

# **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 WTO. This paper examines the implications of China's WTO accession for India's trade, both using econometrics and computable general equilibrium (CGE) models. This paper analyzes how India stands to lose or gain from China's entry in terms of both the direct and competitive channels.

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## I. INTRODUCTION

China became the 143<sup>rd</sup> member of the WTO on December 11, 2001, after negotiating the terms of its entry for 15 years.<sup>1</sup> Given the potential size of the Chinese market, this may mark 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 cheap 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.<sup>2</sup> While the overall welfare effects are generally assessed to be positive, the expected impact varies by country depending on the similarity of its trade structure to China.

This paper focuses on the impact of China's entry into the WTO for 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 commodities, 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 one of the countries most likely to suffer from 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.<sup>3</sup>

The paper is organized as follows. Section II provides some summary information on the protocol of China's WTO entry. Section III compares the current structure of trade of China and India, indicating opportunities for bilateral trade expansion, and measures the extent to which the two countries compete in third markets. 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 are examined in Section IV to gauge the extent to which this trend had prevailed in 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 to

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<sup>1</sup> India has been an original member of the GATT (General Agreement on Trade and Tariffs)

<sup>2</sup> Shafaeddin (2003) argues that the competitive effects of China's accession on developing countries are exaggerated in the literature.

<sup>3</sup> China will have to open up the domestic economy, reduce tariffs and non-tariff barriers, including quantitative restrictions on imports and eliminate price controls in domestic market (Agarwal and Sahoo 2003).

investigate the global impacts of China's WTO accession impacts India's trade. Section VI concludes.

## **II. CHINA'S WTO ACCESSION 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 right on 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 MFN 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.

- 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 are to be phased out by 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 non-market 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 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 UN's COMTRADE database, as reported by the World Bank's World Integrated Trade Solutions.

#### A. Herfindahl index of specialization

The Herfindahl index measures the extent to which a country's production or trade is diversified or specialized.

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

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 U.S. are relatively diversified at the subheading level.<sup>4</sup> 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 U.S.

#### B. Revealed Comparative Advantage

Indices of revealed comparative advantage 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.

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

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.

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<sup>4</sup> 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.

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 & 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). 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 (2003) points out that China and India compete in textiles and clothing, but only in limited items. India concentrates on exporting undergarments and 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 U.S. 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 (2003) 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. 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.

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

$s_i^j$  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:

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

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

In addition to trade patterns driven by comparative advantage, much trade between countries consists of differentiated goods within the same industry. The Gruber-Lloyd intraindustry trade index measures the proportion of total trade comprised by intraindustry trade.

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

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:

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

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 a country and the imports of another country. It 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):

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

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.

## 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). 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:

$$D_t(M_{i,US,India}) = \beta_1 * D_t(T_{i,US,India}) + \beta_2 * D_t(T_{i,US,China}) + \sum_s (\alpha_s Y_s) + e_{it}$$

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.  $M_{i,US,India}$  denotes the change in U.S. import quantities of good *i* from India;  $T_{i,US,India}$  denotes the change in U.S. tariffs on imports of Indian good *i*; and  $T_{i,US,China}$  denotes the change in U.S. tariffs on imports of Chinese good *i*.

The main parameter of interest is  $\beta_2$ . 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 U.S. is the largest trading partner of both India and China.<sup>5</sup> 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, zero tariff rates were suspect and these observations were discarded. After matching available sparse data on import quantities and tariffs, the number of total observations falls to 1463. This dataset is too unbalanced to permit estimating fixed effects in a panel regression. Therefore, the available data is stacked, with time dummies are 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 ( $\beta_2$ ) 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 a pair of years. The R2 of the regression is fairly low, as is typically 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.

## V. GE MODEL SIMULATIONS

### A. Methodology and Data

The general equilibrium model used for the analysis is derived from the Global Trade Analysis Project (GTAP), 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. 5.4 (Dimaranan and McDougall, 2002), which combines detailed bilateral trade, transportation and protection data, and accounts for inter-regional linkages among economies and input/output data bases for inter-sectoral linkages within countries.

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<sup>5</sup> 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.

The data base version used is the most recent available for global analysis.<sup>6</sup> The model used herein assumes perfect competition and constant returns to scale technology.<sup>7</sup> The database includes a fully specified record of trade transactions and duties among different regions for the commodities (Gehlhar *et al.* 1997).

Following the work of Ianchovichina and Walmsley (2003), we employ a 10-region (China; Taiwan; India, Indonesia/Malaysia/Philippines; Rest of Asia; Central America and Caribbean, South America and Mexico; US; EU; and Rest of World) and 22-sector aggregation (food grains; feed grains; vegetables and fruits; oilseeds; 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; communications; commercial services; and other services) to conduct the scenarios.<sup>8</sup>

## 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. Since we use the GTAP version 5 data base with a 1997 base year, the first step toward creating our baseline is to update the data base to 2002. The next step is to update relevant policy instruments, specifically the tariff rates for China in 2002 and create our baseline. Then, the updated database was used to conduct the simulation that implemented the commitments that China has agreed to execute for full WTO accession. In addition, the quota liberalizations expected from full implementation of the Agreement on Textiles and Clothing (ATC) are included.

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 a huge impact for both the Chinese economy and its smaller regional trading partners. It is this final scenario that is the basis for our simulation.

**Table 3 China's average Tariff rates at relevant intervals**

	1997	2002	2007-2010	<i>Rate change over time frame 2002-2007/10</i>
<b>1 Food grains</b>	10.6	7.6	7.6	0.0

<sup>6</sup> Version 6.0 of the GTAP Data Base is expected to be released in September 2004. For more information, see [www.gtap.com](http://www.gtap.com).

<sup>7</sup> 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.

<sup>8</sup> See Tables A1 and A2 in the appendix for the detailed concordance of sectors to aggregation.

<b>2 Feed grains</b>	28.0	32.0	32.0	0.0
<b>3 Vegetables and Fruit</b>	-8.0	-4.0	-4.0	0.0
<b>4 Oilseeds</b>	28.0	17.2	3.0	<b>-14.2</b>
<b>5 Sugar</b>	42.0	36.7	20.0	-16.7
<b>6 Plant fibers</b>	17.0	16.5	16.0	-0.5
<b>7 Livestock, Meat and Dairy</b>	-8.9	-6.3	-7.8	1.5
<b>8 Beverages and Tobacco</b>	63.2	39.9	16.0	<b>-23.9</b>
<b>9 Other food</b>	34.8	31.0	9.5	<b>-21.5</b>
<b>10 Wood products</b>	10.8	8.5	3.6	<b>-4.9</b>
<b>11 Extract</b>	0.2	0.5	0.3	-0.2
<b>12 Textiles</b>	25.1	18.8	8.8	<b>-10.0</b>
<b>13 Clothing</b>	31.8	22.0	15.3	-6.7
<b>14 Light Manufacturing</b>	12.1	11.1	8.0	-3.1
<b>15 Processing Industries</b>	12.0	10.9	6.8	-4.1
<b>16 Autos</b>	34.4	29.0	14.0	<b>-15.0</b>
<b>17 Electronic</b>	11.9	9.0	2.0	<b>-7.0</b>
<b>18 Other Manufacturing</b>	13.2	11.9	6.7	-5.2

Source: Ianchovichina and Walmsley (2003), based on v. 5 GTAP Data Base, World Bank and data from CDS Consulting. These tariffs are trade-weighted, applied, statutory rates.

### C. Results

#### Macroeconomic Results

The macroeconomic results show that China itself, Taiwan, U.S. and EU all enjoy welfare gains from the upcoming trade liberalization expected from the China WTO accession (Table 4). Assuming that there are 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 \$360 million over the shock period.

**Table 4 Macroeconomic Results for all Regions after WTO Accession, changes from baseline**

	<b>Economic Welfare</b> <i>(millions of 1997 U.S. dollars)</i>	<b>Gross Domestic Product, quantity</b> <i>(millions of 1997 U.S. dollars)</i>	<b>Terms of Trade</b> <i>(percent change)</i>
<b>China</b>	2,209	9,414	-2.7
<b>Taiwan</b>	585	45	0.5
<b>India</b>	-646	-361	-0.6
<b>Indonesia-Malaysia-Philippines</b>	-717	-313	-0.2
<b>Rest of Asia</b>	1,358	-209	0.1
<b>Central America, Caribbean</b>	-1,276	-323	-1.9
<b>Latin America and Mexico</b>	-456	-189	-0.1
<b>US</b>	7,051	1,496	0.5
<b>EU</b>	3,037	970	0.1
<b>ROW</b>	-1,157	-544	-0.1

Source: Authors' simulation results.

Further decomposition of the welfare changes reveals that India’s economic welfare loss is being driven by a fall in both allocative efficiency, plus a decrease in their terms of trade (Table 5). At the sectoral level, India’s deterioration in economic welfare is being partially driven by the less favorable terms of trade in both their clothing and textile sectors (Table 6). Assuming that India does not undergo liberalization and currently has distortions, the negative allocative efficiency number indicates that the distortions are continuing to cause inefficiencies in their economy. Therefore, markets and hence resources are not moving to their most efficient allocation. The major importing regions – the U.S. and EU – gain most from the accession, with both enjoying more favorable terms of trade, motivated by the increase in terms of trade for the clothing sector.

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 almost \$9.4 billion means that the Chinese economy realizes efficiency gains as it adjusts to world prices. 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 (textiles and clothing), the prices for Chinese exports decline and the price paid for imports into China increase: the Chinese terms of trade deteriorate, by an amount equivalent to about \$7 billion.

**Table 5 Welfare decomposition on all regions, millions of U.S. dollars**

<b>Region</b>	<b>Allocative Efficiency effect</b>	<b>Terms of Trade effect</b>	<b>Investment-Saving price effect</b>	<b>Total</b>
<b>China</b>	9,387.3	-6,995.8	-182.2	2,209.3
<b>Taiwan</b>	44.7	693.7	-153.6	584.7
<b>India</b>	-360.5	-296	10.4	-646.0
<b>Indonesia-Malaysia-Philippine</b>	-313.1	-429	25.6	-716.6
<b>Rest of Asia</b>	-208.9	1,465.3	101.4	1,357.8
<b>Central America, Caribbean</b>	-321.2	-749.8	-205.1	-1276.1
<b>Latin America and Mexico</b>	-188.9	-307.5	41	-455.5
<b>U.S.</b>	1,496.2	5,348.6	205.8	7,050.5
<b>EU</b>	969.8	2,008.3	58.8	3,036.8
<b>ROW</b>	-544.1	-710.5	97.4	-1,157.2

Source: Authors’ simulation results

The Investment-Savings (I-S) price effect examines the relative changes to the prices of investment and savings in an economy. Given that a large economy is liberalizing trade, regional investment-savings markets are expected to experience relative large price effects because incomes are changing, and so savings would change. At the same time, capital productivity is changing so investment would respond. The I-S price effect generally reinforces the terms of trade effect for most regions, as in this experiment. In the case of India, the I-S price effect is very small although positive, driven largely because investment is falling faster than savings. Since the magnitude of this effect is small, 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 and allocative efficiency losses.

Meanwhile, the Rest of Asia region is expected to enjoy a welfare gain from the regime change, and a \$5 billion dollar rise in its GDP. This composite region also experienced a favorable terms of trade change of all regions.

## **Trade**

Under the WTO accession by China, India's trade is expected to be transformed in two significant ways. First, China will likely demand less of India's exports in several broad sectors: oilseeds, sugar, food and feed grains, and plant fibers, exports of which are expected to decline by up to 86 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 in other regions (Table 7). For example, the percentage change in India's oilseed exports is partially offset by India increasing oilseed exports to other developing regions including Indonesia-Malaysia- Philippines, Rest of Asia, and Latin America and Mexico. India's exports in these sectors are expected to increase by about 2.5 percent over the experiment.

Second, a few regions are expected to expand their trade with India, demanding more of their exports. India is expected to export more autos, and light manufactured goods to other regions, especially to the EU, U.S., and Rest of World. Also, India is expected to increase its Chinese market share of beverages and tobacco, and increase its light manufacturing and process industries, as well as electronics exports to China. In some sectors, India is expected to successfully increase their market share and hence exports, such as in the light manufacturing, other manufacturing and electronics. Other Indian economic sectors, especially clothing, will be hurt by China's WTO accession, as major importers such as the U.S. and EU buy more clothing from China. In this experiment, U.S. decreases its imports of Indian clothing by over 50 percent and the EU by over 11 percent.

India is expected to increase its exports of both textiles and clothing to China. Although the percentage change numbers looks significant, the base level quantity numbers are very small: textiles will increase from 167.3 to 188.9 million units and clothing will increase from 12.9 to 20.1 million units. Relative to India's overall trade numbers, the increase in clothing imports from India makes up slightly more than one percent of its change in exports over the experiment time frame.

After China's liberalizations, India is expected to import less manufactured, raw and processed goods from most regions, and most sectors (Table 8). India will likely import less textiles and clothing from most of its trading partners, especially China (falling about 3 and 10 percent, respectively). Some interesting exceptions include imports from other developing regions including Central American and the Caribbean. Although the import growth rates from this region are largely positive and for clothing, light manufacturing and autos, the base level of imports for these regions were relatively small initially.

In summary, the overall trade picture for India is expected to be somewhat discouraging on a sectoral basis, although overall it is more hopeful than many other studies suggest. Most sectors experience export growth, with the exceptions of textiles and clothing. Auto and light manufacturing exports show the strongest growth, experiencing an increase in exports of over 6 percent.

### **Balance of Trade**

Although examining the sectoral trade numbers might be discouraging, after China's WTO liberalization, India's balance of trade remains relatively unchanged, although it increases by a slim margin of under \$150 million (Table 9). India is expected to export up to \$400 million more other manufacturing, processed goods, and trade transport, and slightly more in several other sectors. However, if there is no change in India's trade restrictions, it will import more clothing than it exports, which will remove 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, save clothing. In that sector, it exports over \$27 billion more than it imports; in every other sector, it is importing more than it exports, especially other manufacturing and other food.

**Table 9 Change in Trade Balance, millions of U.S. dollars**

<b>Region</b>	<b>Change in Trade Balance</b>
<b>China</b>	-7,650
<b>Taiwan</b>	165
<b>India</b>	138
<b>Indonesia-Malaysia- Philippines</b>	87
<b>Rest of Asia</b>	657
<b>Central America, Caribbean</b>	1,504
<b>Latin America and Mexico</b>	700
<b>U.S.</b>	1,550
<b>EU</b>	1,221
<b>ROW</b>	1,629

Source: Authors' simulation results

### **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.<sup>9</sup> Another limitation is that the concept of duty drawbacks are not explicitly modeled, thereby not included in this analysis. For China, duty drawbacks can represent an

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<sup>9</sup> The authors intend to use the GTAP dynamic model when v. 6.0 of the GTAP Data Base is released later this year.

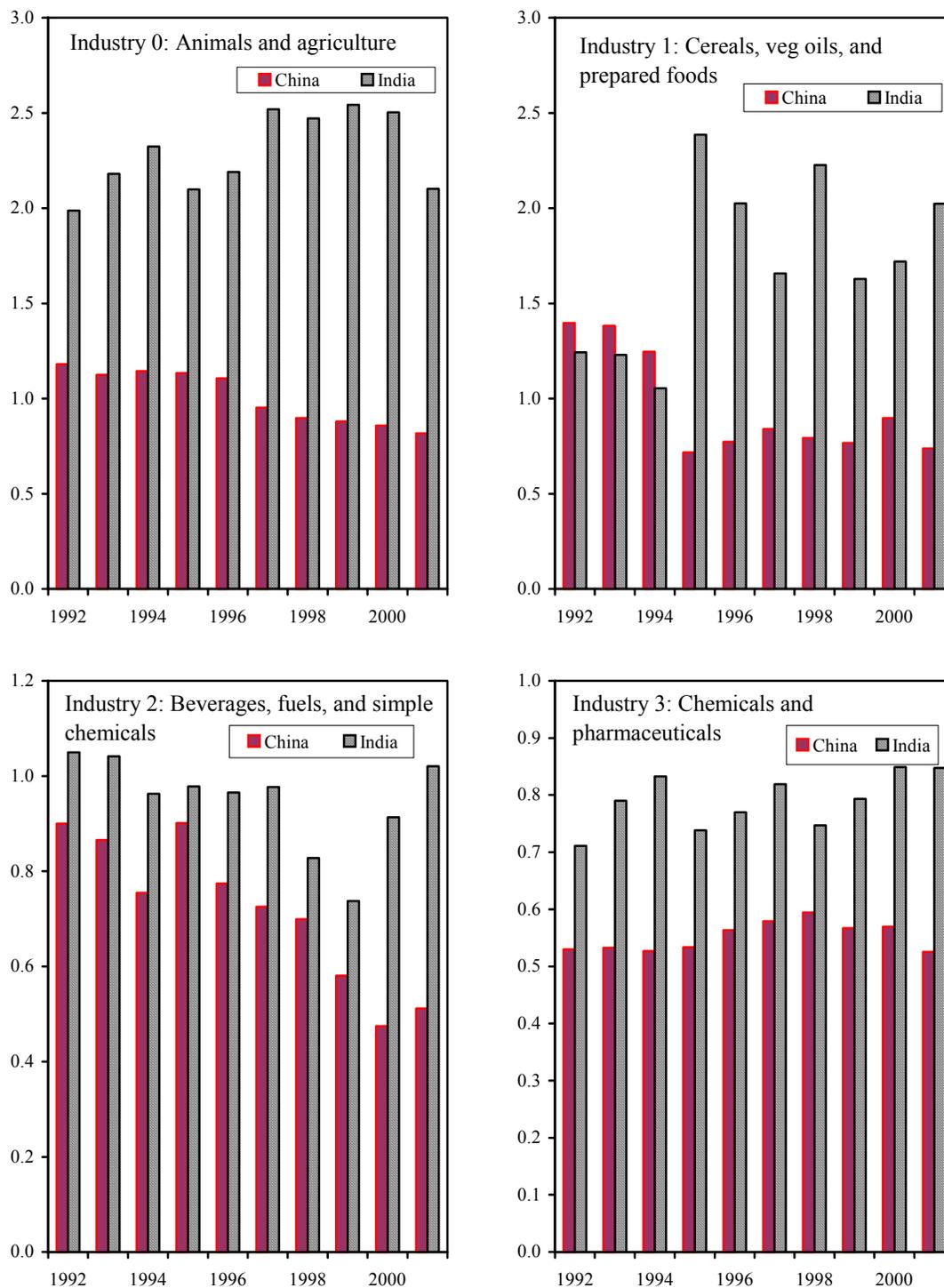
important revenue consideration and will be included in future experiments by the authors. Finally, the analysis may benefit from further regional disaggregation.

## **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 structure 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 trade 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.

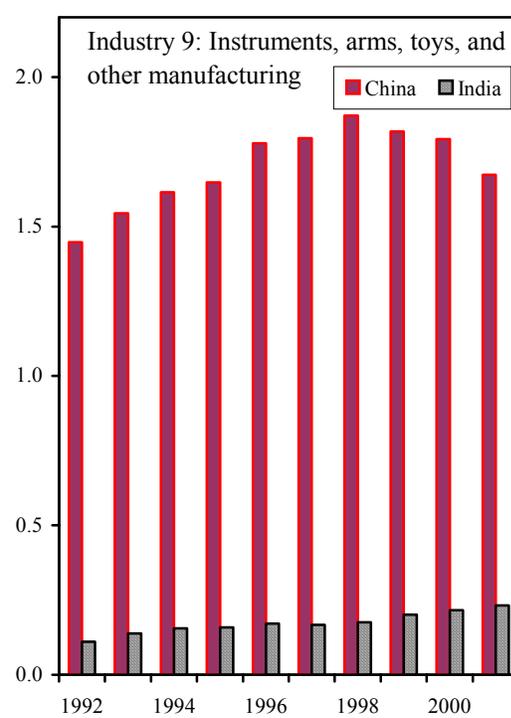
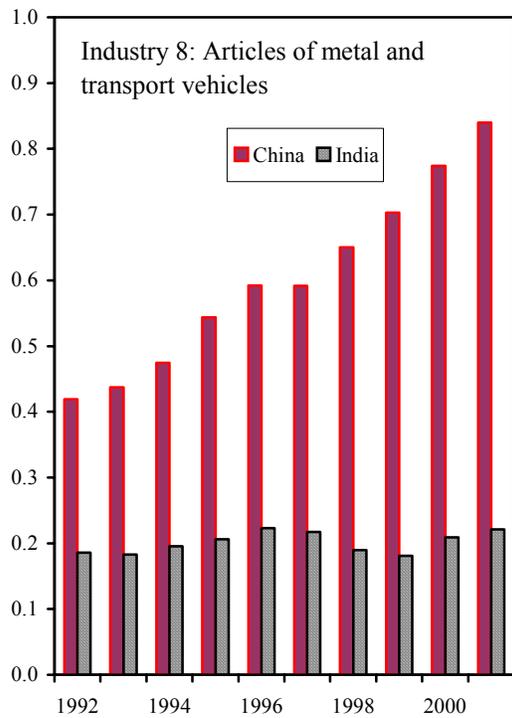
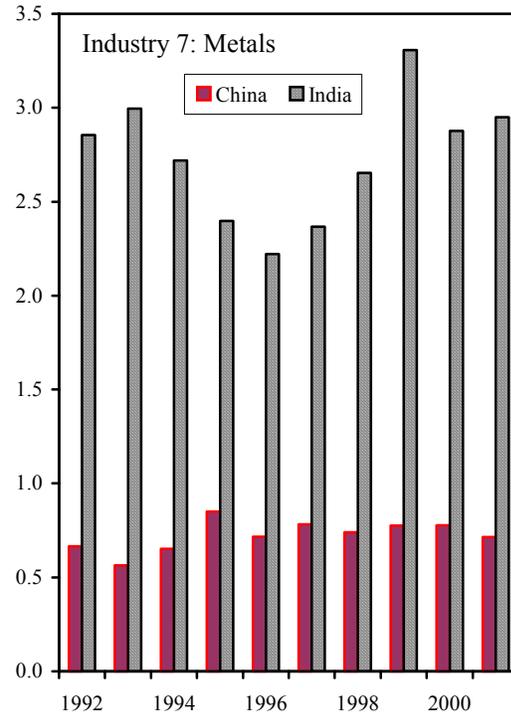
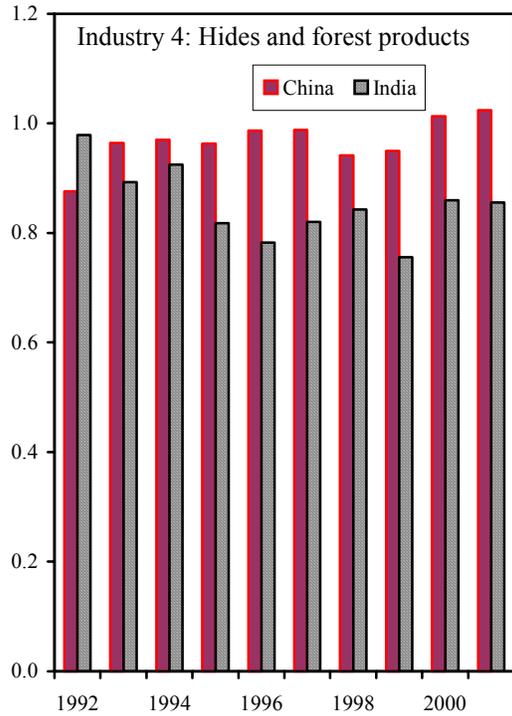
The results from the general equilibrium simulation model largely confirm most of these findings. India is likely to lose export shares in third markets, such as the U.S. and EU, particularly for textiles and clothing. Overall, India's welfare is expected to decline somewhat, mainly due to loss of market share and a deterioration in terms of trade. However, the simulations also demonstrate that other sectors will likely expand to partially offset these declines.

China and India: RCA, 1992-2001



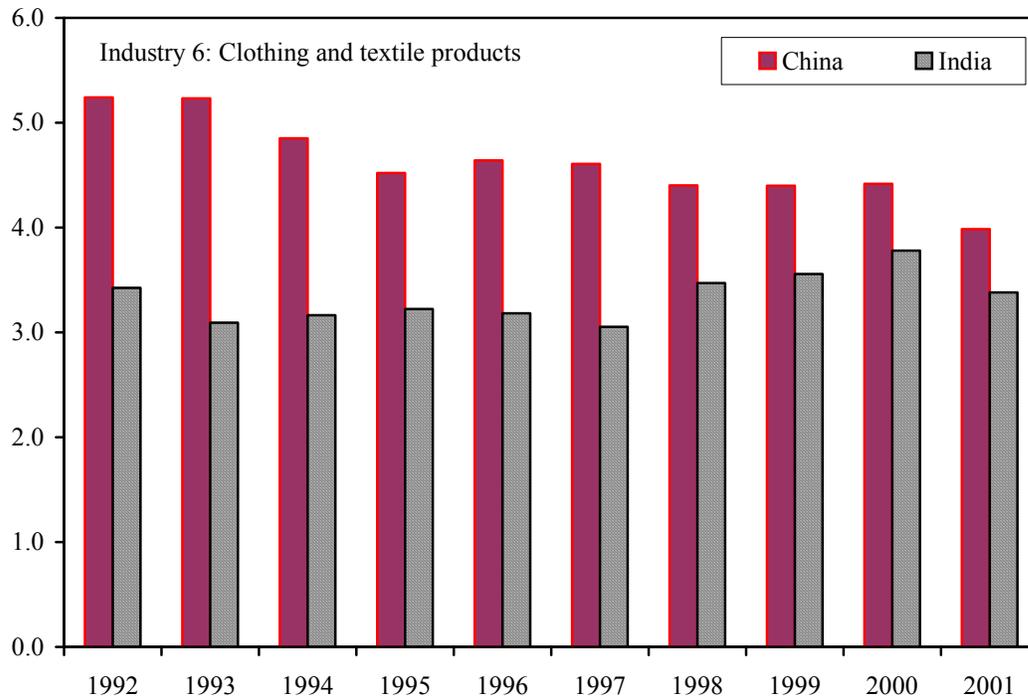
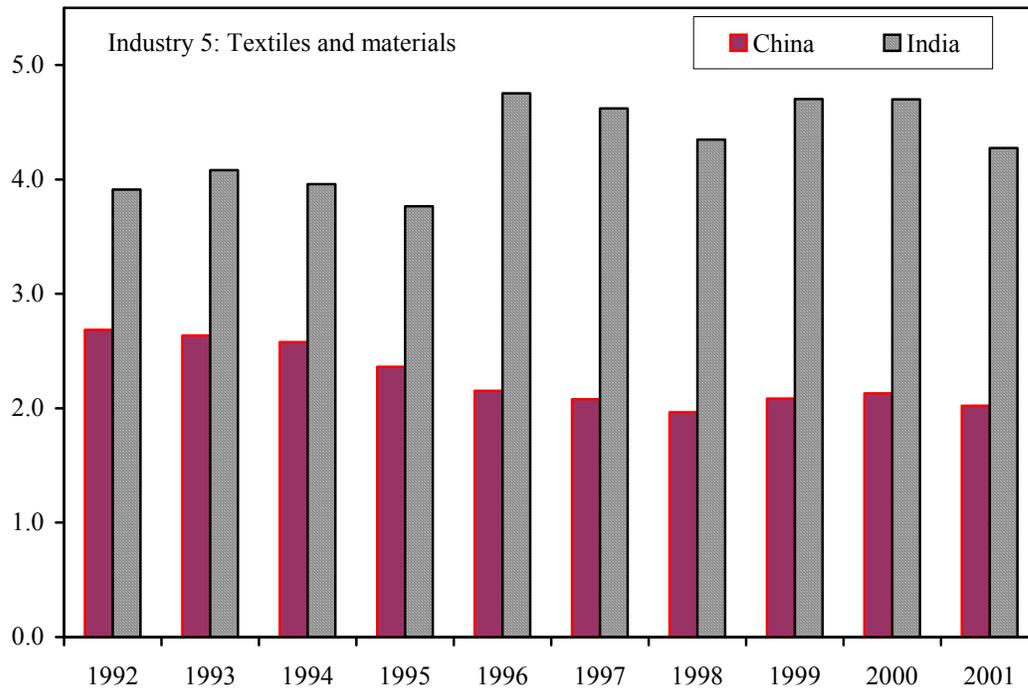
Source: UN COMTRADE

China and India: RCA, 1992-2001



Source: UN COMTRADE

China and India: RCA, 1992-2001



Source: UN COMTRADE

**Table 1**

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Herfindahl Index</b>										
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
<b>Index of Trade Competition in Third Markets (China and India)</b>										
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
<b>Gruber-Lloyd IIT Index</b>										
US 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 China	0.011	0.018	0.034	0.041	0.045	0.049	0.070	0.062	0.079	0.079
US with India	0.051	0.050	0.056	0.077	0.076	0.082	0.080	0.075	0.081	0.095
US with China	0.041	0.058	0.050	0.057	0.068	0.068	0.075	0.078	0.087	0.097
<b>COS Measure for India's Exports</b>										
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
<b>COS Measure for India's Imports</b>										
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**

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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	DW stat		1.96
Adjusted R-squared	0.0137	Mean dep var		2.64
S.E. of regression	186.64	S.D. dep var		187.93
Sum squared resid	50683911	AIC		13.30
Log likelihood	-9722	BIC		13.33
Number of observations: 1463				
White Heteroskedasticity-Consistent Standard Errors & Covariance				

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**Table 6 Terms of Trade Decomposition by Sector and Region, millions of 1997 U.S. dollars**

	5									
	1	2	3	4 Indo	5	6 Cent	7 Latin	8	9	10
Sector	China	Taiwan	India	Malay Philipi	Rest of Asia	Americ Caribb	Ameri Mexico	U.S.	EU	ROW
1 Food grains	5	0	-7	-4	1	-2	-1	12	2	-2
2 Feed grains	4	-2	0	-3	-10	-1	-1	19	0	-3
3 Veggie Fruit	17	0	-4	-3	-11	-26	3	22	8	-4
4 Oilseeds	-12	-6	-2	-3	-13	-2	-3	70	-17	-3
5 Sugar	3	0	-1	-1	3	-33	2	9	8	11
6 Plant fibers	12	-2	-11	-10	0	-32	-1	25	15	5
7 LivskMeaDair	16	2	-2	-1	-20	-5	-2	9	14	-11
8 Bever Tobacco	10	-2	0	-4	-8	-16	-1	3	25	-7
9 Other food	-31	10	-17	-6	37	-32	2	19	31	-11
10 Wood prod	85	20	-3	-14	-20	-13	-9	-43	30	-38
11 Extract	<b>202</b>	1	<b>-20</b>	-27	-132	-30	-21	-68	-32	127
12 Textiles	<b>-1058</b>	94	<b>-35</b>	-10	77	-39	1	<b>587</b>	<b>308</b>	65
13 Clothing	<b>-7336</b>	11	<b>-19</b>	0	3	-67	21	<b>5860</b>	<b>1403</b>	148
14 Light Mnfg	161	12	-8	-5	-16	-14	-8	-75	-19	-30
15 Process Indus	<b>201</b>	103	-39	-60	86	-70	-43	-140	79	-130
16 Autos	-9	1	-4	-17	256	-3	-26	-145	40	-87
17 Electronics	-309	221	-5	-60	508	-9	-24	-178	-53	-73
18 Other Mnfg	<b>599</b>	139	<b>-54</b>	-105	323	-86	-98	-425	56	-342
19 Trade transpo	356	52	<b>-40</b>	-54	256	-164	-62	-160	-22	-192
20 Communicati	10	2	0	-1	9	-12	-3	-7	7	-5
21 CommerServic	39	27	-20	-39	98	-62	-23	-28	98	-86
22 Other Service	39	12	-5	-4	39	-37	-10	-17	28	-43
<i>Total</i>	<i>-6996</i>	<i>694</i>	<i>-296</i>	<i>-429</i>	<i>1465</i>	<i>-750</i>	<i>-308</i>	<i>5349</i>	<i>2008</i>	<i>-711</i>

Source: Authors' simulation results.

**Table 7 India's change in quantity exports to all, percentage change**

	China	Taiwan	Indo- Mal Philipp	Rest of Asia	Cen Am Caribb	Latin Am Mex	U.S.	EU	ROW	Total <sup>1</sup>
<b>Foodgrains</b>	-35.4	3.4	2.9	3.2	0.9	3.4	3.1	2.8	2.6	2.6
<b>Feedgrains</b>	-64.6	3.3	3.8	3.5	2.8	4.0	3.7	3.5	3.3	2.6
<b>Veggie Fruit</b>	-16.3	4.2	2.3	3.8	1.6	3.4	2.7	2.8	2.6	2.5
<b>Oilseeds</b>	-86.6	4.9	3.6	4.1	2.9	5.3	4.7	3.9	3.2	1.8
<b>Sugar</b>	-46.2	3.9	2.4	2.4	-2.1	1.3	0.7	1.9	2.0	1.7
<b>Plant fibers</b>	-30.9	8.0	0.5	3.7	-1.4	3.1	2.5	2.3	2.3	0.3
<b>LivskMeatDair</b>	-1.9	5.6	2.5	3.6	-1.7	3.1	3.2	3.3	2.8	2.9
<b>BeverTobacco</b>	216.2	6.2	4.3	5.1	-2.9	3.6	3.6	4.3	3.6	3.4
<b>Other food</b>	-23.3	3.4	2.0	2.8	-1.6	2.7	2.5	2.8	2.6	1.0
<b>Wood prod</b>	9.4	4.4	3.2	3.4	-1.8	2.3	2.6	2.8	2.6	2.8
<b>Extract</b>	2.0	4.4	3.5	3.4	2.0	2.3	2.5	2.6	2.7	2.9
<b>Textiles</b>	12.9	4.2	-4.3	2.3	-15.9	0.8	-9.7	-1.4	-1.5	-2.0
<b>Clothing</b>	55.7	7.6	2.1	6.6	-9.7	1.1	-56.5	-11.2	-1.3	-19.4
<b>Light Mnfg</b>	10.2	9.0	1.7	7.7	-0.9	5.5	6.8	5.9	5.3	6.1
<b>Process Indus</b>	9.1	3.6	2.1	2.5	-0.8	1.5	1.8	1.9	1.8	2.1
<b>Autos</b>	17.0	8.6	7.3	7.6	2.7	5.7	6.0	6.5	6.2	6.5
<b>Electronics</b>	12.3	1.5	2.9	2.6	-1.4	2.0	2.5	2.4	2.2	2.6
<b>Other Mnfg</b>	4.9	4.6	4.0	4.2	1.3	3.1	3.5	3.5	3.3	3.6
<b>Trade transpo</b>	6.1	4.0	2.3	2.9	-2.2	2.3	2.4	2.7	2.4	2.8
<b>Communicatio</b>	6.6	2.9	2.2	3.0	-3.4	2.3	2.5	2.7	2.4	2.7
<b>CommServices</b>	5.7	3.7	2.0	2.8	-3.1	2.0	2.2	2.4	2.2	2.3
<b>Other Service</b>	7.5	4.3	2.1	3.1	-4.5	2.2	2.5	2.7	2.3	2.7

<sup>1</sup>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.

Source: Authors' simulation results.

**Table 8 India's change in quantity imports to all, percentage change**

	China	Taiwan	Indo- Mal Philipp	Rest of Asia	Cen Am Caribb	Latin Am Mex	U.S.	EU	ROW	Total <sup>1</sup>
<b>Foodgrains</b>	-8.3	-4.1	-0.6	-2.6	6.2	-1.3	-2	-1.7	-1.3	-1.4
<b>Feedgrains</b>	-5.0	-3.8	-1.1	-2.3	4.2	-1.6	-2.1	-1.7	-1.7	0
<b>Veggie Fruit</b>	-7.0	-3.7	-0.9	-2.5	4.6	-1.4	-2	-1.7	-1.3	-1.4
<b>Oilseeds</b>	5.9	-4.4	-1.8	-2.8	3.3	-2.7	-4.6	-2.3	-1.7	0
<b>Sugar</b>	-6.5	-4.6	-0.9	-2.3	8.0	-1.2	-1.4	-1.8	-1.3	-1.4
<b>Plant fibers</b>	-5.5	-2.0	0.7	-2.3	3.8	-1.2	-2	-1.6	-1.3	-1.8
<b>LivskMeatDair</b>	-4.2	-4.5	-0.9	-2.7	7.8	-1.4	-1.8	-2.0	-1.5	-1.5
<b>BeverTobacco</b>	-9.0	-5.7	-0.9	-3.3	<b>14.7</b>	-1.2	-1.7	-2.2	-1.5	-1.9
<b>Other food</b>	1.8	-3.8	-1.0	-2.4	6.9	-1.2	-1.5	-1.8	-1.3	-1.2
<b>Wood prod</b>	-7.6	-3.9	-0.7	-2.2	<b>9.2</b>	-0.6	-0.9	-1.4	-0.9	-1.1
<b>Extract</b>	-8.4	-3.6	-0.3	-1.6	9.0	0.2	-0.1	-0.6	-0.3	-0.5
<b>Textiles</b>	<b>-2.7</b>	-5.6	-2.8	-4.0	6.6	-2.6	-2	-2.5	-2.7	<b>-3.2</b>
<b>Clothing</b>	<b>-10.1</b>	-12.6	-7.2	<b>-9.6</b>	<b>11.8</b>	-6.6	<b>4.5</b>	<b>-6.4</b>	-6.8	<b>-6.7</b>
<b>Light Mnfg</b>	-6.4	-4.2	1.3	-1.7	17.3	1.3	0.6	-0.1	0.9	-0.2
<b>Process Indus</b>	-4.7	-2.5	0	-1.1	6.5	0.3	0	-0.4	-0.1	-0.5
<b>Autos</b>	-4.7	-7.7	-1.6	-4.6	<b>11.3</b>	-1.2	-1.6	-2.7	-1.9	-3.3
<b>Electronics</b>	<b>3.8</b>	-2.6	0.1	-1.3	<b>9.9</b>	0.4	0.1	-0.4	0	-0.6
<b>Other Mnfg</b>	-7.0	-4.4	-0.6	-2.3	10.5	-0.1	-0.5	-1.2	-0.5	-1.3
<b>Trade transpo</b>	-8.2	-3.7	-0.1	-1.8	9.6	-0.2	-0.5	-1.0	-0.5	-1.2
<b>Communicatio</b>	-9.1	-3.8	-0.1	-1.8	12.3	-0.2	-0.6	-1.1	-0.5	-0.8
<b>CommServices</b>	-8.7	-3.6	0.1	-1.6	12.2	0.1	-0.4	-0.8	-0.3	-0.6
<b>Other Service</b>	-9.0	-4.3	-0.7	-2.3	9.8	-0.7	.0	-1.5	-1.0	-1.3

<sup>1</sup>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.

Source: Authors' simulation results.

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**Table A1. Regional Aggregation**

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

Source: Authors' aggregations from GTAP data base

**Table A2. Sector Aggregation**

<b>Sector</b>	<b>Corresponding GTAP sector</b>	
1	<b>Food grains</b>	Patty rice
2	<b>Feed grains</b>	Wheat
3	<b>Veggie Fruit</b>	Cereal grains, n.e.c.
4	<b>Oilseeds</b>	Oilseeds
5	<b>Sugar</b>	Sugar cane, sugar beat
6	<b>Plant Fibers</b>	Crops n.e.c.
7	<b>Livsk-Meat- Dairy</b>	Bovine cattle, sheep and goats, horses; animal products n.e.c.; raw milk; wool, silk-worm cocoons; bovine meat products; meat products n.e.c.; dairy products
8	<b>Wood Products</b>	Forestry
9	<b>Other Food</b>	Fishing; vegetable oils and fats;
10	<b>Extract</b>	Coal; oil; gas; minerals n.e.c.;
11	<b>Beverage- Tobacco</b>	Beverages and tobacco products
12	<b>Textiles</b>	Textiles
13	<b>Clothing</b>	Wearing apparel
14	<b>Light Mnfg</b>	Leather products
15	<b>Processing</b>	Petroleum, coal products
16	<b>Autos</b>	Motor vehicles and parts
17	<b>Other Mnfg</b>	Machinery and equipment n.e.c.; manufactures n.e.c.
18	<b>Electronics</b>	Electronic equipment
19	<b>Other Services</b>	Electricity; gas manufacture, distribution; water; construction;
20	<b>Trade Transport</b>	Trade; transport nec; water transport; air transport;
21	<b>CommerServices</b>	Communication; financial services nec; insurance; business services nec;
22	<b>Other Services</b>	Recreational and other services; public administration, defense, education, health; dwellings.

Source: Authors' aggregations from GTAP data base