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How does China's growth affect India? An Economywide Analysis

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Abstract: China's growth impacts the Asian region in profound and sometime conflicting ways. We use a CGE model to begin revealing the complex linkages and interactions between China, India, and other Asian economies in a global context. Our findings suggest broad economic growth for China has a negative impact on the Indian economy while the Rest of Asia region is likely to benefit. Specifically, when China light manufacturing (such as textiles, apparel, and food processing industries grow due to productivity increases, India is expected to be hurt. Meanwhile, growth in other Chinese industries, such as machinery, transportation and electronic equipment, has a beneficial effect on the corresponding Indian industries. Generally, Rest of Asia is expected to increase its welfare when China grows.

JEL Classification Numbers: F17, 047, O53
Key Words: China, India, Trade, Growth

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I. Introduction

China's WTO accession was only one of many important Chinese economic developments over the past 25 years. Real GDP has grown on average 9 percent per year and its foreign trade by 15 percent annually. As a result, China is now the 6th largest world economy at $1.4 trillion, and its U.S. trade surplus is twice that of Japan.[1]

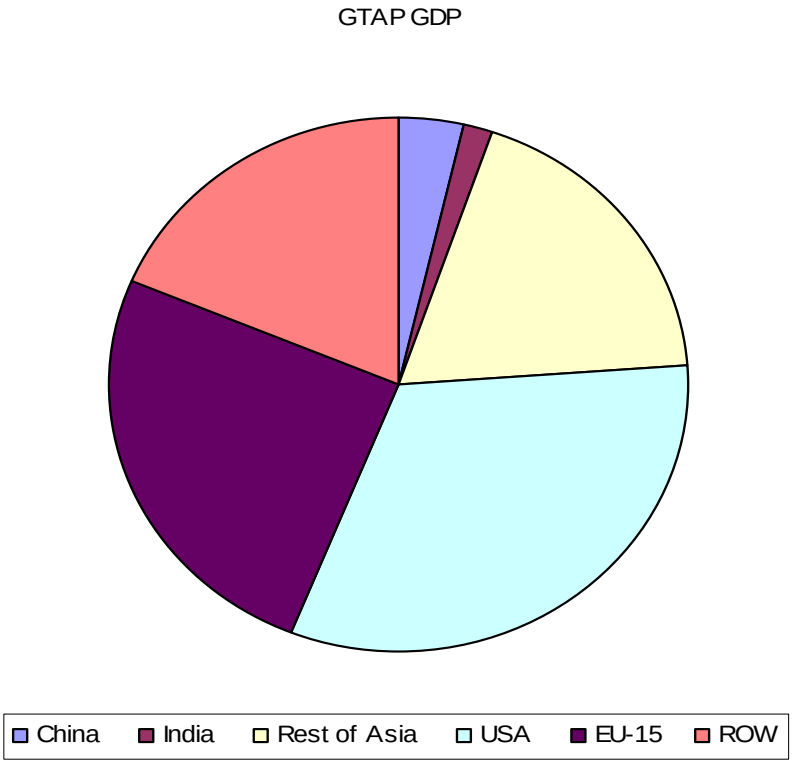
India has also been growing impressively, but more slowly than China's rates. The two economies are linked in many ways: they compete in several markets and complement each other in other markets. This paper aims to improve understanding how China's growth likely affects its Asian trading partners, especially India. Specifically, we will explore the impacts of China's growth on India relative to Asia.

China's export growth over the past two decades has dramatically transformed world trade for many countries. For the United States, average annual growth rate of Chinese imports between 1989 and 2001 was over 20 percent. Relative to other country imports to the U.S. during that time of 7.4 percent, China was more than 2.5 times as high. This trend was not limited to the United States but rather for most of China's trading partners. According to the UNCTAD TRAINS database, between 1994 and 2001, China's exports enjoyed an increase in its average annual (trade weighted) real growth rate of 19.4 percent (Bown and Crowley, 2004a). China's growth during 1979-84 hovered just under 9 percent, and agriculture and industry made almost equal contributions to the output expansion (32 and 34 percent, respectively). However, during 1985-93, industrial production became significantly more important, accounting for 58 percent of the increase in output. As of the late 1990s, industry continues to dominate the expansion and recently accounts for about 47 percent of the expansion (Woo 1998).

Meanwhile although Chinese household incomes are increasing at well over 10 percent per year, household spending is not keeping up, and 2003 household savings is almost 40 percent compared to less than 1 percent for the United States and Australia

[1] "Behind the Mask" *The Economist*, March 18, 2004.

Figure 1 Gross Domestic Product for Aggregated Regions, 2001



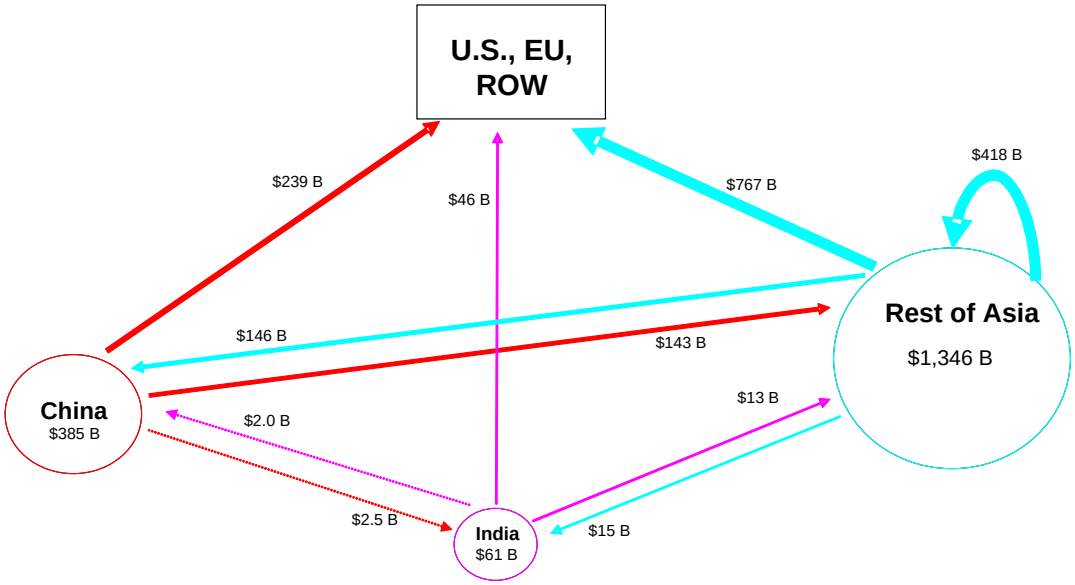
	Region	GDP 2001 USD million	World share percent
1	China	1,159,031	3.7
2	India	477,342	1.5
3	Rest of Asia	5,841,755	18.7
4	USA	10,082,155	32.2
5	EU-15	7,929,525	25.4
6	ROW	5,788,794	18.5
	World	31,278,602	100.0

Source: GTAP Data Base, version 6.0.

(Colebatch 2003). These macroeconomic and industrial growth changes may prove much more important than China's 1991 accession to the WTO.

From the GTAP Data Base, we see in Figure 1 the relative size of the six regions considered. The Rest of Asia region is almost 6 times the size of China. India is under half the size of China. Major export consuming areas (U.S. and EU) are the largest in our aggregation.

Figure 2 Inter- and intra-Asia exports, 2001, Billion USD



Source: GTAP Data Base 6.0.

Figure 2 illustrates the regions under consideration present real trade flows in 2001 U.S. dollars.[2] Rest of Asia region exports three times as much as China. Most notable is that intra-Rest of Asia trade is very important, relative to trade between China and India. Also, the largest volume of exports goes from Rest of Asia to All Other Economies, which consumes $765 billion of exports.

Our work starts revealing the complex linkages and interactions between China, India, and other Asian economies in a global context. Generally, when there is sector-specific growth in the Chinese economy, our research indicates that there may be some contraction in some Indian economic sectors. On contrast, the Rest of Asia region is likely to benefit from Chinese sector specific growth. Our work also suggests that when China grows in light manufacturing, such as textiles, apparel, and food processing industries, India is expected to be hurt by that growth. Growth in other Chinese

[2] China, India and Rest of Asia are drawn to scale, indicating that based on the volume of 2001 exports, the relative size of economies. The variance of the arrow thickness indicates the relative importance of the trade flow.

industries, such as machinery, transportation and electronic equipment, has a beneficial effect on the Indian economy.

The paper is organized as follows: in Section two, we provide an overview of the literature. Section three discusses the data and methodology, where we describe the experiments conducted along with broad projections. Section four includes the results of our simulations. Sections five, six and seven include limitations of this analysis, policy implications and our conclusion.

II. Literature Review

Relevant literature to our topic generally focus on three areas: how policies impose externalities; how they impact trade; and how they impact foreign direct investment (FDI). First, how one country's use of country-specific trade restrictions or agreements may impose an externality on a third country is a new, expanding area of the economics literature.

Bowden and Crowley (2004) examine how trade policy changes lead to a terms of trade externality, examining antidumping cases in the United States. This paper is one of several that focus exclusively on Chinese exports. The authors show that as U.S. import restrictions keep Chinese products out of the United States, the impacts can be world wide. As the number of countries that adopt China-specific import restrictions increase, "the distortions in worldwide trade flows induced by these policies could be a serious problem."[3] Bowden and Crowley find that U.S. antidumping policy prevents China from crowding out other exporters in the U.S. market.

Regarding policy impact on trade, two other recent papers also examine if Chinese exports crowd-out exports from other Asian Countries. Eichengreen, Rhee, and Tong (2004) find that Chinese exports do indeed crowd out other Asian exports, especially in consumer goods exports. However, using panel data spanning 1981-2001, Ahearne, Fernaald, Lougani and Schindler (2003, 2002) conclude the opposite, that there is little evidence of any crowding out. Ahearne *et al.* find that on an aggregate level, Asian economy exports have not been crowded out by China's exports, after adjusting for

[3] Chad P. Boden and Meredith A. Crowley, 2004b, "Policy Externalities: how U.S. Antidumping Affects Japanese Exports to the EU," 3-4.

external demand growth and relative price changes. The authors state that their results suggest that Asian economies can adjust their export structures to China's constantly evolving trade.

Ahearne *et al*. (2002) also suggest that for some countries, China's export growth from WTO accession illustrate complementarities with other Asian exports. This result applies particularly to ASEAN-4 (Singapore, Malaysia, Thailand and Philippines).

Third, policies and FDI are also a relevant area of the literature. Two important driving factors of FDI are identified by Shatz and Venables (2000) as local market size and production costs. However, distance and market size are most critical when determining where firms establish foreign affiliates or chose to invest. Most of the world's FDI is horizontal, designed to serve customers in host countries. However, in the past decade, most FDI in developing countries has been vertical in nature, searching for low cost inputs. The biggest beneficiary in the developing world is China, which yielded about a third of all FDI heading to LDCs.

Using a dynamic general equilibrium model, work by Walmsley, Hertel and Ianchovichina (2001) suggests that FDI in China is expected to rise by 23 percent by 2020, given all the promised FDI rule changes. The authors indicate that Southeast Asia and South Asia are the two regions most likely to experience less FDI from the world. Work by Ahearne *et al.* (2002) confirms these results, and it suggests that since China is committed to further liberalization, it will attract more FDI at the expense of other Asian economies.

III. Methodology and Data

It has now become standard practice to analyze the impacts of international economic developments within global trade models that rely on AGE methodologies.[4] Several of these applied general equilibrium studies are based on the Global Trade Analysis Project or GTAP framework (Hertel 1997). We apply the GTAP framework to quantify impacts of Chinese growth on India and Asia.

[4] See, for example, Hertel *et al*. (1996); McDougal and Tyers (1997), Tsigas *et al.* (2002); and Rae and Strutt (2003).

The GTAP model is based on assumptions that are common in economic literature: perfect competition, constant returns to scale, and no change in the economy-wide employment of resources. Each regional economy consists of several economic agents: on the final demand side of the model, a utility-maximizing household purchases commodities and it saves part of its income, which consists of returns to primary factors and net tax collections. On the production side of the model, cost-minimizing producers employ primary factor services and intermediate inputs to supply commodities. In the model, intermediate (and final demand) users of commodities are assumed to differentiate a commodity by its region of origin (i.e., the *Armington* specification is applied).

In each region, aggregate investment in new capital goods is represented by the output of a capital goods sector. Globally, the sum of household savings is equal to the sum of investment expenditures. Integrated into this treatment of production, demand, and trade, is a set of domestic support and trade policies, which are modeled as *ad valorem* equivalents. These policies affect the equilibrium computed by the model and when they change they induce changes by producers and consumers in all regions. The GTAP model is solved using the GEMPACK suite of software (Harrison and Pearson, 1994).

A. Data

Our analysis is based on aggregated data and parameters derived from the current GTAP database, version 6.0 (Dimaranan and McDougall, 2005). The base year in the current GTAP data is 2001. Our data has 57 industries; that is, we identify all industries available in the GTAP database. We also use five primary factors: land, unskilled labor, skilled labor, natural resources, and capital; and six regions: China, India, Rest of Asia, United States, European Union-15 members, and rest of the world (ROW). We focus on China, India and Rest of Asia.

B. Methodology

Our objective is to decompose the impacts of China's growth on the Indian economy. However, it has been challenging to accomplish this objective using observed statistics.[5] Instead, we apply an alternative methodology, detailed below.

We consider the effects of two types of economic growth. First, we examine the impacts of broad growth which affects the whole Chinese economy. In five different simulations, we simulate growth stemming from each one of the five primary factors in the Chinese economy (i.e., land, unskilled labor, skilled labor, natural resources, and capital).[6] In a sixth simulation, we consider 1 percent growth in all primary factors in China.

Second, we examine the impacts of industry-specific growth in the Chinese economy on the Indian economy. We accomplish this objective by simulating industry-specific technological progress in China.[7] Even though industry-specific growth is not the same as industry-specific technological progress, the effects of the technological progress on India would reveal the sectoral implications of Chinese growth. We focus on the 42-sector merchandise trade industries and model each sector separately. The sector specific simulation conducted is: What would happen to India and Rest of Asia if the Chinese textile industry, for example, were to grow by 1 percent? Using 42 different experiments, we simulate industry-specific technical progress in China. We do not examine growth in the remaining 15 GTAP service sectors.

In both sets of simulations we apply shocks of 1 percent. This type of analysis would reveal all the linkages between the Chinese and Indian economies with regard to growth. Our work can be used to analyze other growth rates. We discuss further this issue in the next section.

IV. Results

Table 1 reports impacts from the factor growth simulations. We focus our discussion on relative factor returns and welfare in China, India and the rest-of-Asia

[5] Our intention was to use observed changes in China's labor, capital, imports and exports as inputs for a historical simulation which would have decomposed Chinese growth. This task is extremely challenging and is currently underway and will be included in forthcoming versions of this paper.

[6] We shock by 1 percent the GTAP exogenous variable *qo (i, "China")*, $i \in ENDW\_COMM$.

[7] In particular, we assume Hicks-neutral technical progress and we shock by 1 percent the GTAP exogenous variable *aoall (i, "China")*, $i \in TRAD\_COMM$.

region. As expected, growth in any of the five factors depresses Chinese relative returns for the growing factor. Relative returns for land and natural resources decline the most (-3.86 and -3.58 percent, respectively) due to inelastic demands for industries that are relatively intensive in those two primary factors.

Unskilled labor is the most abundant primary factor in China and thus welfare increases the most (0.472 percent) when unskilled labor grows by 1 percent. Most welfare gains in China are driven by primary factor growth. Terms-of-trade effects are negative except in the case of natural resource growth. In most simulations, export prices decline relative to import prices. In Table 1, other components in the welfare effects measures welfare changes due to existing trade and domestic policies.

The last column in Table 1 reports impacts from 1 percent growth in all primary factors in China. The GTAP model is a highly non-linear model. However, as with other AGE models, GTAP effects are roughly linear in the shocks. That is, the effects in the last column in Table 1 are roughly equal to the summation of results from the five factor-specific simulations. Appendix Table 1 presents results from the 1 percent growth in all primary factors along results from a simulation where primary factors increase by 9 percent. The results from the 9-percent simulation are roughly nine times as large as the effects from the 1-percent simulation. Thus, growth effects from this paper can be used in describing observed growth in China.

Primary factor growth in China increases the supply of products which are intensive in that particular primary factor. In other regions, increased competition from China has two offsetting effects. First, increased competition from China depresses returns to primary factors which are used intensively in certain commodities. Second, an offsetting effect for some primary factors and regions is that imported intermediate inputs become cheaper and as a result returns to certain primary factors would increase. In the case of growth in China's skilled labor, the net effect for India is that returns to all primary factors increase.

A comparison of the effects in India with those for the Rest of Asia suggests that the international linkages between China-India and China-Rest of Asia are different. The welfare effects in India and the Rest of Asia suggest that it is the terms-of-trade effects which drive the welfare consequences of factor growth in China. India's terms-of-trade

improve when natural resources grow in China but they decline in all other cases. Rest-of-Asia's terms-of-trade improve in all cases.

Each row in Table 2 reports welfare results for China, India and the Rest of Asia stemming from a 1 percent industry-specific Hicks-neutral technical change in China. In the China column, we have identified in bold the top six welfare impacts: machinery and equipment n.e.c.; chemical, rubber, plastic products; mineral products n.e.c.; textiles; vegetables, fruit, nuts; and electronic equipment n.e.c. Similarly, in India and Rest-of-Asia columns, we identify the top and bottom 5 welfare impacts **in bold**.

A comparison of the regional and sectoral impacts in Table 2 reveals that out of 42 industries, there are only 11 industries for which both India and Rest of Asia experience a welfare gain (i.e., Cereal Grains, Oilseeds, Wool/silk, Forestry, Fishing, Mining Industries, Wood products, Petroleum/coal products, and Transportation equipment).

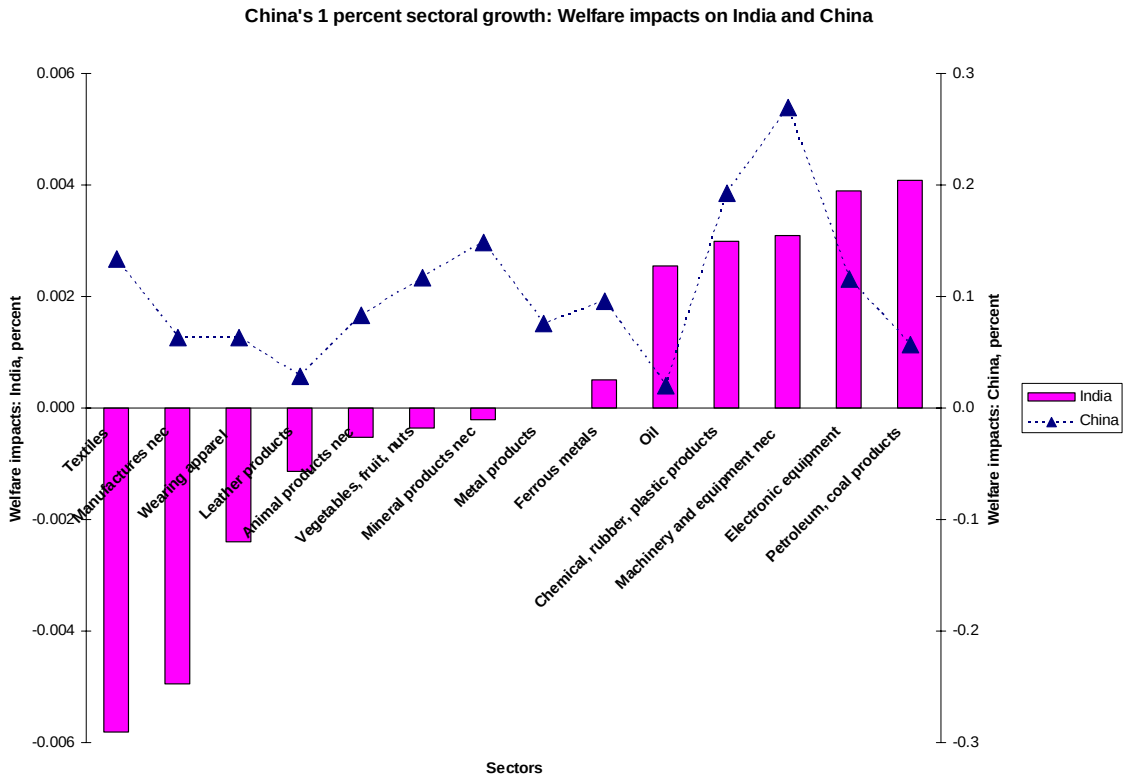
As these impacts may be difficult to glean from Table 2, Figure 3 illustrates 14 sectors that experience the largest welfare impacts in India and Rest of Asia. The table is ordered by smallest (oil) to largest (machinery and equipment) welfare impacts in China. What stands out from this figure is that India and Rest of Asia are expected to react very differently when China grows. Out of the 14 sectors, in only two sectors (oil and petroleum/coal products) are both regions expected to grow as China grows. Also, when China experiences the greatest welfare gains (in chemical/rubber/plastic and machinery/equipment), India is expected to enjoy economic welfare benefits while Rest of Asia looses.

Figure 3 India and Rest of Asia Economic Welfare Impacts of a 1 percent sector-specific Chinese growth rate, percent

Source: Authors' simulations.

When comparing China and India sector-specific welfare, Figure 4 illustrates those trends, ranked from negative to positive India welfare impacts. In our 42- sector specific simulations, China experiences positive welfare impacts in all sectors. In several important sectors, notably textiles, wearing apparel, leather, and manufacturing, when China grows, Indian experiences the largest welfare losses. It may be that there is more competition in these sectors. However, India does not always suffer losses when China grows. India grows when China's oil, chemical/rubber/plastics, petroleum, machinery and equipment n.e.c., and electronic equipment grow.

Figure 4 India and China Economic Welfare Impacts of a 1 percent sector-specific Chinese growth rate, percent

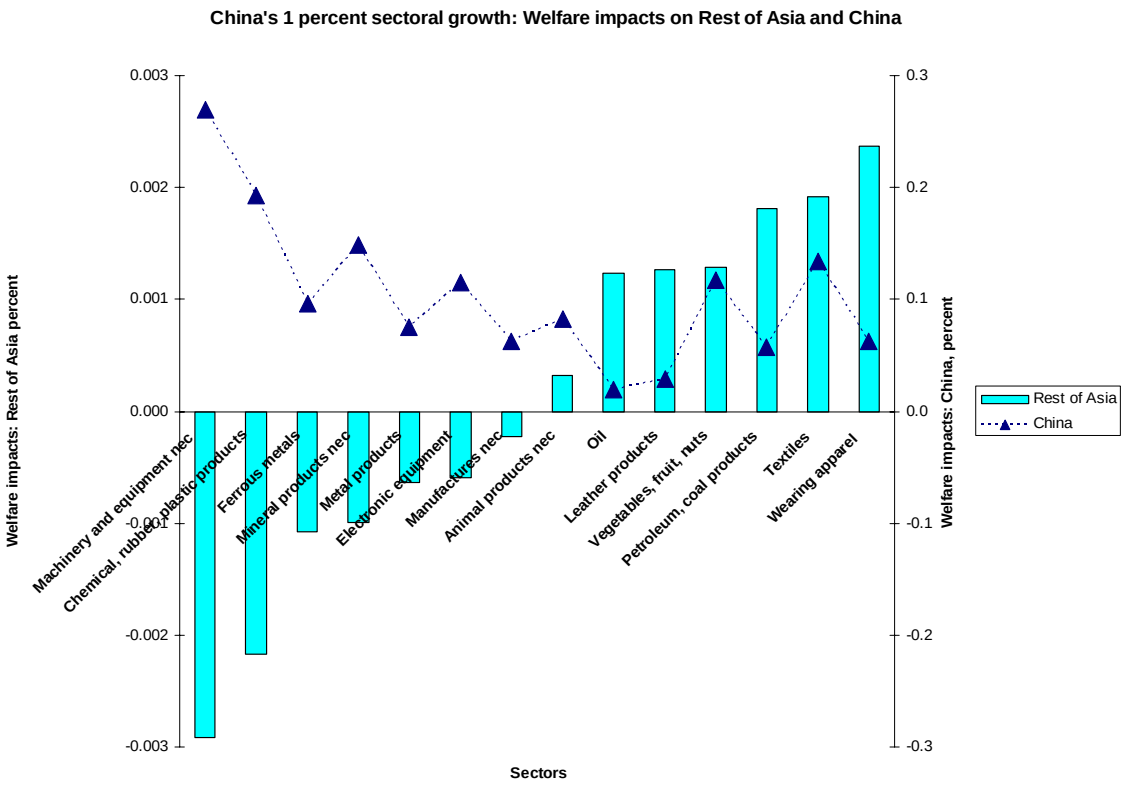


Source: Authors' simulations.

Correspondingly, Figure 5 illustrates economic welfare impacts for China and Rest of Asia. The most telling contrast from India is that Rest of Asia region is expected to experience growth when China's textiles and wearing apparel sectors grow; those two sectors are where Rest of Asia grows most in the simulations. Rest of Asia experiences welfare losses when Chinas heavy manufacturing areas (such as machinery/equipment, chemical/rubber/plastic products, minerals, metals and ferrous metals) fall.

What these results tell us is that how Asia reacts to China's growth varies and cannot be assumed to have big losses or gains across the board. Much of these results can be attributed to the size of China-India versus China-Rest of Asia trade. Further study will benefit this study especially further disaggregating the Rest of Asia economic region.

Figure 5 China and Rest of Asia Economic Welfare Impacts of a 1 percent sector-specific Chinese growth rate, percent



Source: Authors' simulations.

V. Summary and conclusions

China's real GDP has grown on average 9 percent per year for the last 25 years. India has also been growing at an impressive, albeit slower rate. The two economies have several similarities: they compete in several markets, and they complement each other in other markets. This paper has started understanding how China's growth likely affects its Asian trading partners, specifically, India.

We used a global, economy-wide framework to decompose the impacts of China's growth on the Indian economy. We found that broad Chinese economic growth has a negative impact on the Indian economy. The Rest of Asia region, however, is likely to benefit from China's growth. Our work also suggests that growth in China's light

manufacturing (such as textiles, apparel, food processing industries) are likely to correspond to decreases in welfare for India. Growth in other Chinese industries, such as machinery, transportation and electronic equipment, has a beneficial effect on India welfare.

We plan to extend our work by analyzing the impacts of historical and expected Chinese growth on the Indian economy. How would area economies have grown if China's growth had a different pattern that what it has experienced over the past 10 years?

References

Alan G. Ahearne, John G. Fernald, Prakash Loungani and John W. Schindler "The Impact of China's Accession to the WTO on Asia" *Hong Kong Monetary Authority* Quarterly Bulletin (November 2002)

Ahearne, Alan G., John G. Fernald, Prakash Loungani and John W. Schindler "China and Emerging Asia: Comrades or Competitors? *Board of Governors of the Federal Reserve System International Finance Discussion Papers no. 789* (December 2003)

Armington, P.S., 1969, "A theory of demand for products distinguished by place of production," *IMF Staff Papers* 16(1):159-178.

"Behind the Mask" *The Economist* 2004, March 18, 2004.

Bown, Chad P. and Meredith A. Crowley "China's export growth and U.S. Trade Policy, Federal Reserve Bank of Chicago Working Paper Series No. WP 2004-28," (November 2004).

Cerra, Valerie, Sandra Rivera, and Sweta Chapman Saxena, "Crouching Tiger, Hidden Dragon: What are the Consequences of China's WTO Entry for India's Trade? Presented at the 7th Annual Conference on Economic Analysis (Washington DC), June 2004; *IMF Staff Working Paper* (forthcoming, Summer 2005)

Colebatch, T., 2003, "New engine of world growth set to overtake U.S.," *The AGE*, 1 October 2003

Dimaranan, B., and R. McDougall, 2005, *GTAP 6.0 Data Base*, *Release Candidate*, Center for Global Trade Analysis, Purdue University.

Eichengreen, Barry, Yeongseop Rhee, and Hui Tong, "The Impact of China on the Exports of Other Asian Countries" NBER Working Paper No. 10768 (September 2004) www.nber.org/papers/w10768.

Guth, Joanne and Melissa Ginsberg "Energy Use in China: Trends in Oil Demand and Imports," *International Economic Review*, USITC Publication 3742 (November-December 2004), 1-10.

Harrison, W.J. and Pearson, K.R., 1994, "An Introduction to GEMPACK, Release 5.1," GEMPACK Document No. GPD-1, Second Edition, Monash University, April, 1994.

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

Hertel, T., W. Martin, B. Dimaranan, and K. Yanagishima, 1996, "Manufactures Trade in a Changing World Economy," in W. Martin, and L. A. Winters (eds.), *The Uruguay*

Round and the Developing Countries, Chapter 7. New York: Cambridge University Press.

IMF *World Economic Outlook: Advancing Structural Reforms*, especially Chapter 1 "Economic Perspectives and Policy Issues"

McDougall, R. and R. Tyers, 1997, "Developing country expansion and relative wages in industrial countries," Chapter 7 in T.W. Hertel (ed.), *Global Trade Analysis: Modeling and Applications*, Cambridge Univ. Press, January.

Prasad, E., editor, 2004, "China's Growth and Integration into the World Economy: Prospects and Challenges," *IMF Occasional Paper* 232.

Rae, Allan N. and Anna Strutt, 2003, "Doha Proposals for Domestic Support: Assessing the Priorities," paper presented at conference on *Agricultural policy reform and the WTO: Where are we heading?* International Agricultural Trade Research Consortium, Capri, Italy, 23-26 June.

Shatz, Howard J. and Venables, Anthony J., "The Geography of International Investment" (May 2000). World Bank Policy Research Working Paper No. 2338.

Singh, Swaran "China-India: Expanding Economic Engagement" Strategic Analysis 24(10), January 2000 www.ciaoneto.org/olj/sa_jan01sis01.html.

"The Tiger in Front: A survey of India and China" *The Economist*, March 5, 2005

Tsigas, M., D. Gray, and T. W. Hertel, 2002, "How to Assess the Environmental Impacts of Trade Liberalization," selected paper, *Fifth Annual Conference on Global Economic Analysis*, National Tsing Hua University, Taipei, 5-7 June.

Walmsley, Terrie, Thomas Hertel and Elena Ianchovichina, 2001, "Assessing the Impact of China's WTO Accession on Foreign Ownership" presented at 4th Global Economic Analysis Conference, Purdue University. www.gtap.org.

Woo, W., "Chinese Economic Growth; Sources and Prospects" by in Fouquin and Lemoine (ed.) *The Chinese Economy*, (Economica: London, 1998)

Table 1 Factor Returns and Welfare Impacts of 1 percent factor-specific or productivity growth in China, 2001 base year

		1 percent factor growth in:					
			Labor		Natural		All 5
	Simulated impact	Land	Unskilled	Skilled	resources	Capital	factors
		percent					
China	**Factor returns**						
	Land	-3.86258	1.46132	0.28810	0.06948	1.08404	-1.04345
	Unskilled labor	0.12118	-0.69568	0.03225	0.07937	0.25331	-0.20817
	Skilled labor	0.10199	0.23820	-0.81948	0.08209	0.22349	-0.17352
	Natural Resources	0.14764	1.61635	0.37577	-3.58426	1.65523	0.11764
	Capital	0.11054	0.25275	0.03493	0.08772	-0.65548	-0.16825
	Welfare						
	Factor growth	0.04225	0.40218	0.09683	0.01593	0.24184	0.80259
	Terms of trade	-0.00434	-0.01633	-0.00337	0.00417	-0.02450	-0.04421
	Other components	0.00332	0.08694	0.01962	0.00129	0.07806	0.18982
	Total	0.04123	0.47284	0.11310	0.02139	0.29545	0.94819
India	**Factor returns**						
	Land	-0.03938	-0.00170	0.00425	0.01222	0.01039	-0.01433
	Unskilled labor	-0.00261	-0.00605	0.00044	0.01020	-0.00707	-0.00502
	Skilled labor	-0.00085	-0.00512	0.00034	0.00939	-0.00669	-0.00287
	Natural Resources	0.03307	0.10522	0.02421	-0.18040	0.07565	0.05644
	Capital	-0.00004	-0.00529	0.00028	0.00981	-0.00762	-0.00276
	Welfare						
	Factor growth	0	0	0	0	0	0
	Terms of trade	-0.00054	-0.00206	-0.00036	0.00274	-0.00127	-0.00148
	Other components	0.00025	-0.00048	-0.00011	0.00084	-0.00054	-0.00003
	Total	-0.00029	-0.00254	-0.00047	0.00358	-0.00181	-0.00151
Rest of Asia	**Factor returns**						
	Land	-0.15388	0.01273	0.01694	0.01068	0.05495	-0.05972
	Unskilled labor	0.00488	0.00359	0.00151	0.00560	0.00115	0.01690
	Skilled labor	0.00614	0.00447	0.00150	0.00537	0.00142	0.01907
	Natural Resources	0.02244	0.11639	0.03078	-0.23225	0.09263	0.02736
	Capital	0.00604	0.00391	0.00145	0.00498	0.00052	0.01709
	Welfare						
	Factor growth	0	0	0	0	0	0
	Terms of trade	0.00082	0.00075	0.00007	0.00158	0.00103	0.00428
	Other components	0.00052	0.00014	-0.00003	0.00029	0.00004	0.00097
	Total	0.00134	0.00090	0.00004	0.00187	0.00108	0.00525

Notes: The GTAP variables reported in this table are *ps(i,r)* and *u(r)* and its components.
Each column reports results from a single simulation where a particular factor grows by 1 percent in China.
The last column reports results from a simulation where all factors grow by 1 percent in China.

Table 2. Welfare impacts of 1 percent industry-specific Hicks-neutral technological change in China, 2001 base year

	GTAP sector simulated to grow	Simulated output effect in China	Simulated impacts on welfare		
			China	India	Rest of Asia
		percent			
1	Paddy rice	0.003	0.018510	-0.000095	0.000649
2	Wheat	0.103	0.008921	-0.000011	0.000009
3	Cereal grains nec	-0.001	0.007826	0.000009	0.000789
4	**Vegetables, fruit, nuts**	0.237	**0.117090**	-0.000359	**0.001284**
5	Oil seeds	0.789	0.005369	0.000167	0.000268
6	Sugar cane, sugar beet	0.045	0.001098	-0.000008	0.000004
7	Plant-based fibers	0.316	0.006316	-0.000283	0.000131
8	Crops nec	2.126	0.001670	0.000034	0.000083
9	Bovine cattle, sheep and goats, horses	-0.015	0.006652	-0.000189	0.000101
10	**Animal products nec**	0.529	0.082863	***-0.000533***	0.000325
11	Raw milk	0.096	0.002345	-0.000067	0.000036
12	Wool, silk-worm cocoons	1.534	0.003406	0.000325	0.000049
13	Forestry	0.327	0.018158	0.000231	0.000050
14	Fishing	0.276	0.028142	0.000870	0.000590
15	Coal	0.934	0.010517	0.001505	0.001204
16	**Oil**	1.386	0.019856	**0.002542**	0.001235
17	Gas	-0.112	0.000676	0.000040	0.000009
18	Minerals nec	0.215	0.045784	0.000859	-0.000055
19	Bovine meat products	0.459	0.002128	-0.000025	0.000027
20	Meat products nec	1.133	0.013497	0.000009	-0.000022
21	Vegetable oils and fats	0.559	0.005428	0.000025	-0.000032
22	Dairy products	1.160	0.000621	-0.000004	0.000013
23	Processed rice	0.167	0.023061	-0.000007	0.000483
24	Sugar	1.293	0.000288	-0.000006	0.000002
25	Food products nec	0.518	0.060504	-0.000132	0.000974
26	Beverages and tobacco products	0.168	0.037046	-0.000034	0.000047
27	**Textiles**	2.619	**0.133737**	***-0.005814***	**0.001917**
28	**Wearing apparel**	2.717	0.063018	***-0.002390***	**0.002366**
29	**Leather products**	3.959	0.028424	***-0.001137***	**0.001263**
30	Wood products	2.822	0.030256	0.000336	0.000417
31	Paper products, publishing	0.799	0.051403	0.000175	-0.000353
32	**Petroleum, coal products**	0.401	0.057360	**0.004078**	**0.001808**
33	**Chemical, rubber, plastic products**	1.636	**0.192551**	**0.002990**	***-0.002170***
34	**Mineral products nec**	0.511	**0.148195**	-0.000220	***-0.000996***
35	**Ferrous metals**	0.735	0.095988	0.000513	***-0.001082***
36	Metals nec	2.042	0.042263	0.001148	-0.000207
37	**Metal products**	1.326	0.075554	0.000008	***-0.000640***
38	Motor vehicles and parts	1.100	0.042422	0.000100	-0.000574
39	Transport equipment nec	2.750	0.037221	0.000237	0.000756
40	**Electronic equipment**	7.002	**0.115492**	**0.003905**	-0.000595
41	**Machinery and equipment nec**	2.362	**0.269460**	**0.003096**	***-0.002916***
42	**Manufactures nec**	2.660	0.063006	***-0.004945***	-0.000231

Notes: The GTAP variables reported in this table are *qo(i,"China")* and *u(r)*. Each row represents a simulation where a particular industry grows by 1 percent in China. The columns report welfare impacts from each simulation. Sectors and impacts in bold highlight large positive impacts; large negative impacts are highlighted in bold italic.

Sources: Authors' simulation results

Appendix Table 1.
Simulated impacts of 1 and 9 percent factor growth in China on factor returns and welfare, 2001 base year

		Growth in all 5 factors	
	Simulated impact	**1 percent**	**9 percent**
China	**Factor returns**	*---- percent ----*	
	Land	-1.04345	-8.52239
	Unskilled labor	-0.20817	-1.79280
	Skilled labor	-0.17352	-1.50376
	Natural Resources	0.11764	1.02713
	Capital	-0.16825	-1.45824
	Welfare	0.94819	8.49756
India	**Factor returns**		
	Land	-0.01433	-0.12746
	Unskilled labor	-0.00502	-0.04425
	Skilled labor	-0.00287	-0.02515
	Natural Resources	0.05644	0.50931
	Capital	-0.00276	-0.02424
	Welfare	-0.00151	-0.01336
Rest of Asia	**Factor returns**		
	Land	-0.05972	-0.52850
	Unskilled labor	0.01690	0.14993
	Skilled labor	0.01907	0.16913
	Natural Resources	0.02736	0.25024
	Capital	0.01709	0.15148
	Welfare	0.00525	0.04655

Note: The GTAP variables reported in this table are *ps(i,r)* and *u(r)*. Each column reports results from a single simulation where factors grow by either 1 or 5 percent in China.

Sources: Author's simulation results

Appendix Table 2		GTAP Regional Aggregation
1	**China**	China
2	**India**	India
3	**Rest of Asia**	Hong Kong; Japan; Korea; Taiwan; Rest of East Asia; Indonesia; Malaysia; Philippines; Singapore; Thailand; Vietnam; Rest of Southeast Asia; Sri Lanka; Rest of South Asia; Bangladesh
4	**United States**	United States
5	**EU-15**	Austria; Belgium; Denmark; Finland; France; Germany; UK; Greece; Ireland; Italy; Luxembourg; Netherlands; Portugal; Spain; Sweden
6	**Rest of World**	Australia; New Zealand; Canada; Switzerland; Rest of EFTA; Hungary; Poland; Albania; Bulgaria; Croatia; Czech Republic; Hungary; Malta; Romania; Slovakia; Slovenia; Estonia; Latvia; Lithuania; Russian Federation; Rest of Former Soviet Union; Cyprus; Turkey; Rest of Middle East; Morocco; Botswana; Uganda; Rest of SSA; Malawi; Mozambique; Tanzania; Zambia; Zimbabwe; Other Southern Africa; Rest of South Africa; Rest of Southern Africa, Rest of North Africa, Rest of the World, Central America and the Caribbean; Colombia; Peru; Venezuela; Rest of Andean Pact; Argentina; Brazil; Chile; Uruguay; Rest of South America; Mexico

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