

INDIA'S OPTIMAL TRADE STRATEGY: A GENERAL EQUILIBRIUM ANALYSIS*

INTRODUCTION

India has been growing remarkably in light of its economic reforms and trade liberalization in recent decades. It is one of the most vibrant developing countries that potentially may have a great impact on the world economy in this century. In the recent Doha rounds of trade negotiations, India was included as one of the five core parties (European Union, United States, India, Brazil, and Australia) that can set the parameters of the future terms of world trade through negotiations (Financial Times, October 19, 2005).

Table 1 provides an overview of India's foreign trade in recent years. Both exports and imports have grown at a significant pace. Total exports amounted to 36.8 billion U.S. dollars in 2000 and increased to 63.8 billion U.S. dollars in 2004. Imports grew even faster. The corresponding number for 2000 and 2004 are 49.67 billion and 78.15 billion U.S. dollars. Panel B shows India's trade with its important partners: the United States, European Union, China, and Japan. India has the largest trade relationship with the EU, followed by the United States. India's trade with the EU in 2003 accounted for about 2.5 percent of its GDP and with the United States it was 1.6 percent of its GDP. However, while India's total trade continues to grow, overall, it still remains less than 1 percent of total world trade.

Little progress was made in the recent Doha Round negotiations on world trade liberalization in December 2005 in Hong Kong. Some pessimists believe the Doha Round is already dead, while others insist that there still is some hope for success. If Doha fails, the

* We thank Patty Loo for editorial assistance.

world trading system will be broken into bilateral and regional deals, suggesting that the multilateral system would wither. The international cooperation that is a byproduct of the global trading system would benefit emerging markets, such as India, making India, and similar countries, a big winner from freer trade in goods and services.

TABLE 1 - *India's Trade Statistics*

Panel A: General Trade Statistics (US\$ million)

Year	Total Exports	Total Imports	Trade Deficit
2000	36,822	49,671	-12,848
2001	44,560	50,536	-5,976
2002	43,827	51,413	-7,587
2003	52,719	61,412	-8,693
2004	63,843	78,150	-14,307

Panel B: India's Total Trade (export/import)
with Trading Partners (US\$ million)

Trading Partners	2002	2003
U.S.	8,774.6 (6488.1/2286.5)	9,369.7 (6397.0/2772.7)
EU	3,536.1 (6507.8/7028.3)	14,929.0 (7291.3/7637.7)
China	2,340.7 (868.1/1271.6)	3,231.0 (1139.2/2091.8)
Japan	2,183.0 (1155.7/1028.0)	2,399.0 (980.2/1418.8)

Source: Ministry of Commerce & Industry, Department of E-commerce of India,
<http://www.indianinbusiness.nic.in/trade-india/trade-trends.htm>.

India has recognized that gains from openness can be realized and has been slashing its tariffs unilaterally. In this paper we examine the possible impact of India's trade liberalization policies on its own economy and the rest of the world when different combinations of trade liberalization scenarios are considered. Specifically, it attempts to answer the question that if India were to cut unilaterally import tariff rates, exports subsidies, and output subsidies, how would this policy affect its own economy and the rest of the world? We then compare this policy with other alternative schemes. Our study contributes to the literature by shedding light on the important roles played by India in the world economy and the trade strategy of India.

Using the conventional multi-region, multi-sectoral GTAP model, i.e., the global trade analysis project (GTAP) model (Hertel,

1997), we analyze the effects of India's trade liberalization policies in all sectors (agriculture, manufacturing, and services sectors) on output, trade balance, and world welfare. The GTAP model has been widely used in international trade and other applied economic analyses (Zhang *et al.*, 2006; Ianchovichian, 2004; Hertel, 1997; Devarajan *et al.*, 1990; Bandara and Yu, 2001; Harrison *et al.*, 1997 and Tsigas, 2005). In this paper, we demonstrate how the GTAP model based on the computational general equilibrium model can be used for policy tools and analysis.

We briefly discuss India's trade history and world economy in the following section. In section three, we present and discuss our model structure for simulation analyses, utilizing the computational general equilibrium approach. Several policy scenarios are analyzed and explained. The empirical results from the simulation analyses are presented and discussed in section four. The last section provides the summary and conclusions of this study.

2. INDIA'S TRADE HISTORY AND ITS ECONOMY

India's trade liberalization experience has a long history of debate and policy changes. It evolved from a complex system of 'command and control' in the 1950s to partial liberalization in the late 1970s and 1980s, and to more competitive policies in the 1990s. The economic development plans of India from 1951 to 1977 relied on a system of comprehensive controls. In the late 1970's, the Indian government resorted to partial liberalization. Although the process of liberalization continued through the 1980s, the speed of reform was slow and limited (Panagariya, 1994). These policies were later labeled by many economists as 'inward-looking'. The strategy of import substitution policy involved high tariffs and non-tariffs barriers. This led to a constrained economic growth. It was not until the late 1980s when policymakers realized the adverse consequences of these policies and began to remove import and export restrictions. They started to allow foreign investment into previously reserved sectors as well. They also eased the complex import licensing system. Imports, however, were still subject to high tariff rates – at times exceeding 300 percent on some commodities – and controls remained pervasive.

Partly due to these restrictive policies and controls, India's share in world exports declined from 1 percent in 1965 to 0.5 percent in 1980. Foreign investment was also controlled up until the late 1980s and amounted to less than \$400 million per year. Only high-tech and

export-oriented companies could seek foreign equity not exceeding 40 percent of their assets. India faced a foreign exchange crisis in 1966 and its foreign exchange reserves declined steadily from the late 1980s onwards. In 1991, India devalued its currency and started to move toward freer trade. Policy measures included elimination of the monopoly of state trading agencies. Exchange-rate policy became more flexible. Quantitative controls on manufactured intermediate goods were also gradually reduced. Using an import coverage ratio, Mishra and Kumar (2005) estimate that the average coverage ratio in the manufacturing sector declined from 82 percent in 1991 to 17 percent in 2000.

Liberal trade policies and the structural reforms that India embarked on in 1991 are now yielding significant dividends. For instance, merchandized exports grew by 24.4 percent in 2004 to about \$80 billion while imports increased by 35 percent to about \$106 billion. The Indian rupee has also been strengthening; appreciating about 5 percent in 2004. Foreign exchange reserves now stand at US\$137.4 billion. India's performance is often compared to that of China. Both China and India are viewed as vast emerging markets. Both have a strong middle class and high economic growth.

However, India's performance, although impressive, does not match that of China. Compared to China, its reform process has been slow and its performance less impressive. China has been growing at a 10 percent rate, its share of world exports stands at 5.8 percent while that of India remains at a mere 0.7 percent. In terms of *per capita* income, both countries were about equal in 1980. However, China's *per capita* income now is twice that of India. Also, India's foreign direct investment is less than one-tenth of the level achieved by China. Under pressure from WTO, India is now moving to further opening up foreign direct investments in sectors such as pharmaceuticals, telecommunications, power, transportation, and insurance. As noted, India's imports have exceeded exports throughout the entire period and the trade deficit may continue in the future for quite some time. This may constrain growth. India may be asked to cut its export and production subsidies as it is calling on western countries to do the same under the Doha round.

Table 2, Panel A reports India's top 10 imports from other regions in 2001. India's largest imports were apparel (\$8.67 billion), electrical products (\$7.66 billion), mineral products (\$7.03 billion), and leather products (\$6.47 billion). Panel B of Table 3 shows India's 10 largest exports to foreign countries. They were electrical products (\$7.5 billion), apparel (\$7.13 billion), mineral products (\$6.39 billion),

and recreation and other services (\$6.28 billion). The top items in India's exports and imports are quite similar in nature, reflecting the Indian economy's focus on primary and secondary industries.

TABLE 2 - *Composition of Imports and Exports in India*

Panel A: India's Top 10 Imports from Other Regions at Market Price in Year 2001 (US\$ million)

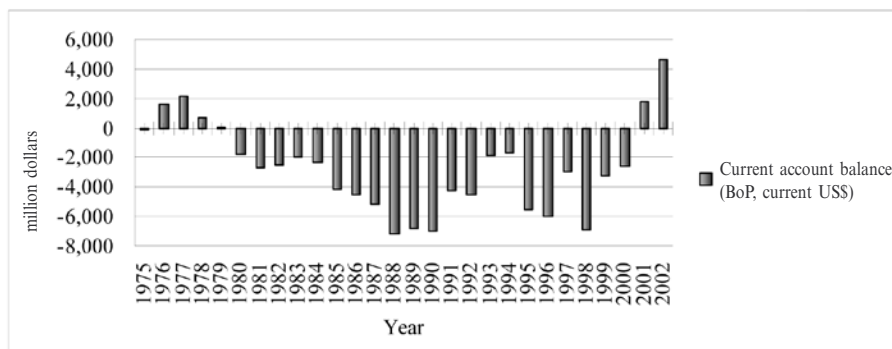
	USA	EU	China	Japan	ROW	Total
Cattle, sheep, goats, horses	259.52	361.73	18.06	61.34	808.08	1,508.73
Beverages and tobacco products	339.29	390.89	123.08	538.07	1,280.11	2,671.44
Apparel	1,640.81	2,646.99	204.99	238.15	3,934.06	8,665.01
Leather products	1,913.53	2,545.12	4.72	113.77	1,889.29	6,466.43
Wood products	226.23	1,100.88	39.55	25.88	466.66	1,859.20
Mineral products	973.19	1,214.98	577.11	124.48	4,139.22	7,028.98
Metals	211.35	219.89	90.86	47.23	1,168.45	1,737.78
Manufactures	660.5	860.43	89.4	104.03	1,797.18	3,511.55
Electrical	3,217.01	1,485.16	160.16	457.24	2,343.25	7,662.82
Transport	52.79	1,242.32	242.77	250.96	593.75	2,382.59

Panel B: India's Top 10 Exports to Other Regions at Market Price in 2001 (US\$ million)

	USA	EU	China	Japan	ROW	Total
Beverages and tobacco products	321.993	345.04	101.81	504.29	1,013.41	2,286.54
Apparel	1,316.15	2,132.93	176.03	215.26	3,290.94	7,131.31
Leather products	1,528.32	2,085.50	3.87	99.47	1,552.40	5,269.56
Wood products	197.80	1,006.04	34.66	21.94	414.91	1,675.35
Mineral products	916.06	1,161.29	488.56	119.81	3,708.01	6,393.73
Metals	193.13	201.73	80.16	44.148	978.44	1,497.61
Motor vehicles and parts	464.05	426.10	3.37	15.01	632.33	1,540.86
Manufactures	631.04	829.55	78.41	101.40	1,625.66	3,266.07
Electrical	3,187.55	1463.69	141.35	455.66	2,254.72	7,502.97
Recreation and other services	831.92	2,935.88	22.11	335.22	2,159.04	6,284.18

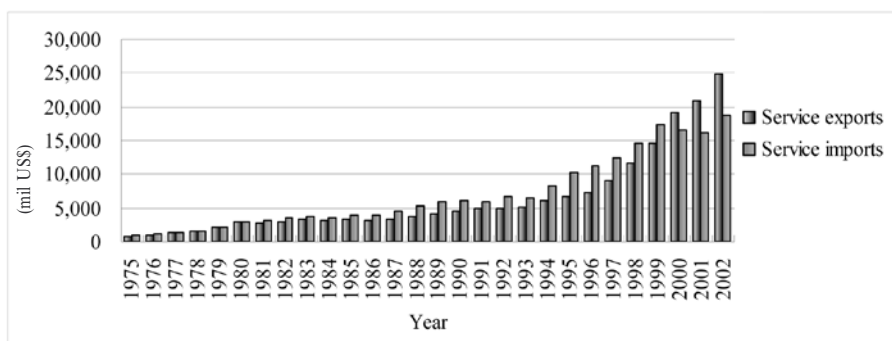
Source: GTAP Version 6 (2005).

For over twenty years, India experienced a prolonged trade deficit as shown in Figure 1. However, in recent years, India has improved its current account balance and is making progress toward achieving a surplus in the current account.

FIGURE 1 - *India's Current Account Balance 1975-2002*

Source: World Development Index (2004).

The size of India's service sector has also grown. Figure 2 shows the total value of exports and imports of services in India. Historically, the total value of the service sector imports exceeded the exports of the service sector. Starting in 1999, India's exports in services exceeded its service imports, reversing the long-term trend. In 2002, the service trade was worth about \$43 billion, which accounted for roughly 45 percent of India's total trade, which suggested that the service trade has now become an important part of India's economy.

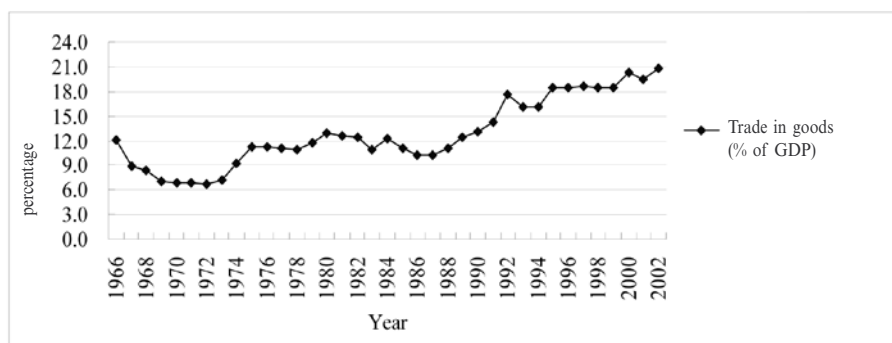
FIGURE 2 - *India's Service Sectors Exports/Imports*

Source: World Development Index (2004).

Although India's growth rate has been impressive, the trade in the goods sector is still a relatively small component of its GDP.

Figure 3 shows trends in India's trade component relative to its GDP. In the past few years, trade in goods and services has reached about 20 percent of its GDP. It seems clear that this percentage will continue to climb as India becomes more integrated into the global trading system.

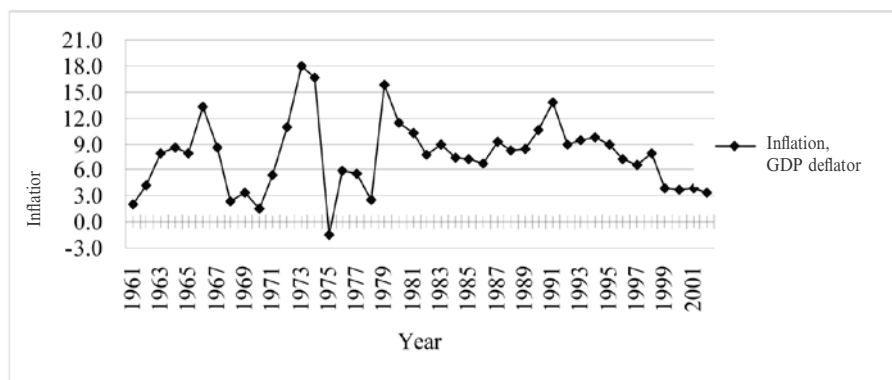
FIGURE 3 - *India's Trade in Goods (% of GDP)*



Source: World Development Index (2004).

From late 1970s through the early 1990s, India's inflation rate was high, exceeding 10 percent at times. After 1994, the inflation rate began to decline steadily to less than 5 percent per year as illustrated in Figure 4. The steady decline in inflation rates signals to the world that India is committed to fighting inflation and its economy is now on a sound economic course track with continual open markets.

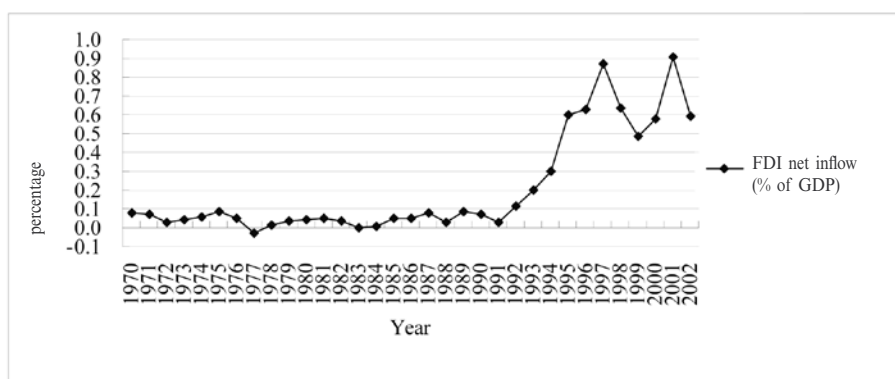
FIGURE 4 - *India's Inflation, GDP Deflator (Annual %) 1961-2002*



Source: World Development Index (2004).

The combined effects of cautious domestic and open market policies created confidence in investors overseas, thereby increasing the influx of foreign direct investment (FDIs) in India. Until 1994, India was a closed economy to foreign investors. However, after 1994, FDI has increased, but its size is still small and India needs to continue to open its door to foreign investors and trade liberalization.

FIGURE 5 - *India's Foreign Direct Investment, 1970-2002*
Net Inflows (% of GDP)



Source: World Development Index (2004).

3. RESEARCH METHODOLOGY

3.1 Model Structure and Simulations

A computable general equilibrium (CGE) model is developed for this analysis because the model is able to capture the multi-sectoral and multi-regional linkages among the economies studied. Our model is based on the Global Trade Analysis Project (GTAP) model (Hertel, 1997). The model assumes a perfectly competitive market structure. The original GTAP model is a comparative static, multi-commodity, multi-region model, which has been widely used for analyzing the impact of economic growth (Johansen, 1960 and Jorgenson, 1998), trade policy analysis (Gan, 2004; Bosello and Zhang, 2005), and foreign exchange policy (Zhang *et al.*, 2006; Zhang and Fung, 2006).

In our model, all experiments are conducted with a multicountry CGE closure. The general equilibrium closure is appropriate for capturing the substitution in production and consumption. Output

levels, prices, and income are endogenous for each region. The global bank's allocation of investment is flexible. The world economy is classified into six regions with each representing either a single country or a composite region consisting of many countries. These six regions are as follows: the European Union (EU), the United States, China, Japan, India, and the rest of the world (ROW). The regional aggregation is primarily based on perception of their importance in world production, trade volume (especially with India), economic development status, and geographic location. Each region's economy is further divided into 17 sectors or commodity groups with emphasis on agriculture, manufacturing, and service products. Since we are focusing on agriculture trade in developing countries, each regional economy is divided into the following 17 sectors: rice, wheat, cereal crops (CerCrops), vegetables and fruits (VegFruits), animals, forestry, fishing, coal, oil, gas, oil products, electricity, water, energy intensive industry, other industries, manufacturing services (MServ), and non-manufacturing services (NMServ).

According to its comparative advantages, each region produces its own unique variety of commodities using primary factors such as skilled and unskilled labor, capital, land, natural resources, and domestically-produced or imported intermediate inputs. The production process is represented by a nested constant elasticity of substitution (CES) structure. Each primary factor is supplied to industries from its fixed regional endowment. We assume that skilled and unskilled labor and capital are mobile between industries, while land and natural resources are immobile. Therefore, wages for each category of labor and the user price of capital are uniform across industries, but the rental prices of land and natural resources can vary.

Commodities produced in each region are either used to meet domestic demand (as intermediate inputs in production or final products in consumption) or exported to other regions. Both intermediate and final products from different regions are considered to be imperfectly substitutable with each other (Armington, 1969). The final demand consists of investment, government consumption, and private consumption, each of which consumes composite commodities that are CES combinations of domestic and imported varieties. Government consumption is determined by the maximization of a Cobb-Douglas type utility function. A constant-difference-elasticity (CDE) utility function is used for determining private consumption. Nominal government consumption, private consumption and net saving are each a fixed share of nominal national income. Aggregated investment can be determined by one of the two configurable mechanisms.

First, global net saving between regions in fixed shares. Second, elasticities of future expected rates of return with respect to future capital stocks are incorporated into the model (Hanslow *et al.*, 2002).

Savings are assumed to finance investments at the global level. Global saving is the sum of regional savings. The rate of returns from capital determines the capital investment and flows. The current account is not necessarily balanced for each country/region from a global point of view. If savings exceed investments for one country, then it has a trade surplus; otherwise it has a trade deficit. Finally, transportation costs are accounted for by using the difference between the f.o.b. (free on board) and c.i.f. (cost, insurance, and freight) values. The general structure and behavioral equations of the GTAP model can be found in Hertel (1997). The baseline data is based on GTAP database version 6 (Dimaranan and McDougall, 2006).

3.2. Policy Scenario Design

As noted, the CGE model is employed because it can catch the intersectoral linkage between regions and international trade flows. The rationale of the paper is to evaluate India's optimal strategy in recent international trade negotiations. Therefore, the three scenarios designed in our study are as follows. We assume that the U.S., EU, and Japan belong to developed regions, while China, India, and ROW are developing regions.

We employ the Swiss Formula to generate the final bounded tax rates for tariff, export subsidies, and output subsidies. The simple Swiss formula is as follow:

$$t_1 = \frac{(a \text{ or } b) \times t_0}{(a \text{ or } b) + t_0} \quad (1)$$

where,

t_1 = Final bound tariff; t_0 = Base rate; a and b are the coefficients for developed regions and developing regions, respectively.

As shown in Table 3, the scenarios are divided into three scenarios. For the first scenario (scenario A: Full trade liberalization), there will be 100 percent reduction of tariff rates, export subsidies, and output subsidies across all sectors and regions in the world economy. This scenario is one of the extreme cases, it is difficult to implement in the real world trading system at this stage. We only use it as a reference for comparisons with other scenarios. It serves as a reference for the ideal free trade policy.

In the second scenario (scenario B: the joint cooperative trade liberalization), we apply different reduced rates for developed regions and developing regions according to our assumptions about real world trade negotiation situation. That is, we would have more trade liberalization in developed countries than developing countries. Thus, we call this scenario a joint cooperative trade liberalization scheme.

For developed regions, there will be a 60 percent reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors, 40 percent reduction in manufacturing sectors, and a 20 percent reduction in service sectors. For developing countries which include China, India, and ROW, it assumes a 40 percent reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors, 20 percent in manufacturing sectors, and a 10 percent reduction in service sectors. At the current stage, the trade liberalization of the agriculture sectors is still the main issue on the negotiation table, though service-sector trade negotiations are on the agenda between developed and developing regions.

We are mainly interested in India's strategy in trade negotiation in the third scenario (scenario C: India's unilateral trade liberalization), where India implements a unilateral trade liberalization, i.e., with 40 percent reduction in tariff rates, export subsidies, and output subsidies in agriculture sectors, 20 percent reduction in manufacturing sectors, and 10 percent reduction in service sectors, while other countries and regions do not change their trade policies – a zero reduction of taxes and subsidies.

TABLE 3 - *Scenarios Design*

Scenarios	Description
Scenario A: Full Trade Liberalization	All sectors in all regions with 100% reduction in tariff rates, export subsidies, and output subsidies. This scenario reflects a full trade liberalization situation.
Scenario B: Joint Cooperative Trade Liberalization	For the developed regions, there will be a 60% reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors, 40% reduction in manufacturing sectors, and 20% reduction in service sectors. For developing countries, there will be a 40% reduction of tariff rates, export subsidies, and output subsidies in the agricultural sectors, 20% in the manufacturing sectors, and a 10% reduction in service sectors.
Scenario C: Unilateral Trade Liberalization	India has implemented unitary trade liberalization, with a 40% reduction in tariff rates, export subsidies, and output subsidies in agricultural sectors, a 20% reduction in manufacturing sectors, and a 10% reduction in service sectors.

4. INTERPRETATION OF RESULTS

4.1 Output Analysis

Panel A of Table 4 shows the impact of full trade liberalization policy across the globe on different sectors in all regions. We have a 100 percent reduction of tariff rates, export subsidies, and output subsidies, which are implemented by all regions. The effect on the output of different sectors varies, depending upon the type of industries and regions. For example, the U.S. will generally experience positive output effects of trade liberalization with the exception of rice, oil products, and manufactured services (MServ). China will experience positive output effects on rice, oil products, and manufactured services, while also experiencing negative output effects on others. India will have a mix of positive and negative effects. In short, it seems that U.S. appears to have the greatest positive gain in output in both agricultural and manufacturing sectors

TABLE 4 - *Output Change in Different Sectors (% Change with Respect to Benchmark)*

Panel A - Scenario A: Full Trade Liberalization

Output	USA	EU	China	Japan	India	ROW
<i>Agricultural Sectors</i>						
Rice	-37.87	-55.71	5.40	-36.85	1.88	-5.15
Wheat	2.62	10.33	-1.60	-63.83	-1.81	-1.46
CerCrops	8.85	-2.48	18.33	-15.86	-2.48	-5.70
VegFruits	2.94	-6.19	-6.23	-4.08	-1.00	2.33
Animals	3.62	1.10	-0.76	-5.41	0.16	0.22
Forestry	4.64	-0.38	-1.16	-9.04	-0.55	1.27
Fishing	1.54	-0.64	-0.01	-2.84	0.47	0.43
<i>Manufacturing Sectors</i>						
Coal	2.02	1.20	-3.20	-8.89	-8.71	0.03
Oil	1.76	-0.42	-3.89	-5.43	-7.57	0.12
Gas	2.62	-2.03	-1.51	-26.11	-1.20	0.45
Oil Products	-3.21	-3.14	0.32	-4.65	0.79	4.04
Electricity	0.89	2.54	-1.72	-1.84	0.00	-0.35
Water	0.01	3.07	-1.29	-2.85	-1.13	-0.03
En_Int_Ind	6.28	2.85	-4.43	-10.56	-3.28	-1.71
Oth_Ind	2.77	-0.79	-0.27	-7.32	3.01	1.65
<i>Services</i>						
MServ	-1.43	1.39	5.88	4.45	0.86	0.73
NMServ	0.26	-4.30	-5.53	-3.73	-2.82	-3.28

Note: CerCrop=Cereal Crops; VegFruits=Vegetables and Fruits; En_Int_Ind=Energy Intensive Industry; Oth_Ind=Other Industries; MServ=Manufactured Services; NMServ=Non-Manufactured Services.

in world trade liberalization; Japan appears to have a fall in output and other countries would display mixed effects.

As we all know, full trade liberalization is not a realistic scenario at the current stage. On the trade negotiation table, a more realistic deal is similar to what we implemented in scenario B, joint cooperative trade liberalization. Developed regions or industrial countries demand developing regions to further open their domestic market while developing regions request developed regions to cut their farm subsidies more aggressively. To what extent the trade negotiation can be a success depends on finding a balancing point among trading partners. Of course, the more open the domestic markets and free trade are, the better it is for the global and regional economy in general. However, the issue of how to balance domestic sustainable development (especially domestic employment) and external trade policy is still a very challenging task for policymakers.

Panel B of Table 4 illustrates the effects of the joint cooperative trade liberalization of developed and developing countries on different sectors. For the developed regions, there will be 60 percent reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors, 40 percent reduction in manufacturing sectors,

TABLE 4 - *Continued*

Panel B - Scenario B: Joint Cooperative Liberalization

Output	USA	EU	China	Japan	India	ROW
Rice	-27.33	-33.75	1.53	-13.36	1.23	0.02
Wheat	0.73	2.01	-0.10	-74.83	-0.78	0.22
CerCrops	2.89	-1.96	7.02	-7.32	-0.81	-1.60
VegFruits	-1.45	-4.62	-1.35	-1.67	-0.35	1.44
Animals	0.77	0.19	0.01	-1.58	0.08	0.20
Forestry	1.05	-0.83	-0.06	-2.80	-0.16	0.56
Fishing	0.38	-0.51	0.21	-0.44	0.23	0.28
Coal	0.47	0.37	-0.73	-3.10	-1.46	0.07
Oil	0.40	-0.04	-0.92	-1.78	-1.33	0.01
Gas	0.43	2.78	-0.29	-5.98	-0.20	-0.21
Oil_Pcts	-0.69	-0.59	-0.05	-1.32	0.19	0.87
Electricity	0.19	0.96	-0.33	-0.30	0.00	-0.08
Water	-0.02	1.17	-0.30	-0.78	-0.11	0.01
En_Int_Ind	1.43	0.82	-1.00	-3.44	-0.59	-0.18
Oth_Ind	0.60	-0.37	0.22	-1.95	0.82	0.77
MServ	-0.30	0.36	0.80	1.31	0.08	-0.12
NMServ	0.04	-0.91	-0.97	-1.09	-0.39	-0.53

Note: CerCrop=Cereal Crops; VegFruits=Vegetables and Fruits; Oil_Pct=Oil Products; En_Int_Ind=Energy Intensive Industry; Oth_Ind=Other Industries; MServ=Manufactured Services; NMServ=Non-Manufactured Services.

and 20 percent reduction in service sectors. For developing countries such as India, there will be 40 percent reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors, 20 percent in manufacturing sectors, and 10 percent reduction in service sectors. In this analysis, developed countries will implement a more liberal trade policy than the developing countries.

The results indicate that U.S., EU and Japan will have a significant drop in output in rice sectors (-27.3 percent, -33.8 percent, and -13.4 percent, respectively), while other sectors experience relatively small effects. The EU and Japan will experience output contraction and/or negative effects in most sectors and the U.S. will gain in most sectors. From the point of view of developing countries, China, India, and ROW will experience relatively small reductions compared with developed regions. China and India will both suffer output reduction in most sectors while ROW will show mix effects.

Panel C of Table 4 shows India's unilateral trade policy as related to tariff rates, export subsidies, and output subsidies. While the effects on output of the U.S., EU, China, and Japan are positive, India suffers negative effects. India has a drop in output in most

TABLE 4 - *Continued*

Scenario C - India Unilateral Trade Liberalization

Output	USA	EU	China	Japan	India	ROW
Rice	0.29	1.59	0.01	0.05	-0.16	-0.01
Wheat	0.22	0.16	0.03	0.14	-0.91	0.16
CerCrops	0.02	0.04	0.08	0.04	-0.58	0.03
VegFruits	0.05	0.06	0.01	0.01	-0.72	0.09
Animals	0.00	0.00	0.02	0.01	0.10	0.00
Forestry	0.01	0.01	0.01	0.01	-0.48	0.04
Fishing	0.00	0.00	0.00	0.00	0.12	0.00
Coal	0.01	0.02	0.04	0.03	-1.72	0.03
Oil	0.02	0.00	0.02	0.02	-1.31	0.01
Gas	0.02	0.01	0.00	0.06	-0.25	-0.01
Oil Products	-0.01	-0.01	0.00	-0.01	0.68	-0.03
Electricity	0.00	0.00	0.00	0.00	-0.13	0.00
Water	0.00	0.00	0.00	0.00	-0.13	0.00
En_Int_Ind	0.01	0.00	0.01	0.02	-0.79	0.00
Oth_Ind	0.00	-0.01	-0.01	0.01	0.23	-0.02
MServ	0.00	0.00	-0.01	-0.01	0.49	0.00
NMServ	0.00	0.00	0.00	0.00	-0.51	0.01

Source: simulation results.

Note: CerCrop=Cereal Crops; VegFruits=Vegetables and Fruits; En_Int_Ind=Energy Intensive Industry; Oth_Ind=Other Industries; MServ=Manufactured Services; NMServ=Non-Manufactured Services.

sectors, and that affects the employment in different industries as its output shrinks.

4.2. Effects on India's Trade

Table 5 presents the change in trade values for the three scenarios (full trade liberation in scenario A, joint cooperative trade liberalization in scenario B, and India's unilateral trade liberalization in scenario C for India. In terms of exports, across the three scenarios, India suffers a decline in certain agricultural products (such as wheat and cereal crops), in some manufacturing sectors, such as gas and water, and two service sectors (manufactured services and non-manufactured services). The results imply that there are tradeoffs in agricultural export sectors, but a gain on average for the manufacturing sectors. India's service trade sectors will be hurt in general. In terms of imports, India basically increases its imports in all sectors with the exception of electricity. The two sectors that experience the largest increase in imports are wheat and gas.

TABLE 5 - *Value Change of India's Trade*
(% Change with Respect to Benchmark)

	Exports			Imports		
	Scenario A	Scenario B	Scenario C	Scenario A	Scenario B	Scenario C
Rice	41.09	54.68	-13.91	61.61	11.19	39.23
Wheat	-53.17	-22.02	-25.82	188.53	59.66	63.53
CerCrops	-23.96	-7.39	-3.51	85.53	28.92	29.93
VegFruits	17.00	8.27	-2.42	52.85	17.81	19.13
Animals	8.94	4.68	0.68	26.77	10.36	11.05
Forestry	3.00	4.52	-2.34	15.90	5.69	6.92
Fishing	23.44	9.40	-1.48	6.17	1.91	2.81
Coal	142.88	23.32	18.78	30.85	5.06	5.25
Oil	122.7	20.2	22.28	3.55	0.69	1.34
Gas	-93.86	-45.89	-13.43	96.58	18.26	7.83
Oil_Pcts	27.68	5.33	8.56	21.33	3.93	1.84
Electricity	6.10	-1.59	4.78	-2.09	1.06	-2.30
Water	-27.39	-8.67	-2.28	15.5	4.42	0.98
En_Int_Ind	55.93	9.77	7.74	54.37	9.64	8.67
Oth_Ind	68.03	14.32	7.65	74.88	12.76	12.6
MServ	-1.86	-0.19	-0.40	3.16	0.52	0.61
NMServ	-9.97	-1.90	-2.42	6.26	1.26	1.29

Source: simulation results.

Note: CerCrop=Cereal Crops; VegFruits=Vegetables and Fruits; Oil_Pct=Oil Products; En_Int_Ind=Energy Intensive Industry; Oth_Ind=Other Industries; MServ=Manufactured Services; NMServ=Non-Manufactured Services.

4.3. Impact on World Prices and other Economic Indicators

Table 6 shows the trade liberalization impact on world price of goods. The price of rice experiences the maximum reduction in the world market. In general, agricultural goods prices, such as rice, wheat, cereal crops, and vegetable and fruits experience a decline in all these three scenarios. It appears that scenario A has the strongest impact on prices because of full trade liberalization while the scenario C has the smallest effect because of unilateral trade liberalization.

TABLE 6 - *Impact on Index of World Price*
(% Change with Respect to Baseline)

	Scenario A	Scenario B	Scenario C
Rice	-8.380	-2.300	0.010
Wheat	-0.610	-0.390	-0.020
CerCrops	-1.920	-0.750	-0.010
VegFruits	-1.110	-0.360	-0.010
Animals	0.530	0.190	0.010
Forestry	0.440	0.110	0.000
Fishing	-0.280	-0.010	0.000
Coal	0.050	0.060	-0.030
Oil	0.010	-0.010	0.000
Gas	0.570	0.190	0.000
Oil_Pcts	0.090	0.000	0.000
Electricity	0.210	0.150	0.000
Water	0.170	0.110	0.000
En_Int_Ind	-0.100	-0.030	-0.010
Oth_Ind	0.030	0.050	0.000
MServ	0.790	0.160	0.000
NMServ	-2.440	-0.520	0.000

Source: simulation results.

Note: CerCrop=Cereal Crops; VegFruits=Vegetables and Fruits; Oil_Pct=Oil Products; En_Int_Ind=Energy Intensive Industry; Oth_Ind=Other Industries; MServ=Manufactured Services; NMServ=Non-Manufactured Services.

Agriculture sectors are the most important sectors for both developed and developing countries in trade negotiation talks. For developing countries, agriculture makes up more than 50 percent of the GDP share, and trade policy directly affects domestic sustainable developments, especially the employment problem and structural change in the industries. For developed countries, agriculture sectors account for less than 20 percent of their GDP, while manufacturing sectors and service sectors are playing a more important role. Trade policy strongly influences the manufacturing and service sectors, especially in

the labor intensive manufacturing sectors. Therefore, how to achieve a win-win solution for both developed and developing regions in the global trading system is still a very difficult task for policymakers.

Table 7 shows the results on the changes in terms of trade, private regional consumption, and the ratio of trade balance in regional income. Terms of trade is defined as the ratio of exports to import prices or quantity of imports to exports. The results indicate that the U.S., EU, and India will have a decline in terms of trade (i.e., their imports will decline relative to exports or the export price will decline relative to import price). Other countries will experience an improvement in terms of trade.

The results on changes to regional income indicate that the U.S. in general will experience a decline in income while others including the EU, China, Japan, India, and ROW will have a positive increase in regional income. The improvement in income is likely due to increased trade among nations resulting from fewer trade barriers and lower world prices of commodities as shown in Table 6.

TABLE 7 - *Major Macroeconomic Indicators*

	Scenario A	Scenario B	Scenario C
Terms of trade (% change with respect to benchmark)			
USA	-3.190	-0.780	0.000
EU	-0.200	-0.140	0.000
China	0.890	0.340	0.000
Japan	7.600	2.280	-0.010
India	-3.130	-0.560	-0.750
ROW	0.090	-0.020	0.020
Changes in Regional Income (% change with respect to benchmark)			
USA	-0.45	-0.10	0.00
EU	0.14	0.03	0.00
China	1.56	0.44	0.00
Japan	1.37	0.45	0.00
India	1.09	0.29	0.22
ROW	0.57	0.12	0.01

Source: simulation results.

Note: Terms of trade is the ratio of price of export goods to price of import goods.

4.4 Welfare Analysis

The GTAP model follows the traditional welfare analysis theory and employs Equivalent Variation Method which takes into account

income and utility factors. Welfare can be decomposed into resource allocation effects, terms of trade effects, and other factors such as profit shifting effects and scale effects (Elbehri and Hertel, 2004). The welfare gain or loss is determined by the net effects of all these components. India gains most in the full trade liberalization scenario, gains less with joint cooperative liberalization with China and ROW, and gains the least with unilateral trade liberalization.

Table 8 shows the welfare change for different regions for the three scenarios. Most of the regions, with the exception of the U.S., appear to gain in welfare with the full trade liberalization and the joint cooperative trade liberalization. Although welfare decreases for the United States, the amount is small relative to its size. The results suggest that if the U.S. is willing to pay a small price, the world appears to benefit much more and be better.

TABLE 8 - *Welfare Analysis*

Welfare Change (US\$ million, deviation from benchmark)			
	Scenario A	Scenario B	Scenario C
USA	-42,154.6	-9,706.91	-27.17
EU	10,241.51	1,811.04	110.03
China	17,050.46	4,801.83	-3.47
Japan	50,331.05	16,556.17	-61.98
India	4,930.42	1,317.86	1,011.21
ROW	38,602.98	8,265.66	472.03

Source: simulation results.

In terms of India's trade negotiations strategy, it is clear that working toward full trade liberalization is its best strategy. However, because of self-interest in their own policies, full liberalization may not be easily realized as we can see from the recent negotiations in the Doha rounds. As a result, the second scenario (joint cooperative liberalization) for India may be a feasible solution to achieve some gains in the negotiation talks. If developing countries, which include China and India, implement a trade policy with relatively small tariffs or subsidies reductions as compared to the developed regions, both developed and developing countries will be better off. However, the gains still will be unevenly distributed according to regional substitution effects.

As for the third scenario, with unilateral trade liberalization, India still gains from trade; however, the gains will be less than the

gains in a joint cooperative trade scenario. This is mainly caused by a trade deficit. Given the current domestic situation, unilateral trade liberalization is technically a feasible solution for India's economy; however, politically it may not be the best outcome because a large range of output contraction will bring a negative impact on domestic development that will adversely affect unemployment rates in India. In sum, in the negotiation game, each player will try to predict the reaction function of other players and then choose the optimal solution for its next step among the desirable possible solutions.

5. SUMMARY

Using the conventional multi-region, multi-sectoral global trade analysis project (GTAP) model, we analyze the effects of India's trade liberalization policies in the non-service sectors on output, trade balance, and world welfare. The GTAP model has been widely used in international trade analysis and other applied economic analysis.

In our experiments, we analyze three trade policy scenarios. The first scenario implies a full trade liberalization situation with a 100 percent reduction of tariff rates, export subsidies, and output subsidies across sectors in the world. The second scenario, a joint cooperative liberalization scenario, assumes different rates for developed regions and developing regions. For developed regions, there will be a 60 percent reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors; a 40 percent reduction in manufacturing sectors; and a 20 percent reduction in service sectors. For developing countries, which include China, India and ROW, there will be a 40 percent reduction of tariff rates, export subsidies, and output subsidies in agricultural sectors, a 20 percent in manufacturing sectors, and a 10 percent reduction in service sectors.

In the third scenario, only India is assumed to have unilateral trade liberalization, with a 40 percent reduction of tariff rates, export subsidies, and output subsidies in agriculture sectors, a 20 percent reduction in manufacturing sectors, and a 10 percent reduction in service sectors. Other regions do not change their trade policies or do not reduce taxes or subsidies.

The results indicate that several of India's agriculture sectors will face cutbacks in production across all three scenarios. Because of larger imports in wheat and cereal crops across the three scenarios, domestic and export production in these sectors will consequently

decline. The amount of service exports will decline and imports of services will increase. Export of good from many of India's manufacturing sectors will improve due to trade liberalization. However, as the trade barriers are removed, there will be more trade at lower prices, contributing to improved income.

Across all three scenarios, India will gain most from full trade liberalization and least from unilateral trade liberalization. In terms of India's strategy in trade negotiations, it is clear that working toward a full trade liberalization situation is its best strategy. However, a full liberalization is not easily realizable as the recent negotiations in the Doha rounds show, as well as uneven economic development of the world economy and the complicated negotiation processes among world trading partners. As a result, the second strategy for India should be to aim for joint cooperative liberalization. The unilateral trade scenario is a possible solution, but not politically feasible. Whether the Doha Round talks can possibly have some meaningful future depends on deals that are acceptable to all parties. This remains to be seen.

JIAN ZHANG

Department of Economics, University of Hawaii at Manoa, Honolulu, Hawaii, USA

HUNG-GAY FUNG

College of Business Administration & Center of International Studies, University of Missouri-St. Louis, St. Louis, Missouri, USA

BANSI SAWHNEY

Merrick School of Business, University of Baltimore, Baltimore, Maryland, USA

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ABSTRACT

Using a conventional multi-region, multi-sectoral global trade analysis project (GTAP) model, we analyze the effects of India's trade liberalization policies on its output, trade, and welfare. We also analyze three trade policy scenarios: full trade liberalization, joint cooperative trade liberalization, and unilateral trade liberalization. India, despite some tradeoffs in the trade and agricultural sectors, primarily gains in welfare. The gains in the unilateral trade liberalization scheme, though positive, are smaller than that of the joint cooperative trade liberalization and the full trade liberalization schemes, implying some flexibility in trade negotiations.

Keywords: International trade, Computational General Equilibrium, India

JEL Classification: F13, F14, F23

RIASSUNTO

La strategia commerciale ottimale dell'India: un'analisi di equilibrio generale

Questo studio analizza gli effetti della politica di liberalizzazione del commercio dell'India sulla produzione, il commercio e il *welfare*, tramite l'utilizzo di un modello GTAP (Global Trade Analysis Project) pluriregionale e pluri-settoriale. Gli scenari presi in considerazione sono tre: liberalizzazione totale del commercio, liberalizzazione attraverso cooperazione congiunta e liberalizzazione unilaterale. Nonostante alcuni *trade-off* tra i settori del commercio e dell'agricoltura, l'India ottiene importanti guadagni di *welfare*. Benché positivi, i benefici ottenuti tramite il modello di liberalizzazione unilaterale sono inferiori a quelli derivati dagli altri due sistemi (cioè tramite cooperazione congiunta e liberalizzazione totale), il che implica la possibilità di una certa flessibilità nelle negoziazioni commerciali.