + \beta_2 * D(T_{i,US,China}) + \Sigma_s(\alpha_s Y_s) + e_i$$

where M is the log of trade quantities, T is the tariff rate, and Y is a dummy common to all products within a time interval. $D(M_{i,US,India})$ denotes the change in U.S. import quantities of good *i* from India; $D(T_{i,US,India})$ denotes the change in U.S. tariffs on imports of Indian good *i*; and $D(T_{i,US,China})$ denotes the change in U.S. tariffs on imports of Chinese good *i*.

The main parameter of interest is β_2. If $\beta_2>0$, reductions in U.S. tariffs on Chinese goods divert trade from Indian goods. In addition, reductions in U.S. tariffs on imports from India are expected to increase the quantity of imports from India ($\beta_1<0$).

B. Data

Import quantities are obtained from UN COMTRADE, and they are U.S. imports from India. U.S. is used as a proxy for world trade, and the United States is the largest trading partner of both India and China.[9] We used HS Combined at the subheading level (6-digits), because HS is the same classification system used for the tariff data. Tariff rates are from UN Conference on Trade and Development (UNCTAD), Trade Analysis Information System (TRAINS).

The data spans 1995–2001, with 3886 product categories. However, observations with zero tariff rates were discarded out of suspicion that some of these reflected data errors. After matching available sparse data on import quantities and tariffs, the number of total observations falls to 1463. Unfortunately, the dataset is too unbalanced to permit estimating fixed effects in a panel regression. Therefore, the available data is stacked, with time dummies included to identify the common constant for each time interval.

C. Econometric Results

We estimate the change in U.S. imports from India considering the influence of U.S. tariff changes on both Chinese and Indian goods. Estimation results are presented in Table 2. The coefficient estimates on changes in tariff rates are large in magnitude and significant at the 10 percent confidence level for both Indian and Chinese goods. Reductions in U.S. tariffs on Indian goods are associated with an expansion in the volume of U.S. imports from India, as theory would predict. The coefficient estimate on the change in U.S. import tariffs of Chinese goods (β_2) is negative, suggesting that there is evidence of some trade diversion from India to China. The time dummies provide estimates of the average growth in import volumes over each pair of years. The R^2 of the regression is fairly low, as is typical with many cross-sectional datasets. The gravity model is obviously not applicable since there is only one pair of countries in the trade volume regression. However, we are not primarily concerned with explaining cross-sectional export growth. Our interest is merely in testing that whether we could detect trade diversion.

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[9] We also experimented with data from the European Union; however, the available data did not display any variation between tariff changes on Chinese versus Indian goods. Thus, these variables were perfectly collinear.

This section found some evidence in the historical data for trade diversion as a result of tariff changes. This result may be offset by the potential gains mentioned earlier from new areas of direct trade between India and China, as well as intra-industry trade and trade of intermediate products in textiles and clothing. To most effectively quantify the size of potential positive and negative effects, we turn to simulations from a computable general-equilibrium trade model in the next section.

V. GE Model Simulations

A. Methodology and Data

The general equilibrium model used for analysis herein is derived from the Global Trade Analysis Project (GTAP) and data base, which is widely used for international trade policy analysis. We apply a modified version of the static model (Hertel and Tsigas, 1997) to an aggregation of the GTAP data base v. 6.0 release candidate (Dimaranan and McDougall, forthcoming 2005).[10] The database combines detailed bilateral trade, transportation, and protection data. In addition, it accounts for interregional linkages among economies and input/output data bases for intersectoral linkages within countries. The model assumes perfect competition and constant-returns-to-scale technology.[11] The database includes a fully specified record of trade transactions and duties among different regions for the commodities. Supply elasticities are allowed to vary with changes in supply and demand conditions. Production-function parameters are constant, which implies that technology is constant.[12]

Following the work of Ianchovichina and Walmsley (2003), we employ a 10-region (China; Taiwan Province of China; India, Indonesia/Malaysia/Philippines; Rest of Asia; Central America /Caribbean, Latin America/Mexico; United States; European Union (EU); and Rest of World) and 22-sector aggregation (food grains; feedgrains; vegetables and fruits; oilseeds;

[10] The GTAP Data Base v. 6.0 release candidate was distributed to GTAP Consortium members in December 2004, thus is the most recent general equilibrium data base publicly or privately available worldwide. According to the Center for Global Trade Analysis, the public version is expected to be released in 2005.

[11] Standard GTAP assumes that production and consumption decisions by each agent are made under the assumption that prices are not affected by that agent's decision. But when these decisions are brought to the market place, they have price consequences. Prices are fixed at the individual household level and market supply and demand are sloping.

[12] We have knowingly held technology constant. As economies become more efficient, welfare changes after liberalization. There is no theoretical basis for dictating a change in the production function resulting from a tariff liberalization (which changes prices). Also, Leontief preferences are assumed for intermediate goods.

sugar; plant fibers; livestock, meat and dairy; beverage and tobacco; other food; wood products; textiles; clothing; light manufacturing; processing industries; autos; electronics; other manufacturing; trade transportation; communication services; commercial services; and other services) to conduct the scenarios.[13]

B. Scenarios

To evaluate the impact of China's WTO commitments, we compare a baseline "no policy change" scenario to a full implementation of WTO commitments. The database was used to conduct the simulation that implemented the commitments that China has agreed to execute for full WTO accession. Since the base data's base year is 2001, the experiment spans from that time frame to when all of China's promised WTO liberalizations take place (2010). In addition, the 2005 quota liberalizations from full implementation of the Agreement on Textiles and Clothing (ATC) are modeled in our experiment.

For further clarity, Table 3 illustrates how the model characterizes the protection in China for tradable goods. Over the next several years, large cuts in tariffs, especially in oilseeds, electronics, autos, other food and other manufacturing, are expected to have an impact for both the Chinese economy and its smaller regional trading partners. It is this scenario that is the basis for our simulation.

C. Results

Macroeconomic Results

The macroeconomic results show that China itself, Taiwan Province of China, the Rest of Asia, the United States, the EU, and the rest of the world (ROW) regions all enjoy welfare gains from the upcoming trade liberalization expected from the China WTO accession (Table 4). Assuming that there is no other liberalization during this time frame, India is expected to experience a fall in economic welfare, along with a fall in the GDP (quantity) by about $359 million over the shock period. Some developing regions—Latin America/Mexico, Central American/Caribbean, and Indonesia-Malaysia-Philippines—experience welfare losses as well.

Further decomposition of the welfare changes reveals that India's economic welfare loss is being driven primarily by deterioration in its terms of trade (Table 5). At the sectoral level, India's fall in economic welfare is being driven largely by the less favorable terms of trade in their clothing sector (Table 6). Assuming that India does not undergo liberalization and currently has distortions, the small negative allocative efficiency number (-$28 million) indicates that the distortions are continuing to cause relative inefficiencies in its economy.

[13] See Tables A1 and A2 in Appendix I for the detailed concordance of sectors to aggregation.

The major importing regions—the EU and the United States—gain strongly from the accession, with both enjoying more favorable terms of trade, especially in the clothing sector. Relative to other Asian economies, China is expected to enjoy a large increase in economic welfare, generated from significant allocative efficiency gains (Table 6). The positive allocative efficiency impact of about $10.4 billion means that the Chinese economy becomes more productive as it adjusts to world prices (Table 5). The Chinese economy reallocates its resources to produce the goods that they have a comparative advantage in and import the goods that other regions are more efficient at producing. As China demands more imports and supplies, and increases its export production of textiles and clothing, the prices for Chinese exports decline and the prices paid for imports into China increase: the Chinese terms of trade deteriorate, by an amount equivalent to about $9 billion.

Our welfare findings are smaller than other studies on the topic, although the signs are consistent. For example, Ianchovichina and Martin (2003) estimated that China would gain around $30 billion a year from trade reforms in preparation from accession and $10 billion a year after reforms take place. However they used the GTAP v.5 data with a 1997 base year, which implies that their simulations involved more trade liberalization than in our simulations. Furthermore, they were using a dynamic model.

The investment-savings (I-S) price effect examines the relative changes to the prices of investment and savings in an economy (Table 5). For India, and in most countries, the impact of investment and savings is relatively small because most savings tend to be invested domestically. Hence, Table 5 suggests there is little difference between the price of savings and price of investment. Since the magnitude of this effect is almost nonexistent for India ($5 million), it shows that although there have been small changes in the relative prices of investment and savings, these price effects are dominated by that country's terms of trade losses. In China, the change in the price of capital goods is relatively higher (although the movement is relatively small) after the WTO liberalization.

Trade

Under the WTO accession by China, India's trade is expected to be transformed in two significant ways (Tables 7 and 8). First, China will likely demand less of India's exports in several broad sectors—oilseeds, livestock/meat/dairy, extract, and autos—exports of which are expected to decline by up to 88 percent (see Elbehri, Hertel, and Martin, 2003, for similar results). This change in Chinese demand for India's exports is made up for by other increased opportunities to export to other regions (Table 7). For example, the percentage change in India's oilseed exports to China is partially offset by India increasing oilseed exports to other developing regions, especially Latin America, Taiwan Province of China and Central America/Caribbean. India's oilseed exports overall are expected to increase by up to 0.5 percent over the experiment.

Second, most regions in the model are expected to expand their trade with India, demanding more of their exports. Out of the 22 aggregated composite sectors, 19 Indian sectors are expected to export more after China's WTO accession.[14] On a percentage basis, the largest increases are for Taiwan Province of China and Rest of Asia. India is expected to increase exports of its wood products, other manufacturing, beverages and tobacco, clothing, other food, light manufacturing, and process industries to China. Other Indian economic sector exports, such as oilseeds, livestock-meat-dairy, and extracts will fall in world markets. In this experiment, developing countries are expected to demand more imports of Indian clothing by up to 5 percent. Large developed country importers—the United States and the EU—are expected to demand about the same amount of Indian clothing as before.

After China's liberalizations, India is expected to import less manufactured, raw, and processed goods from most Asian regions (Table 8). India will likely import less of all goods, except extracts and electronics, where its imports should remain about the same, and clothing, where its imports should rise slightly. Some interesting exceptions include imports from other developing regions including Central America/Caribbean, and Latin America/Mexico. Although the import growth rates from these regions are largely positive, especially for extracts, light manufacturing, and livestock-meat-dairy sectors (at 10, 9, and 8 percent, respectively), the base levels of imports were relatively small initially.

Other studies generate results in line with our analysis. For example, Eichengreen, Rhee, and Tong (2004) utilize an econometric approach to analyze the impact of China's WTO accession based on a gravity-style model. The authors find that the crowding out of other Asian countries' exports to third markets is limited only to consumer goods. Yang and Vines (2000) use a multisector/country model with differentiated products, finding that the exports of Association of Southeast Asian Nations (ASEAN) countries are slightly reduced while those of Japan and other Asian countries rise. The latter study finds, furthermore, that China's imports increase while its exports to third markets fall.

In summary, the overall trade picture for India, as indicated by our analysis, is expected to be somewhat discouraging on a sectoral basis, although overall it is more hopeful than many other studies suggest. Most sectors experience modest export growth, with the exceptions of textiles, clothing, and electronics. The strongest growth sectors are light manufacturing, wood products, and food grains, with light manufacturing experiencing an increase in exports of almost 2 percent.

Balance of trade

India's balance of trade remains relatively unchanged, increasing by a slim margin of $43 million (Table 9). India is expected to export about $340 million more of light and other

[14] The excepted sectors include textiles, clothing, and electronics. Authors' simulation results.

manufacturing products that it imports. However, with no change in India's trade restrictions, it will import $475 million more of textiles and clothing than it exports, which will offset the balance of trade gains from the increased exports in other sectors.

For China, the large negative trade balance is being driven by it demanding more imports from every sector, except for clothing, electronics, and livestock-meat-dairy. In those sectors, it exports over $38 billion more than it imports, reflecting mostly the impact of the WTO's Agreement on Textiles and Clothing (ATC).[15]

D. Limitations

Since this experiment was conducted using a static, rather than a dynamic model, one limitation is that the influence of growth over the experiment time frame is not considered. A dynamic model would enable us to understand the impact of growth from China's WTO accession. Another limitation is that the concept of duty drawbacks is not explicitly modeled, and thus is not included in this analysis. For China, duty drawbacks may represent an important revenue consideration and will likely be included in future experiments by the authors.

VI. CONCLUSIONS

The results of the econometric analysis provide some evidence that previous reductions in U.S. tariffs on Chinese imports have led to trade diversion from India. However, analysis of the countries' relative trade structures also indicates that the extent of trade competition in third markets is only about 25 percent of products. Moreover, while both India and China have strong comparative advantages in textile exports, they specialize in different aspects of this broad industry group. As China expands its production and export of finished textile products, there is scope for direct export of intermediate inputs from India to China. Several other sectors have also been identified that provide some opportunity for increasing direct trade between India and China.

The results from the general-equilibrium simulation model largely confirm most of these findings. India is likely to lose export shares in third markets, such as the United States and EU, particularly for textiles. Overall, India's relative economic welfare is expected to decline modestly owing to loss of market share and deterioration in its terms of trade. However, the simulations also demonstrate that other sectors will likely expand to partially offset these declines.

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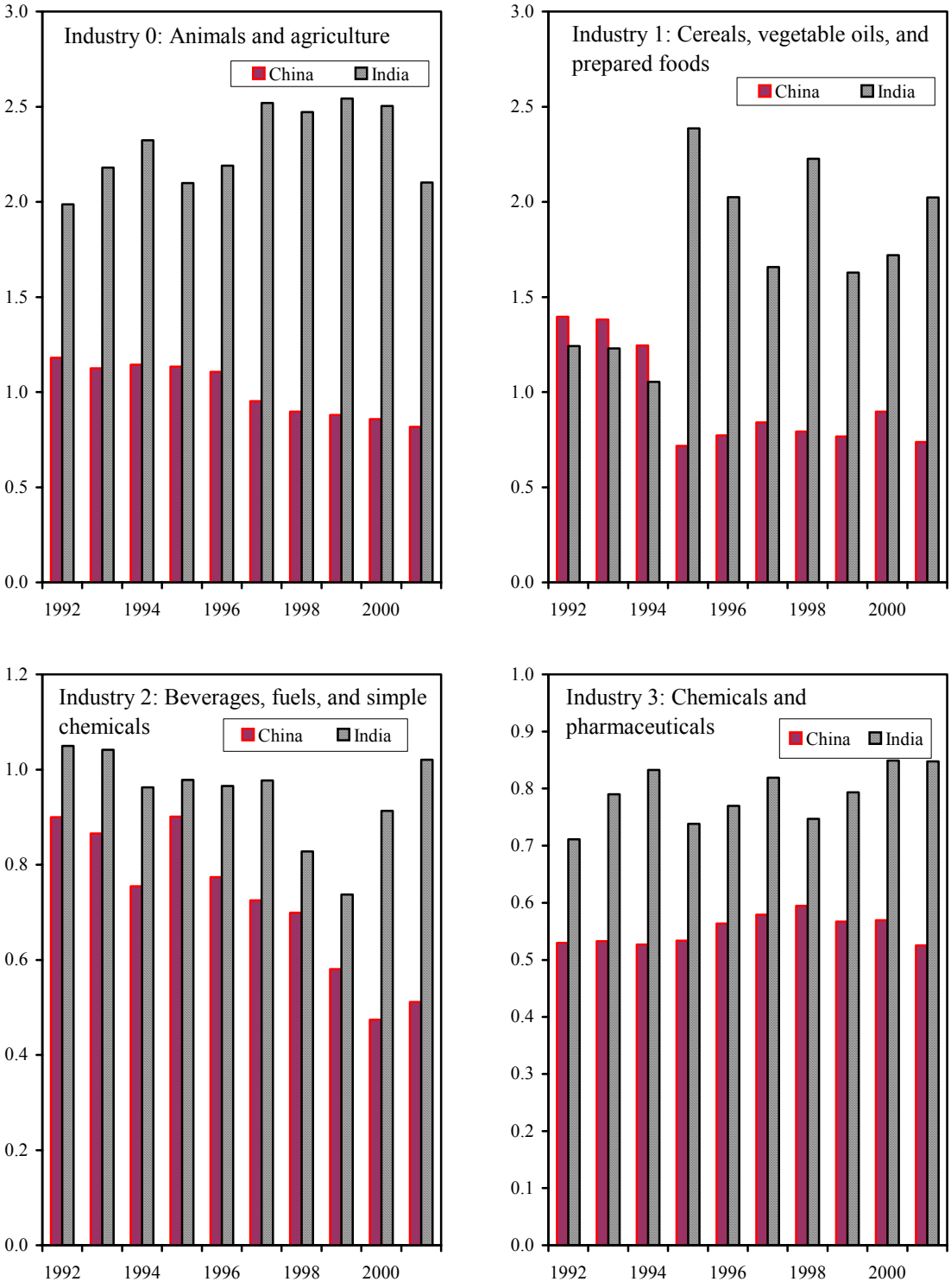
[15] Clothing alone accounts for most of this gap, with China expecting to export $37.5 billion more than it imports after its WTO accession. For a disaggregated breakdown of the trade balance, please contact the authors. Authors' simulation results.

Figure 1. China and India: Revealed Comparative Advantage (RCA), Industries 0–3, 1992–2001



Source: UN COMTRADE.

Figure 2. China and India: RCA, Industries 4 and 7–9, 1992–2001

Source: UN COMTRADE.

Figure 3. China and India: RCA, Industries 5 and 6, 1992–2001

Source: UN COMTRADE.

Table 1. Trade Structure

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Herfindahl Index											
India		0.028	0.032	0.029	0.028	0.021	0.021	0.028	0.036	0.026	0.025
China		0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004
United States		0.007	0.006	0.006	0.005	0.006	0.006	0.007	0.007	0.007	0.006
Index of Trade Competition in Third Markets (China and India)											
Total exports		0.244	0.251	0.247	0.250	0.248	0.241	0.239	0.242	0.248	0.251
Excluding direct trade		0.244	0.250	0.246	0.250	0.247	0.240	0.239	0.242	0.247	0.250
Gruber-Lloyd IIT Index											
United States with World		0.476	0.481	0.487	0.489	0.490	0.498	0.501	0.503	0.498	0.493
India with World		0.121	0.122	0.139	0.143	0.142	0.148	0.135	0.136	0.173	0.179
China with World		0.238	0.234	0.244	0.275	0.270	0.277	0.280	0.294	0.312	0.311
India with World		0.011	0.018	0.034	0.041	0.045	0.049	0.070	0.062	0.079	0.079
United States with India		0.051	0.050	0.056	0.077	0.076	0.082	0.080	0.075	0.081	0.095
United States with China		0.041	0.058	0.050	0.057	0.068	0.068	0.075	0.078	0.087	0.097
COS Measure for India's Exports											
Total		0.397	0.366	0.241	0.273	0.252	0.199	0.118	0.089	0.169	0.121
Industry	0	0.019	0.020	0.043	0.034	0.021	0.024	0.031	0.021	0.020	0.027
Industry	1	0.019	0.075	0.271	0.253	0.093	0.064	0.059	0.026	0.009	0.006
Industry	2	0.797	0.872	0.671	0.708	0.630	0.622	0.542	0.424	0.727	0.433
Industry	3	0.064	0.075	0.143	0.164	0.106	0.139	0.130	0.108	0.234	0.244
Industry	4	0.032	0.031	0.026	0.045	0.022	0.027	0.028	0.026	0.034	0.034
Industry	5	0.288	0.169	0.210	0.143	0.153	0.161	0.176	0.293	0.295	0.155
Industry	6	0.009	0.011	0.010	0.016	0.016	0.027	0.055	0.062	0.069	0.095
Industry	7	0.023	0.032	0.049	0.057	0.051	0.036	0.033	0.037	0.057	0.062
Industry	8	0.266	0.116	0.221	0.309	0.300	0.472	0.542	0.547	0.643	0.682
Industry	9	0.035	0.036	0.060	0.063	0.069	0.072	0.083	0.102	0.112	0.130
COS Measure for India's Imports											
Total		0.057	0.088	0.051	0.085	0.086	0.072	0.051	0.040	0.041	0.050
Industry	0	0.213	0.216	0.347	0.275	0.222	0.210	0.135	0.106	0.227	0.230
Industry	1	0.048	0.061	0.130	0.234	0.278	0.114	0.100	0.065	0.074	0.054
Industry	2	0.188	0.486	0.284	0.483	0.235	0.232	0.322	0.113	0.027	0.039
Industry	3	0.132	0.200	0.173	0.123	0.114	0.104	0.113	0.185	0.276	0.317
Industry	4	0.079	0.120	0.140	0.106	0.090	0.076	0.067	0.074	0.072	0.082
Industry	5	0.137	0.101	0.131	0.138	0.337	0.232	0.147	0.128	0.132	0.151
Industry	6	0.070	0.079	0.109	0.081	0.081	0.095	0.096	0.120	0.128	0.139
Industry	7	0.057	0.031	0.047	0.039	0.048	0.067	0.065	0.087	0.092	0.078
Industry	8	0.300	0.274	0.227	0.280	0.306	0.310	0.228	0.287	0.327	0.406
Industry	9	0.230	0.168	0.141	0.127	0.131	0.144	0.157	0.261	0.266	0.300

Table 2. Regression Results
(dependent variable: D (India Trade Quantity))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IndiaTariffs)	-20.42	11.52	-1.77	0.076
D(ChinaTariffs)	24.07	13.64	1.76	0.078
DUM9596	-4.50	14.39	-0.31	0.755
DUM9697	-3.28	12.31	-0.27	0.790
DUM9798	18.07	12.21	1.48	0.139
DUM9899	-23.33	11.67	-2.00	0.046
DUM9900	45.19	11.93	3.79	0.000
DUM0001	-11.48	10.95	-1.05	0.295

R-squared	0.0184	Durbin Watson statistic	1.96
Adjusted R-squared	0.0137	Mean dep variable	2.64
Standard error of regression	186.64	Standard deviation of dependent variable	187.93
Sum of squared residuals	50683911	Akaike criterion	13.3
Log likelihood	-9722	Schwarz criterion	13.33
Number of observations:	1,463		

White Heteroskedasticity-Consistent Standard Errors and Covariance

Table 3. China's Average Nominal Rates of Protection, at Relevant Intervals

	1997	2001	2007–2010	*Absolute rate change Over time frame 2002–2007/10*
1 Foodgrains	10.6	7.6	7.6	0.0
2 Feedgrains	28.0	32.0	32.0	0.0
3 Vegetables and fruit[1]	-8.0	-4.0	-4.0	0.0
4 Oilseeds	28.0	20.0	3.0	-17.0
5 Sugar	42.0	40.0	20.0	-20.0
6 Plant fibers	17.0	17.0	16.0	-3.0
7 Livestock, meat and dairy[1]	-8.9	-5.9	-7.8	1.9
8 Beverages and tobacco	63.2	44.6	16.0	-28.6
9 Other food	34.8	35.3	9.5	-25.8
10 Wood products	10.8	9.5	3.6	-5.9
11 Extract	0.2	0.5	0.3	-0.2
12 Textiles	25.1	20.7	8.8	-11.9
13 Clothing	31.8	23.4	15.3	-8.1
14 Light manufacturing	12.1	11.7	8.0	-3.7
15 Processing industries	12.0	11.7	6.8	-4.9
16 Autos	34.4	32.0	14.0	-18.0
17 Electronic	11.9	10.3	2.0	-8.3
18 Other manufacturing	13.2	12.9	6.7	-6.2

[1]

Source: Ianchovichina and Walmsley (2003),*www.gtap.org*, based on GTAP Data Base v. 5, World Bank and data from CDS Consulting based on data from Dr. Jikun Huang. These rates are trade-weighted, applied, statutory rates

For importable commodities, figures can be interpreted as import tax equivalents. For exportable agricultural commodities, the negative rates imply that domestic prices are lower than boarder prices. Experts indicated that these instances are likely due to SPS and other nontariff barriers imposed on China's exported products. Dr. Jikun Huang, Center for Chinese Agricultural Policy, Institute of Geographical Sciences and Natural Resources (September 2004).

Table 4. Macroeconomic Results for all Regions after WTO Accession, Changes from Baseline
(Millions of 2001 U.S. dollars)

	Economic Welfare *(millions of 1997 U.S. dollars)*	**Gross Domestic Product, quantity** *(millions of 1997 U.S. dollars)*	**Terms of Trade** *(percent change)*
China	1,352	10,387	-2.2
Taiwan Province of China	558	71	0.4
India	-359	-28	-0.5
Indonesia-Malaysia-Philippines	-276	-3	-0.1
Rest of Asia	191	-6	0.0
Central America and Caribbean	-550	-146	-0.9
Latin America and Mexico	-616	-230	-0.1
United States	5,161	829	0.3
European Union	7,430	2,762	0.2
Rest of the world	866	142	0.0

Source: Authors' simulation results.

Table 5. Welfare Decomposition of All Regions
(Millions of 2001 U.S. dollars)

Region	Allocative Efficiency Effect	Terms of Trade Effect	Investment-Saving Price Effect	*Total*
China	10,359	-9,091	83	1,352
Taiwan Province of China	71	589	-102	558
India	-28	-336	5	-359
Indonesia-Malaysia-Philippines	-3	-167	-106	-276
Rest of Asia	-6	221	-24	191
Central America and Caribbean	-146	-309	-95	-550
Latin America and Mexico	-230	-407	21	-616
United States	830	3,957	374	5,161
European Union	2,762	4,643	25	7,430
Rest of the world	142	904	-180	866

Source: Authors' simulation results.

Table 6. Terms of Trade Decomposition by Sector and Region
(Millions of 2001U.S. dollars)

Sector	China	Taiwan Province of China	India	Indonesia Malaysia Philippines	Rest of Asia	Central America Caribbean	Latin America Mexico	United States	European Union	10 Rest of the world
1 Foodgrains	1	0	0	0	-2	0	0	1	0	1
2 Feedgrains	0	0	0	-2	-3	0	-1	10	0	-4
3 Vegetable fruit	38	-3	-2	-5	-13	-12	7	25	-11	-32
4 Oilseeds	-55	-5	0	-1	-1	-1	29	66	-19	-10
5 Sugar	1	0	0	-1	2	-11	0	1	-1	11
6 Plant fibers	24	-2	-2	-1	1	-6	2	8	-13	-19
7 Livestock, meat, dairy	16	-1	-2	-2	-10	-4	-5	4	0	-1
8 Beverage tobacco	0	-1	0	-1	0	-5	-2	-3	15	-5
9 Other food	-23	7	-1	6	32	-15	-3	2	2	-20
10 Wood products	114	13	-2	10	-6	-8	-20	-102	-20	5
11 Extract	60	-19	-19	11	-67	-6	7	-127	-169	356
12 Textiles	-178	76	2	0	102	-24	-6	10	-70	109
13 Clothing	-8,868	10	-265	-138	-419	8	24	4,598	4,915	119
14 Light manufacturing	202	7	1	2	-49	-3	-8	-79	-35	-63
15 Process industry	-25	61	-16	-26	-1	-30	-78	-73	27	139
16 Autos	-41	10	-1	-4	45	-2	-37	-120	42	162
17 Electronics	-772	209	-1	37	221	-17	-34	97	65	227
18 Other manufacturing	239	147	-10	-31	16	-44	-128	-223	20	1
19 Trade transportation	99	33	-11	-11	282	-72	-83	-147	-84	-22
20 Services	8	1	0	-1	-3	-2	-4	0	-8	7
21Commercial services	37	31	-6	-7	79	-38	-47	-5	-7	-35
22 Other services	32	14	-1	-1	13	-18	-20	14	-5	-23
Total	*-9,091*	*589*	*-336*	*-167*	*221*	*-309*	*-407*	*3,957*	*4,643*	*904*

Source: Authors' simulation results.

Table 7. India's Change in Quantity of Exports to All
(Percentage change)

	China	Taiwan Province of China	Indonesia-Malaysia-Philippines	Rest of Asia	Central America Caribbean	Latin America Mexico	United States	European Union	Rest of the world	*Total* [1]
Foodgrains	8.1	13.0	2.1	3.2	0.4	1.2	1.9	1.3	2.0	*1.5*
Feedgrains	5.4	1.2	1.2	1.5	0.7	1.3	1.4	1.1	1.2	*1.3*
Vegetable Fruit	3.3	1.0	1.1	1.4	-0.4	0.5	0.4	0.4	0.6	*0.7*
Oilseeds	-88.3	3.5	1.3	0.0	2.5	3.4	2.0	1.7	0.4	*0.5*
Sugar	-1.3	1.0	0.6	0.6	-2.5	-0.3	-0.2	0.4	0.0	*0.4*
Plant fibers	5.7	6.7	0.5	2.0	-0.6	0.9	1.0	0.3	1.3	*1.1*
Livestock, meat, dairy	-12.6	2.9	0.8	1.6	-3.4	0.3	0.8	0.8	1.0	*0.7*
Beverages tobacco	20.3	0.8	0.2	0.4	-1.7	-0.1	0.1	0.2	0.2	*0.6*
Other food	16.6	1.2	0.4	0.6	-2.1	0.0	0.3	0.4	0.4	*1.0*
Wood products	43.2	2.3	1.9	1.3	-3.0	-0.2	0.7	0.6	0.8	*1.6*
Extract	-12.1	3.0	2.6	3.2	0.6	0.4	1.1	1.3	1.5	*1.1*
Textiles	19.4	4.7	-3.4	-3.3	-12.5	-2.5	-2.5	-3.8	-2.1	*-2.4*
Clothing	18.7	1.4	-2.2	-1.1	-5.2	-2.2	0.6	0.3	-2.8	*-0.5*
Light manufacturing	13.4	2.4	-0.7	3.1	1.6	0.2	2.3	1.1	1.6	*1.7*
Process industry	12.6	1.8	1.0	1.6	-1.0	-0.1	0.3	0.4	0.6	*1.4*
Autos	-7.9	1.0	0.5	0.6	-0.8	0.0	0.2	0.4	0.4	*0.4*
Electronics	7.9	-1.8	-0.2	-0.6	-1.1	-0.3	-0.5	0.2	0.0	*-0.3*
Other manufacturing	33.6	1.6	1.2	1.4	-0.9	-0.1	0.4	0.7	0.7	*1.3*
Trade transportation	1.7	1.6	0.3	0.7	-1.6	0.0	0.3	0.4	0.5	*0.8*
Services	4.3	1.9	0.3	1.1	-4.3	-0.3	0.4	0.4	0.5	*0.6*
Commercial services	1.6	1.4	0.4	0.7	-2.3	0.0	0.3	0.4	0.4	*0.4*
Other service	2.0	1.7	0.3	0.7	-2.8	-0.1	0.3	0.4	0.4	*0.4*

Source: Authors' simulation results.

[1] This percentage change number was calculated from total levels simulations results data, not a summation of the corresponding percentage changes. For simulation results on levels, please contact the authors.

Table 8. India's Change in Quantity of Imports to All
(Percentage change)

	China	Taiwan Province of China	Indonesia-Malaysia-Philippines	Rest of Asia	Central America Caribbean	Latin America-Mexico	United States	European Union	Rest of the world	*Total* [1]
Foodgrains	-11.7	-4.5	-0.6	-0.9	6.2	0.7	-0.3	0.4	0.1	*-1.8*
Feedgrains	-8.7	-2.3	-0.6	-1.3	4.7	-0.4	-0.9	-0.3	-0.5	*-0.7*
Vegetable fruit	-4.0	-1.5	-0.3	-0.6	2.0	-0.1	-0.3	0.0	-0.1	*-0.4*
Oilseeds	20.1	-3.1	-0.9	0.0	2.2	-3.3	-3.4	-0.4	0.6	*-0.3*
Sugar	-2.8	-3.1	-0.3	-0.9	5.0	0.5	0.0	-0.3	-0.3	*-0.4*
Plant fibers	-9.5	-2.8	-0.9	-1.4	2.7	-0.4	-1.0	-0.5	-0.6	*-1.0*
Livestock meat dairy	-3.8	-3.5	0.1	-0.9	8.1	0.9	0.3	0.1	-0.1	*-1.0*
Beverage tobacco	0.0	-1.3	-0.2	-0.5	2.9	0.3	0.0	-0.1	-0.2	*-0.2*
Other food	1.2	-2.1	-0.4	-0.9	3.6	0.3	-0.1	-0.3	-0.4	*-0.2*
Wood products	-4.4	-3.1	-0.3	-1.0	7.3	1.1	0.2	-0.1	-0.3	*-0.4*
Extract	-6.4	-5.6	-1.1	-3.6	10.4	1.3	0.4	0.1	-0.2	*0.0*
Textiles	3.7	-3.8	-0.7	-1.4	7.0	0.9	0.2	1.6	-0.5	*-0.6*
Clothing	-0.1	-4.7	-1.3	-1.9	6.9	0.4	4.9	2.2	-1.1	*0.3*
Light manufacturing	4.0	-2.8	-0.1	-1.2	9.1	1.6	0.1	0.2	-0.3	*-0.1*
Process industry	-1.6	-2.2	-0.1	-0.7	5.6	1.2	0.5	0.2	0.0	*-0.1*
Autos	6.2	-2.4	-0.3	-0.9	3.2	0.7	0.1	-0.2	-0.4	*-0.4*
Electronics	8.8	-3.5	-0.8	-1.1	8.1	0.7	-0.3	-0.8	-1.1	*0.0*
Other manufacturing	-1.8	-3.6	-0.3	-1.2	7.9	1.4	0.4	-0.1	-0.4	*-0.2*
Trade transportation	4.0	-2.4	0.0	-0.7	5.3	0.8	0.2	0.0	-0.2	*-0.2*
Services	-4.1	-2.7	-0.3	-1.1	5.8	0.8	0.1	-0.2	-0.3	*-0.3*
Commercial services	-4.3	-2.5	-0.1	-0.7	6.0	0.8	0.2	-0.1	-0.2	*-0.1*
Other service	-4.2	-2.6	-0.1	-0.9	5.8	0.7	0.1	-0.2	-0.3	*-0.2*

Source: Authors' simulation results.

[1] This percentage change number was calculated from total levels simulation results data, not a summation of the corresponding percentage changes. For simulation results on levels, please contact the authors.

Table 9. Change in Trade Balance
(Millions of 2001 U.S. dollars)

Region	Change in Trade Balance
China	-8,387
Taiwan Province of China	96
India	43
Indonesia-Malaysia-Philippines	-35
Rest of Asia	-109
Central America and Caribbean	678
Latin America and Mexico	946
United States	2,669
European Union	2,169
Rest of the world	1,930

Source: Authors' simulation results.

APPENDIX

I. Regional and Sector Aggregations

Table A1. Regional Aggregation

		Corresponding GTAP Regions used in CGE Experiment
1	**China**	China
2	**Taiwan Province of China**	Taiwan Province of China
3	**India**	India
4	**Indonesia-Malaysia-Philippines**	Indonesia; Malaysia; Philippines
5	**Rest of Asia**	Hong Kong SAR, Korea, Singapore, Thailand, Vietnam, Sri Lanka; Rest of South Asia, Bangladesh
6	**Central America and Caribbean**	Central America and the Caribbean
7	**Latin America and Mexico**	Colombia; Peru; Venezuela; Rest of Andean Pact; Argentina; Brazil; Chile; Uruguay; Rest of South America; Mexico
8	**United States**	United States
9	**European Union-15**	Austria; Belgium; Denmark; Finland; France; Germany; United Kingdom; Greece; Ireland; Italy; Luxembourg; Netherlands; Portugal; Spain; Sweden
10	**Rest of world**	Australia; New Zealand; Canada; Switzerland; Rest of European Free Trade Area; Hungary; Poland; Albania; Bulgaria; Croatia; Czech Republic; Hungary; Malta; Romania; Slovakia; Slovenia; Estonia; Latvia; Lithuania; Russian Federation; Rest of Former Soviet Union; Japan; Cyprus; Turkey; Rest of Middle East; Morocco; Botswana; Uganda; Rest of Sub-Saharan Africa; Malawi; Mozambique; Tanzania; Zambia; Zimbabwe; Other Southern Africa; Rest of South Africa; Rest of Southern Africa, Rest of North Africa, Rest of the World.

Source: Authors' aggregations from GTAP data base v. 6.0 release candidate (December 2004).

Table A2. Sector Aggregation

	Sector	Corresponding GTAP sector
1	**Foodgrains**	Patty rice
2	**Feedgrains**	Wheat
3	**Vegetable fruit**	Vegetables, fruits, nuts; cereal grains, n.e.c.
4	**Oilseeds**	Oilseeds
5	**Sugar**	Sugar cane, sugar beat, sugar
6	**Plant fibers**	Plant-based fibers; crops n.e.c.;
7	**Livestock-meat-dairy**	Cattle, sheep and goats, horses; animal products n.e.c.; raw milk; wool, silk-worm cocoons; meat: cattle, sheep, goat, horse; meat products n.e.c.; dairy products
8	**Wood products**	Forestry; wood products; paper products, publishing.
9	**Other food**	Fishing; vegetable oils and fats; food products n.e.c., vegetable oils and fats; processed rice.
10	**Extract**	Coal; oil; gas; minerals n.e.c.; mineral products n.e.c.
11	**Beverages-tobacco**	Beverages and tobacco products
12	**Textiles**	Textiles
13	**Clothing**	Wearing apparel
14	**Light manufacturing**	Leather products
15	**Processing**	Petroleum, coal products; chemical, rubber, plastic products; ferrous metals; metals n.e.c.
16	**Autos**	Motor vehicles and parts
17	**Other manufacturing**	Transport equipment n.e.c.; machinery and equipment n.e.c.; manufactures n.e.c.; metal products
18	**Electronics**	Electronic equipment
19	**Services**	Electricity; gas manufacture, distribution; water; construction;
20	**Trade transportation**	Trade; transport nec; sea transport; air transport;
21	**Commercial services**	Communication; financial services n.e.c.; insurance; business services n.e.c.;
22	**Other services**	Recreational and other services; public administration, defense, education, health; dwellings.

Source: Authors' aggregations from GTAP data base v. 6.0 release candidate (December 2004).

Note: n.e.c. denotes not elsewhere classified.

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