Economic Impacts of China's Accession to the World Trade Organization[*]

by

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Abstract

This paper presents estimates of the impact of accession by China and Chinese Taipei to the WTO. China is estimated to be the biggest beneficiary, followed by Chinese Taipei and their major trading partners. Accession will boost the labor-intensive manufacturing sectors in China and especially the textiles and apparel sector that will benefit directly from the removal of quotas on textiles and apparel exports to North America and Western Europe. Consequently, developing economies competing with China in third markets may suffer relatively small losses. China has already benefited from the reforms undertaken between 1995 and 2001 (US$31 billion) and trade reforms after accession will lead to additional gains of around $US10 billion. Accession will have important distributional consequences for China, with wages of skilled workers and unskilled non-farm workers rising in real terms and relative to farm incomes. Reduction in agricultural protection may hurt some farmers.

Possible policy changes considered to offset these impacts include reductions in barriers to labor mobility and improvements in rural education. We estimate that the removal of the hukou system would raise farm wages and allow 28 million workers to migrate to nonfarm jobs. If in addition there is an increase in education spending that results in a percentage point increase in the annual skilled labor growth rate, approximately 32 million farm workers would leave their job for jobs in the nonfarm sectors. These policies would not only facilitate the evolution of China's economy towards high-tech manufacturing and services, they have the potential to much more than offset any negative impacts of accession on rural wages and rural incomes generally.

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Economic Impacts of China's Accession to the WTO

In this paper, we seek to measure the major impacts of China's accession to WTO. Trade policy reforms such as those flowing from accession to the WTO lead directly to changes in policy instruments such as tariffs, nontariff barriers and the rules of the trading system. However, the main policy concerns are with impacts on the economic variables such as prices; output, employment and trade volumes; factor returns and household incomes that we estimate. Because of the direct policy linkage between the accession of China and that of Chinese Taipei, and the strong trade linkages between the two economies, we consider the impact of the accession agreements for both of these economies.

The obvious instrument for performing this type of assessment is the computable general equilibrium model. Many such models now exist and a cottage industry has emerged in estimating these impacts (Gilbert and Wahl, 2001). The availability of the internationally standard GTAP database has facilitated such modeling work, and reduced the burden involved in obtaining estimates of basic information such as trade flows, and patterns of production and consumption. Unfortunately, standard models such as the GTAP model (Hertel, 1997; www.gtap.org) do not incorporate non-standard features of China's economy, where many imports enter duty-free if used in the production of exports, and labor market policies result in serious barriers between urban and rural areas.

Like Ianchovichina and Martin (2001), we explicitly allow for the duty exemption arrangements that result in close to half of China's imports entering duty free as inputs into the production of exports. We extend that work by moving to the GTAP Version 5 database (Dimaranan and McDougall, 2002) for 1997 from the previous 1995 base year; by incorporating improved estimates of protection and the effects of liberalization based on the final, multilateral agreements; by allowing for the consequences of major labor market distortions in China (Sicular and Zhao, 2002); by taking into account the restructuring of the Chinese automobile sector (Francois, 2002), and by incorporating improved estimates of the impact of liberalization of the agricultural sector (Huang and Rozelle, 2002) and the service sectors in China (Francois, 2002).

In the next section of the paper, we examine some of the key assessments made in formulating the analysis reported in this paper. Then, in the third section, we describe the

experimental design and examine the specific shocks imposed in the experiments reported in this paper. Following this, we examine the results from the simulation analysis. Then, we consider some possible complementary policy actions, such as reducing the barriers to outmigration from the rural sector, and expanding access to education. Finally, we offer some concluding remarks.

Methodology

We build on the GTAP model, which is a relatively standard global model extensively documented in Hertel (1997) and on the GTAP web site (www.gtap.org). The first major adjustment we made to GTAP was to incorporate the special implications of the export processing system applying in China. Ianchovichina, Martin and Fukase (2000) show that failure to account for China's duty exemptions in the analysis of WTO accession will overstate the increase in China's export share of apparel by as much as 60 percent, and the increase in China's welfare by roughly 50 percent. We also consider the implications of some of China's key labor market mechanisms and institutions for the structure of the model that related research has shown may have a major influence on the impacts of WTO accession (Sicular and Zhao 2002).

Export Processing Arrangements

Export processing arrangements in China take many forms, a common feature of which is that they allow firms to import intermediate inputs at world prices in order to produce and export finished goods. These arrangements have been implemented in the special version of the GTAP model used in this study by creating two activities for each sector. In those sectors covered – or potentially covered – by export processing arrangements one activity is specialized in production for export, while the other is specialized in production for the domestic market.[1] The decision to fully separate domestic and export production is necessary to simplify the representation of the trade regime in an already large global model. The tax arrangements for export processing[2] discourage export processors from

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[1] Some sectors, particularly the service sectors, do not participate in export processing arrangements, and so are not exempt from duties on intermediate inputs used in the production of exports.
[2] The tax arrangements referred to include duty/VAT exemptions on imported intermediate inputs and VAT refunds on exports.

selling in the local market. The arrangements also encourage ordinary exporters[3] to use mainly domestic, rather than imported, intermediates. Local content requirement and foreign exchange balancing rules,[4] and the tax arrangements have restricted the ability of companies selling locally to use imported intermediates.

We assume that all imported intermediates used by the export sector are either exempt from duties or are eligible for refunds on taxes paid. We believe this assumption to be a fairly accurate representation of the situation in China. According to China's Customs, in 2000, 60 percent of imports entered China duty-free, of which 41 percentage points were imports used for export processing, 13 percentage points were capital goods, and 6 percentage points were goods that fall in special categories, such as materials used by research institutions. Input-output information from the GTAP Version 4 database (McDougall et al., 1998) suggests that 23 percent of imports in China were used to produce for the domestic market, and only an estimated 3 percent were used to produce ordinary exports.[5] This implies that the vast majority of exports produced using imported intermediate imports benefited from the duty exemption system.

The data for the domestic and export-oriented activities were initially estimated by dividing the intermediate inputs in each sector in proportion to sales in export and domestic markets. However, this yielded unsatisfactory results with, in particular, the database showing much less use of imported inputs in the export sector than the reported imports of duty-free intermediate inputs for export production obtained from China Customs (Li Yan, personal communication) To deal with this, we allowed for increased use of imported intermediates in the export activities in accordance with the price changes involved in providing duty exemptions, and the elasticities of substitution

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[3] Ordinary exporters, unlike export processors, use mainly domestic materials.
[4] The local content requirements and foreign exchange balancing rules have typically required companies selling domestically to source 70-80 percent of their inputs from domestic producers and to finance imports by selling exports. These rules are being removed in order to bring China into compliance with the TRIMs agreement.
[5] According to GTAP v.4 (McDougall et al., 1998), 14% of imports were for final consumption and according to China's Customs 40% of imports are ordinary imports that are not duty exempt. This means that approximately 26% are ordinary imports used as intermediates. According to GTAP v. 4 China's firms export on average 10% of their output, implying that only 3% of imports are used for the production of ordinary exports.

between domestic and intermediate goods in the model.[6] This increased the import-intensity of the exporting activities and reduced that of the domestically-oriented activities.[7]

China's Labor Market Policies

China's labor markets include substantial barriers to mobility between rural and urban activities. Taking up non-agricultural employment in an urban area is inhibited by the need to obtain an urban residence permit (*hukou*). In addition, workers tend to be reluctant to permanently cut their ties with the rural sector because it is not generally possible to sell the land on which the family has usage rights, (Hussain, 2002). Many workers move from rural to urban areas on a temporary basis, although quantitative restrictions are frequently imposed on such movements, and social welfare benefits such as health care and schooling for children enjoyed by urban residents are typically not available to such migrants. While it is possible, under some circumstances, to overcome these problems by purchasing an urban residence permit, this imposes an additional cost on migrants from rural to urban areas, a group with particularly limited access to capital. As in all countries, rural-urban labor mobility is also inhibited by factors such as the sector-specific nature of farmers' human capital, and reluctance to cut family ties by migration to urban areas.

The income per head of workers engaged in agriculture is only about one-third that of urban workers (World Bank, 2002). This large difference, however, overstates the difference in income created by barriers to mobility between the sectors, because urban workers typically have higher skills, work more intensively, and face higher costs of living than rural workers (Sicular and Zhao 2002b).

To capture the effects of the barriers to mobility between sectors, we concluded that it was necessary both to allow for imperfect transformation between unskilled workers in agricultural and non-agricultural employment and to introduce an implicit "tax" wedge between agricultural and non-agricultural employment. The imperfect

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[6] The GTAP Version 5 data base (Dimaranan and McDougall, 2002) is the source for the elasticities of substitution between domestic and composite imported commodities in the Armington production structure of a sector. The values for these elasticities are shown in column 1 of Table A.4 in the appendix.

[7] It more than doubled the share of imports used by the export-specialized activities in the GTAP data base.

transformation is designed to reflect the substantial differences in the characteristics of unskilled workers with rural and urban residence, and the ability, at a cost, to transform agricultural workers into non-agricultural workers through training, experience, and the creation of non-agricultural jobs in rural settings. The "tax" wedge is designed to reflect the pure policy-induced barriers between rural and urban workers, such as the requirement for a residence permit in urban areas and barriers associated with the inability to sell farm land. It is specified as a barrier that raises the cost of labor to urban employers, with urban workers receiving the tax-inclusive wage.

We represented the imperfect transformation between agricultural and non-agricultural workers using a constant-elasticity-of-transformation between workers in agriculture and workers in other sectors in the following simple manner:

$$L_{NF}/L_F = \alpha(W_{NF}/W_F)^\sigma,$$

where α is a constant term; L is the number of workers; W is the wage; the subscripts NF and F stand for nonfarm and farm types of employment and σ is the elasticity of transformation. The value of the elasticity of transformation σ is set at 1.32 based on estimates of this parameter in Sicular and Zhao (2002a).[8] The pure "wedge" between rural and urban wages for workers of the same skill level was estimated at 34 percent based on Shi Xinzeng (2002).[9]

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[8] In a more recent work, Sicular and Zhao (2002b) estimate the responsiveness of rural labor supply to changes in agricultural returns. Sicular and Zhao (2002b) present two "push" elasticities – for non-agricultural wage employment of 2.67 and non-agricultural non-wage employment of 0.24. We focus on the "push" elasticity for non-agricultural wage employment (2.67) and test the sensitivity of the results by replacing the elasticity of 1.32 with 2.67. We find that the aggregate results remain largely unchanged (see Table A.7). The greater responsiveness of labor movement implied by the larger elasticity of transformation (2.67) translates into better poverty and inequality outcomes since farm wages remain nearly unchanged and an additional 1 million farm workers leave farming.

[9] Sicular and Zhao (2002b) estimated that, after adjusting for differences in skills and work effort between rural and urban workers, 11 percent of the earnings differential between rural and urban workers is due to the "hukou" registration. Furthermore, they assessed that the mean of the predicted nonagricultural wage is 424% higher than the mean of the predicted agricultural wage and that the confidence intervals around these means are large. This estimate implies that on average the "hukou" registration may account for 44 percent of the differential between the means of the predicted agricultural and nonagricultural wages and that the confidence intervals around the predicted means is large. If instead we use the actual differential between rural and urban wages we find that the "hukou" represents 29 percent of this differential. Given the large degree of uncertainty associated with these estimates, we continue to employ the 34 percent tax wedge implied by Shi Xinzheng's work.

Trade policies and WTO accession

We consider next the implications of reforms that have taken place in China's and Chinese Taipei's trade policies in the years leading up to accession.

Changes in China's Trade Policies

Over the course of the 1990's China has made substantial progress in reducing the coverage of nontariff barriers, reducing tariffs, and abolishing the trade distortions created by the exchange rate regime. Lardy (2002) estimates that the number of tariff lines subject to quotas and licenses fell from 1247 in 1992 to 261 in 1999. By 2001, we estimate that 257 tariff lines were covered by a combination of licenses and quotas and 47 by licenses only, while 245 were subject to designated trading and 84 to state trading. Tendering and other registration requirements, primarily for machinery and electrical products, covered an additional 120 tariff lines. By 2001, nontariff barriers of any kind covered 664 tariff lines, or less than 10 percent of total tariff lines (see Appendix Table A.1), with over a third of these being subject to designated trading, one of the less intrusive forms of quantitative restriction employed in China.

Data on NTB frequency alone may be misleading because of the enormous variations in the importance of tariff lines. To gain some indication of the potential importance of nontariff barriers, the import coverage of the key nontariff barriers was calculated using data on nontariff barrier coverage of tariff lines, and import data by tariff line. For 1996, the trade data used were for 1992, while for 2001, the trade weights used were for 2000.

Table 1. Changes in the import coverage of nontariff barriers from 1996 to 2001

	Licenses & Quotas	Tendering	Licensing only	State Trading	Designated Trading	Any NTB	No NTBs	Total
	%	%	%	%	%	%	%	%
2001	12.8	2.7	0.5	9.5	6.2	21.6	78.4	100
1996	18.5	7.4	2.2	11.0	7.3	32.5	67.5	100

Note: Calculations for 2001 performed by Mei Zhen of MOFTEC during an internship at the World Bank.

The import coverage of all NTBs in China has fallen from 32.5 percent in 1996 (World Bank 1997b, p15) to 21.6 percent in 2001 (see Appendix, Table A.2). The coverage of import licensing has fallen from 18.5 percent in 1996 to 12.8 percent in 2001, and the

coverage of state trading from 11 to 9.5 percent. The import coverage of tendering requirements has fallen particularly rapidly, from 7.4 percent in 1996 to 2.7 percent in 2001.

Appendix Table A.3 shows that oil was by far the most important import subject to NTBs, and accounted for almost half the value of imports subject to any NTBs. Ferrous metals, subject to designated trading arrangements, were the second most important category. Imports of oil and oil products accounted for 84 percent of total imports subject to state trading.

The average protective impact of the complete set of nontariff barriers in China was estimated (very crudely) to be 9.3 percent in the mid-1990s (World Bank, 1997), with most of the protective effect arising from license and quota-constrained goods. The protective effect of these nontariff barriers has clearly declined since this estimate was made because of the progressive phase-out of NTBs, a standstill on introduction of new NTBs during the accession process, and a likely reduction in the severity with which many of these measures have been administered. Within agriculture, however, there are indications that some of these measures have been used in a way that reduced negative rates of protection and increased some positive levels of protection (Martin, 2001a).[10] A naïve rule of thumb that protection provided by NTBs declines with their import coverage would suggest that the protective impact of NTBs has fallen to around 5 percent. Given the very large margin of uncertainty associated with this measure, we have chosen to focus only on tariff liberalization, implying that our results should be taken as a lower bound to the overall impact of liberalization.

The pace of tariff reform in China was also rapid during the 1990s. While average tariffs were very high in the early 1990s, they fell sharply after 1994. A significant tariff reform in October 1997, reduced average tariffs significantly below 20 percent. Three subsequent tariff reductions, on January 1 of 1999, 2000 and 2001, further reduced tariffs on a wide range of items. Some basic data on trends in average tariff rates are given in Table 2, together with an assessment of the average tariff rates applying after China's Accession to the WTO. The progressive reductions in tariffs between 1992 and 2001 lowered average tariffs by two thirds, with larger than average cuts in the manufacturing

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[10] This is the subject of the work by Huang, Rozelle and Min (2002).

sector, ensuring that the future reductions in tariffs required under the WTO accession agreement are much smaller in percentage points than the reductions occurring prior to accession. Another important feature of the reforms has been a substantial reduction in the dispersion of tariff rates—with the standard deviation falling from 32.1 percent in 1992 to 10 percent in 2001.

Table 2. Changes in average statutory tariff rates in China (%)

	All products		Primary products		Manufactures	
	Simple	Weighted	Simple	Weighted	Simple	Weighted
1992	42.9*	40.6	36.2	22.3	44.9	46.5
1993	39.9	38.4	33.3	20.9	41.8	44.0
1994	36.3	35.5	32.1	19.6	37.6	40.6
1996	23.6	22.6	25.4	20.0	23.1	23.2
1997	17.6	18.2	17.9	20.0	17.5	17.8
1998	17.5	18.7	17.9	20.0	17.4	18.5
1999	17.2	14.2	21.8	21.8	16.8	13.4
2000	17.0	14.1	22.4	19.5	16.6	13.3
2001	16.6	12.0	21.6	17.7	16.2	13.0
Post-Accession	9.8	6.8	13.2	3.6	9.5	6.9

*Source: World Bank (1999, p340) to 1998. Authors' calculations for tariff lines with imports from 1999 and China's final WTO offer. CDS Consulting Co. provided applied tariffs for 2001. Trade data come from COMTRADE.

Table 3 shows weighted average applied tariffs for 1995 and 2001 and tariffs[11] after the introduction of the tariff bindings applying at the end of the implementation period. The numbers in Table 3 suggest that substantial merchandise trade liberalization occurred in China over the period 1995-2001. Weighted average tariffs dropped substantially for wheat, beverages and tobacco, textiles and apparel, light manufactures, petrochemicals, metals, automobiles, electronics. Analysis by Huang and Rozelle (2002) suggests that some agricultural commodities such as vegetables and fruits, livestock and meat, and rice faced negative protection in 1995. Protection on these commodities rose (or negative protection fell) over the period 1995-2001. It is not expected that accession will lead to a significant fall in protection on most agricultural commodities after 2001.

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[11] These are the lesser of 2001 applied rates and post-accession bindings.

Import protection is expected to remain unchanged for most commodities except oilseeds, sugar and dairy products.

Protection will continue to fall for all other merchandise commodities with especially big cuts for processed food, beverages and tobacco, automobiles, electronics, and other manufactures. Francois (2002) concludes that liberalization of the automobile sector will be accompanied by a massive restructuring of the industry to realize economies of scale and improve structural efficiency, that could perhaps increase productivity by 20 percent.

With accession to the WTO, China will have to remove all export subsidies. Huang and Rozelle (2002) estimate that in 2001 there was a 32% export subsidy on feedgrains and a 10% export subsidy on plant-based fibers (particularly cotton). These will be abolished in the post-accession period as China has committed to zero export subsidies in the post-accession period.

In addition to its barriers on merchandise trade, China has had policies, including both border measures and domestic regulations that have reduced the efficiency of its domestic service sectors and trade in these services. Based on work by Francois and Spinanger (2001) reported in Francois (2002), we have represented these measures as barriers to trade in services expressed in *ad valorem* terms. Following Francois (2002), we represent the impact of accession as halving the barriers to services trade.

Changes in China's Partners' Policies

The arrangements for textiles and clothing will be particularly important for China. Unlike most other developing economy exporters, China was excluded from the Uruguay Round Agreement on Textiles and Clothing.[12] This means that, prior to accession, China did not benefit from the integration of textile and clothing products into GATT or the increases in quota growth rates provided for under this agreement. This has placed upward pressure on the transaction prices of these quotas, which are equivalent in effect to an export tax of comparable magnitude.[13] Under its accession agreement, China

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[12] This agreement applied only to members of the GATT 1947.

[13] These quotas have been represented in the analysis as if they were an export tax. In some cases, the proceeds of this implicit export tax are redistributed to quota holders, who may be quite different from the producers and exporters of the goods. In other cases, the quotas are auctioned, with the quota rents accruing

benefited immediately from the integration of textiles and clothing into GATT, and hence the abolition of quotas and the increases in quota growth rates, that have occurred since 1994 (WTO, 1994a). All existing quotas are to be phased out by 2005. Importing economies will be allowed to introduce special textile safeguards during the period 2005-2007, but these will be effective for only one year at a time.

Table 3. Pre- and post-accession import protection (tariff or tariff equivalent)

	China			Chinese Taipei		
	1995	2001	Post-accession	1997	2001	Post-accession
Rice	-5.0	-3.3	-3.3	2.2	0.0	0.0
Wheat	25.0	12.0	12.0	6.5	6.5	6.5
Feedgrains	20.0	32.0	32.0	1.0	1.0	0.0
Vegetables & fruits	-10.0	-4.0	-4.0	35.7	36.9	16.0
Oilseeds	30.0	20.0	3.0	1.8	0.8	0.2
Sugar	44.0	40.0	20.0	21.9	25.8	22.7
Plantfibers	20.0	17.0	20.0	0.0	0.0	0.0
Livestock & meat	-20.0	-15.0	-15.0	7.5	6.5	4.0
Dairy	30.0	30.0	11.0	16.6	9.3	5.9
Processed food	20.1	26.2	9.9	14.9	14.2	9.9
Beverages & tobacco	137.2	43.2	15.6	48.1	22.0	13.0
Extract	3.4	1.0	0.6	5.5	5.5	4.1
Textiles	56.0	21.6	8.9	6.1	6.3	5.6
Apparel	76.1	23.7	14.9	12.8	13.4	11.2
Light manufactures	32.3	12.3	8.4	4.0	4.1	3.4
Petrochemicals	20.2	12.8	7.1	4.2	4.2	2.9
Metals	17.4	8.9	5.7	4.0	3.8	1.5
Automobiles	123.1	28.9	13.8	23.9	21.5	13.3
Electronics	24.4	10.3	2.3	2.9	0.5	0.3
Other manufactures	22.0	12.9	6.6	4.4	3.3	2.1
Trade & transport	1.9	1.9	0.9	1.3	1.3	0.7
Construction	13.7	13.7	6.8	5.9	5.9	2.9
Communications	9.2	9.2	4.6	9.2	9.2	4.6
Commercial Services	29.4	29.4	14.7	3.7	3.7	1.9
Other services	24.5	24.5	12.7	7.1	7.1	3.5
Total – Agriculture	4.8	7.6	3.6	9.1	6.9	4.6
Total – Manufactures	25.3	13.5	6.9	6.3	5.2	3.5
Total merchandise trade*	24.3	13.3	6.8	6.5	5.2	3.6

*The estimates in the table are based on trade weights for the respective years. If trade weights for 2000 at the six-digit level of the harmonized system are used the total weighted average tariffs in 2001 and 2007 are 12.2% and 6.3%, respectively, for China, and 4.5% and 3.1%, respectively, for Chinese Taipei.

to the government. In either case, the marginal return from additional output of textiles and apparel is net of the quota rent/export tax.

The accession agreement includes a Transitional Product Safeguard mechanism that allows China's trading partners to take safeguard actions under rules that are more liberal than the regular safeguard rules of the WTO (Messerlin, 2002). These provisions have the regrettable implication of introducing a new form of protection against China. This potential danger needs to be weighed against the substantial gains to China from being able to take action against economies imposing GATT-inconsistent barriers against her exports. For simplicity, we have assumed that these gains and losses cancel each other out.

<u>Changes in Chinese Taipei's Trade Policies</u>

With the completion of all the scheduled tariff reductions on merchandise trade, Chinese Taipei's average tariffs will fall by almost one and a half percentage points, from 4.5 percent to 3.1 percent. Chinese Taipei has committed to a tariff reductions on thousands of industrial and agricultural product lines, a phase-out of tariffs on a number of products as part of the Zero-for-Zero program of the Uruguay Round, and reductions in tariffs as part of the Chemical Harmonization program. Under this program Chinese Taipei has agreed to reduce tariff rates on finished chemical products to 6.5 percent, on intermediates to 5.5 percent, and on basic chemical products to zero. Tariffs on the vast majority of products related to information technology were reduced in 2000 and when WTO accession commitments are implemented, the tariff on electronic products will fall to 0.3 percent (Table 3).

Chinese Taipei has made horizontal and sector-specific commitments for the following service sectors: business, communication, construction, engineering, distribution, education, environmental, financial, health, social, transport services, tourism and recreation. Francois (2002) estimated that the impact of Chinese Taipei's WTO accession commitments will be to halve the nontariff barriers to trade in services.

Experimental Design

We evaluate the impact of accession in the context of the growth and structural change expected in China and its trading partners during the period up to 2007, when almost all

of the changes associated with accession will have come into effect. To evaluate the impact of accession in this dynamic context, we construct a baseline scenario, under which the economies of the world grow and experience the manifold structural changes associated with economic growth up to 2007(see Table 4 and Appendix, Table A.6). The GTAP model includes key elements such as changes in demand patterns as incomes rise; changes in the industrial structure associated with changes in the stock of capital per worker; and changes in world prices resulting from changes in both world supply and demand that allow it to capture key changes in the world economy over this period. The baseline broadly replicated World Bank projections for overall growth in each region, and uses projections of factor input growth and a residually determined level of total factor productivity growth to ensure consistency between the two (Table 4).

For analytical purposes, we consider liberalization in China since 1995 to have been undertaken as part of the accession process even though it preceded the reductions in applied rates directly required by the tariff bindings agreed at the Doha Ministerial in November 2001. While any such choice of the starting point for liberalization is, to a degree, arbitrary, it is clear that much of the liberalization undertaken during the 1990s was influenced by China's desire to prepare its economy for the type of trade regime needed for WTO accession, and to establish the credibility of its commitments to an open economy. We chose 1995 as the starting point for liberalization since it marks a major turning point in the negotiations -- the closing of the door on China's attempt to enter the world trading system by resuming its status as a contracting party to the GATT. As Long (2000, p. 43) has emphasized, China focused more strongly on commercial considerations in 1995 and after than it had previously done – and its trading partners also strongly emphasized the commercial aspects of the negotiations. In order to capture the implications of WTO accession we adjust the 1997 protection data for China in the benchmark data (GTAP version 5) to 1995 levels to obtain our initial base.[14] For Chinese Taipei we have considered liberalization since 1997, the year for which we have tariff data from GTAP version 5.

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[14] This adjustment was made with ALTERTAX (Malcolm, 1998) so that the consistency and the shares in the GTAP database would be preserved.

We evaluate the impact of WTO accession and the trade liberalization that has taken place in China between 1995 and 2007, by conducting two experiments. The first assesses the impact of the fall in tariffs from 1995 to 2001 levels and the restructuring of the automobile sector accompanying the reduction in tariffs on autos and auto parts during this period. The second assesses the impact of the fall in tariffs to post accession (2007) tariff levels, the liberalization of the service sectors, the continued restructuring of the automobile sector, the removal of the quotas on China's clothing and textiles exports, and the removal of China's agricultural export subsidies.[15] The difference between the two scenarios isolates the adjustment to WTO accession policies taking place after China joined the WTO.

We use the same macroeconomic closure for all experiments – full employment, perfect mobility of skilled and unskilled workers between nonagricultural sectors and perfect mobility of unskilled workers within agriculture. We make the working assumptions that there is little induced change in net international capital flows, and China's and Chinese Taipei's trade balances are therefore fixed as a share of their GDP. While the trade balance can be expected to vary, particularly if there is a substantial change in foreign investment levels, foreign investment levels are not determined within the model. We also assume that taxes lost due to trade liberalization are replaced via a uniform consumption tax affecting both private and government final consumption.[16] This hypothetical tax is included to ensure that any adverse impacts of trade reform on government revenues, and hence on its ability to provide income transfers or public services, are allowed for in the analysis of impacts of reform on households.

Since accession to WTO involves a long run change in the stance of trade policy, we have represented it in most of our analysis using a standard long-run specification, where capital and labor are freely mobile between industrial sectors, and within agriculture, although there are barriers to mobility of labor between rural and urban employment. For our analysis of the impacts of accession on poor households, however, we are more interested in a shorter-run situation in which capital is relatively immobile between sectors, and many households receive much of their income from specific

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[15] The productivity shock designed to capture the restructuring of the automobile sector is proportionate to the fall in tariffs on automobiles in each simulation.

[16] This tax is designed to be non-distortionary.

sectors. We therefore use a short run closure in which capital is intersectorally immobile and land is intersectorally immobile between agricultural sectors as a basis for the analysis of the impacts of trade reform on poverty undertaken by Chen and Ravallion (2002). The differences between these two cases in terms of their impacts on prices are given in the last four columns of Appendix Table A.4 .

Assessment of Accession by China and Chinese Taipei

<u>Impacts on China</u>

We focus initially on the impacts of the trade policy changes remaining after 2001 and present results for the period before 2001 in Appendix Table A.5.

In the period after 2001, a key feature is the effects of removing quotas on apparel and textiles, which gives a significant boost to the textile and apparel sectors in China. Output and employment in these sectors rise by about 16 percent and 57 percent, respectively (Table 5). The expansion of textiles and apparel in turn stimulates the production of plant-based fibers (mainly cotton), which increases by 16 percent as a result of accession. Output and employment in the other agricultural sectors with the exception of livestock are expected to fall as unskilled agricultural labor moves into the textile and apparel sectors and unskilled non-farm real wages rise (Table 9). Sugar and oilseeds contract more than other farm sectors as a result of falling protection. Tariffs on sugar fall from 40 percent to 20 percent, while tariffs on oilseeds fall from 20 percent to 3 percent. Protection on other agricultural sectors is assumed to remain almost unchanged. The automobile sector and the electronics sector also expand slightly creating opportunities, particularly for skilled labor.[17] Results suggest that approximately 6 million farm workers in China will leave their farm jobs as a result of WTO accession reform after 2001 in pursuit of employment in the non-agricultural sectors (Table 9).[18]

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[17] The model underestimates the potential expansion and efficiency increase in the service sectors. According to Mattoo (2002) China's GATS commitments represent the most radical services reform program negotiated in the WTO. With its promise to eliminate over the next few years most restrictions on foreign entry and ownership, as well as most forms of discrimination against foreign firms, China has set the stage for increases in foreign investment and productivity in these sectors. This in turn could lead to much larger income gains from WTO accession and larger increases in wages of skilled workers than shown in this paper (see Walmsley, Hertel and Ianchovichina, 2002).
[18] This estimate represents the number of 'effective' farm workers likely to migrate from rural to urban areas based on employment data for 2000 from China Statistical Yearbook (2001, pp 111-112).

Table 4. Percentage Growth Rates over the Period 1997-2007 (annual rates in parentheses)

Regions	Population	Unskilled Labor	Skilled Labor	Capital	Manufacturing TFP*
North America	11	11	12	49	High
	(1.05)	(1.08)	(1.11)	(4.07)	
Western Europe	0	-1	1	30	High
	(0.03)	(-0.08)	(0.07)	(2.69)	
Australia/New Zealand	10	12	10	55	High
	(0.98)	(1.14)	(0.99)	(4.45)	
Japan	1	-2	-7	35	Medium
	(0.06)	(-0.19)	(-0.71)	(3.02)	
China	8	13	50	174	High
	(0.81)	(1.26)	(4.15)	(10.62)	
Taiwan, China	9	11	14	96	High
	(0.86)	(1.05)	(1.36)	(6.97)	
Other NICs	10	-1	55	88	Medium
	(0.93)	(-0.10)	(4.47)	(6.53)	
Indonesia	16	17	123	25	Low
	(1.50)	(1.59)	(8.36)	(2.27)	
Vietnam	15	32	36	111	Medium
	(1.40)	(2.79)	(3.10)	(7.78)	
Other Southeast Asia	18	22	134	60	Low
	(1.70)	(2.04)	(8.87)	(4.83)	
India	18	23	78	88	Medium
	(1.67)	(2.10)	(5.92)	(6.54)	
Other South Asia	25	30	80	72	Medium
	(2.22)	(2.69)	(6.06)	(5.55)	
Brazil	14	19	72	31	Medium
	(1.31)	(1.77)	(5.60)	(2.75)	
Other Latin America	18	6	90	54	Low
	(1.68)	(0.57)	(6.65)	(4.42)	
Turkey	16	19	107	55	Low
	(1.47)	(1.75)	(7.55)	(4.46)	
Other Middle East & North Africa	24	37	67	28	Low
	(2.16)	(3.23)	(5.24)	(2.50)	
Economies in Transition	-1	6	9	33	High
	(-0.11)	(0.56)	(0.90)	(2.88)	
South African Customs Union	15	31	47	34	Low
	(1.39)	(2.76)	(3.92)	(2.94)	
Other Sub-Saharan Africa	30	40	54	38	Medium
	(2.65)	(3.42)	(4.42)	(3.26)	
Rest of World	18	23	35	68	Low
	(1.63)	(2.10)	(3.05)	(5.32)	

*The low, medium, and high growth assumptions for total factor productivity (TFP) in manufacturing correspond to annual growth rates of 0.1%, 1.0%, and above 2.0% (between 2% and 4%), respectively.

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Table 5. Changes in China's key economic indicators due to WTO accession for the period after 2001

	Output %	Employment %	Exports %	Imports %	Trade Balance US$ m.	Wholesale Prices %	Consumer Prices %
Rice	-2.1	-2.3	6.1	-7.1	64	-0.9	0.9
Wheat	-2.0	-2.3	18.9	-10.1	174	-1.7	0.4
Feedgrains	-2.3	-2.6	-77.8	-2.4	-596	-1.9	1.9
Vegetables and fruits	-3.4	-3.7	14.6	-6.3	214	-1.9	-0.1
Oilseeds	-7.9	-8.4	29.8	20.9	-789	-2.8	-4.7
Sugar	-6.5	-7.4	13.9	24.1	-73	-1.9	-3.1
Plant based fibers	15.8	16.4	-51.8	7.7	-189	0.1	3.1
Livestock & meat	1.3	1.1	15.5	-8.9	837	-1.6	0.2
Dairy	-2.0	-2.4	13.5	23.8	-143	-1.5	0.2
Other food	-5.9	-6.4	11.4	62.6	-3460	-1.7	-1.8
Beverages & tobacco	-33.0	-33.1	9.7	112.4	-14222	-1.8	-6.9
Extractive industries	-1.0	-1.3	7.5	-4.4	2088	-0.7	1.2
Textiles	15.6	15.5	32.7	38.5	-10366	-1.7	-3.2
Apparel	57.3	56.1	105.8	30.9	49690	-0.5	-1.9
Light manufacturing	3.7	3.7	5.9	6.8	1786	-0.9	0.0
Petrochemical industry	-2.3	-2.3	3.1	11.8	-8810	-0.7	0.8
Metals	-2.1	-2.1	3.7	6.8	-1893	-0.4	1.3
Autos	1.4	-2.2	27.7	24.0	516	-3.9	-4.2
Electronics	0.6	0.4	6.7	6.8	453	-1.3	-1.7
Other manufactures	-2.1	-2.2	4.1	18.9	-11291	-0.5	0.8
Trade and transport	0.0	0.0	0.8	-0.4	493	-0.2	1.6
Construction	0.9	0.9	2.7	17.5	-436	-0.2	1.7
Communication	-0.5	-0.5	-0.5	10.9	-56	0.1	1.9
Commercial services	-2.0	-2.0	-0.4	35.4	-1749	0.2	1.9
Other services	-1.7	-1.8	1.4	33.6	-1525	-0.1	1.6
Total	1.0	0.0*	16.8	17.3	717	-0.7	-0.2

*Reflects the fixed labor supply assumption.

Table 6. Welfare and sources of welfare change (1997 US$ million)

	Impact 1995-2007	Tariff Cuts	Quotas	Export Subsidies	Service Liberalization	Auto Restructuring	Impact 2001-2007
North America	6072 (0.0)**	3207	2713	24	172	-44	5259
Western Europe	18189 (0.2)	9724	8285	-51	338	-107	14200
Australia/New Zealand	136 (0.0)	175	-47	2	18	-12	152
Japan	5694 (0.1)	5522	291	-22	5	-102	2553
China	40552 (2.2)	29452	2389	275	1160	7276	9563
Taiwán	2985 (0.6)	2300	338	-4	265	85	1376
Other NICs	6831 (0.7)	6539	-82	-185	49	511	1456
Indonesia	-408 (-0.2)	-167	-216	-10	1	-16	-310
Vietnam	-453 (-1.4)	-63	-395	0	6	0	-405
Other South East Asia	-585 (-0.1)	-109	-464	-46	16	18	-268
India	-3357 (-0.4)	-1087	-2338	-5	-23	96	-2999
Other South Asia	-1622 (-0.8)	-176	-1427	-7	1	-12	-1619
Brazil	-76 (-0.0)	-76	3	4	5	-12	359
Other Latin America	-32 (-0.0)	59	-171	20	32	29	-36
Turkey	-338 (-0.1)	-50	-295	-2	7	2	-327
Other Middle East and North Africa	368 (0.0)	675	-467	-13	57	116	-365
Economies in Transition	19 (0.0)	318	-321	4	15	3	-185
South African Customs Union	78 (0.0)	89	-18	0	5	2	13
Other Sub-Saharan Africa	-45 (-0.0)	71	-159	4	15	24	-78
Rest of World	155 (0.0)	330	-210	-15	27	23	-78
World	74166	56733	7409	-27	2171	7880	28261

*Source: Authors' simulations with modified GTAP model.
**Numbers in parentheses are percentage changes in per capita utility.
*** Welfare numbers for China exclude output tax losses. Such losses will not occur because the VAT on domestic output is levied both on imported and domestic goods.

Real wholesale prices of most merchandise goods fall due to the trade liberalization undertaken after accession in 2001. Retail prices reflect a uniform consumption tax increase of about 1.9 percent levied to compensate for the loss of tariff revenue.[19] The fall in the real retail prices of some products reflects a larger than proportionate drop in protection on these products, e.g. beverages and tobacco, automobiles, and sugar.

Increased demand for nonagricultural labor means higher real nonfarm wages and higher returns to nonagricultural relative to agricultural labor. Removal of protection on some agricultural sectors additionally lowers the attractiveness of farming and implies that returns to farm labor and land will fall. Real farm wages fall by 0.7 percent and the real rental price of land falls by 5.5 percent. The decline in farm incomes and the rise in the real retail price of many nonfarm products imply that some farmers may be hurt by WTO accession. Nonfarm wages rise by 1.2 percent and skilled labor wages rise by 0.8 percent implying that workers in urban centers—those farmers able to participate in non-farm employment—are more likely to be better off as a result of WTO accession.

Accession will make China a much bigger player in world markets for three reasons—the rapid growth and structural change of its economy, the liberalization undertaken in preparation for WTO accession, and the liberalization undertaken after accession in 2001. The liberalization undertaken after 2001, contributes to an increase in China's share in world exports from 4.4 percent to 7.8 percent upon completion of accession (2007). Similarly, China's share in world import markets rises from 5.8 percent in 2001 to 6.4 percent in the post-accession period (2007). Not surprisingly due to the removal of textile and apparel quotas, apparel exports lead the export expansion with an increase in export volume of about 106 percent, followed by textiles and automobiles.

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[19] The consumption tax is close to non-distortionary as it applies at the same rate to all components of private and government consumption, but not investment. Since GTAP represents VAT on domestic production as an output tax, the model considers as tax losses the reduction in taxes from the contraction of some industries, e.g. tobacco and alcohol industries. These inward-oriented industries have higher VAT rates than export-oriented sectors such as clothing because VAT is not levied on exports. When the export-oriented sectors expand, the net impact of WTO accession is a sharp contraction in tax revenues. In reality, such a contraction will not be observed because VATs of the same magnitude are levied on imports. To offset this impact, particularly in our poverty analyses, we had to adjust the consumption tax in a downward direction. We first computed the consumption tax that compensates for the loss in output taxes. This tax as a share of the total replacement tax is equal to the share of the output tax loss in the total tax losses. Second, we adjusted the consumption tax rate to eliminate the component due to the change in output taxes.

Due to the dramatic fall in the protection on beverages and tobacco, imports of these products more than double, followed by increases in imports of food products, textiles, agricultural products, automobile parts and commercial services.

Table 7. Sources of welfare change after 2001 (1997 US$ million)

	Tariff Cuts	Quotas	Export Subsidies	Service Liberalization	Auto Restructuring	Impact 2001-2007
North America	2355	2713	24	172	-4	5259
Western Europe	5682	8285	-51	338	-54	14200
Australia/New Zealand	179	-47	2	18	0	152
Japan	2281	291	-22	5	-2	2553
China	4658	2389	275	1160	1081	9563
Taiwan	754	338	-4	265	22	1376
Other NICs	1543	-82	-185	49	131	1456
Indonesia	-82	-216	-10	1	-3	-310
Vietnam	-20	-395	0	6	4	-405
Other South East Asia	215	-464	-46	16	12	-268
India	-676	-2338	-5	-23	43	-2999
Other South Asia	-198	-1427	-7	1	13	-1619
Brazil	348	3	4	5	-1	359
Other Latin America	74	-171	20	32	10	-36
Turkey	-39	-295	-2	7	2	-327
Other Middle East/N. Africa	24	-467	-13	57	34	-365
Economies in Transition	114	-321	4	15	3	-185
South Afr. Customs Union	25	-18	0	5	1	13
Other Sub-Saharan Africa	54	-159	4	15	8	-78
Rest of World	111	-210	-15	27	9	-78
World	17402	7409	-27	2171	1309	28261

WTO accession has a positive overall impact on China's economy. China's total welfare gain from WTO accession is estimated to be US$ 40.6 billion[20] or 2.2 percent of per capita income (Table 6). Most of this gain (US$31 billion) has already been realized as a result of the massive liberalization that took place between 1995 and 2001 and the restructuring of the automobile industry that has been underway. The remaining reforms are going to lead to an additional welfare increase of US$9.6 billion (after 2001). Additional merchandise trade liberalization will lead to the largest gain in welfare about US$4.7 billion or 49% of the 9.6 billion increase in welfare, followed by the removal of quotas on textiles and apparel US$2.4 billion or 25% of the 9.6 billion increase in welfare

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[20] These are in 1997 US $.

and services liberalization US$1.2 billion or 12% of the welfare gain (Table 7). Automobile sector restructuring will generate 11% of the US$9.6 billion increase in welfare, while the removal of agricultural export subsidies will amount to only US$275 million in additional benefits.

Impact on Chinese Taipei

WTO accession reduces the cost of imported industrial materials and the cost of production leading to a fall in real wholesale prices. Retail prices drop less than wholesale price since they reflect a small uniform consumption tax (0.8%) levied to compensate for the loss of tariff revenue (Table 8). The drop in retail prices stimulates domestic competition and encourages domestic consumption.

Taiwan's total welfare gain from accession is estimated to be US$ 3.0 billion – the second largest gain after China's (Table 6). About half of this gain (US$1.6b.) has already been realized as a result of the liberalization that took place in Taiwan between 1997 and 2001. The remaining reforms are estimated to lead to an additional real income gain of US$1.4 billion per year after 2001 (Table 7). The largest source of real income gains is tariff cuts, accounting for $US 0.8 billion or 55% of the US$1.4 b. welfare gain, followed by removal of quotas on textiles and apparel (US$338 million or 25% of the welfare gain), and service liberalization (US$265 million or 20% of the welfare gain) (Table 7). The per capita income change from WTO accession is small and positive – about a 0.6% increase (Table 6).

WTO accession will boost domestic production and employment of Taiwan's textiles, light manufactures, petrochemical industry, and machinery and equipment sectors (Table 8). The expansion of these sectors implies increased demand for labor and capital and higher wages and rental rates for capital. Much of the expansion of textiles, light manufactures, petrochemicals and machinery and equipment exports is driven by increased demand for these products from China. A fall in tariffs in general boosts imports across all product lines, with a particularly large decline in vegetables, fruits and beverages. Since tariffs on electronic products are already low, there is not much of an effect on the electronics industry from WTO accession after 2001.

The overall impact on Taiwan's trade is modest and positive. Taiwan's share in world export markets increases from 2.7% in 2001 to 2.8% in 2007, and in world import markets rises from 2.0% in 2001 to 2.2% in 2007.

Table 8. Changes in Chinese Taipei's key economic indicators due to WTO accession for the period 2001-2007

	Output %	Employment %	Exports %	Imports %	Trade Balance US$ m.	Wholesale Prices %	Consumer Prices %
Rice	-1.1	-1.8	0.8	6.0	0	-1.2	-0.4
Wheat	-1.1	-1.6	4.4	-3.5	7	-1.3	-0.5
Feedgrains	-1.3	-1.8	37.3	-3.0	27	-1.3	-0.5
Vegetables and fruits	-5.7	-6.4	7.8	85.0	-248	-2.0	-2.8
Oilseeds	-0.9	-1.5	9.3	-3.8	33	-1.4	-0.8
Sugar	-5.5	-6.1	2.5	4.6	-2	-0.7	0.0
Plant based fibers	6.6	6.5	-3.6	16.6	-66	-0.7	0.1
Livestock & meat	-0.9	-1.6	0.7	9.2	-150	-0.9	-0.2
Dairy	-5.0	-5.4	12.4	8.7	-40	-0.7	-1.1
Other food	-3.1	-3.5	1.6	10.0	-260	-1.2	-1.3
Beverages & tobacco	-17.5	-17.7	-3.4	27.8	-988	-0.9	-3.6
Extractive industries	-1.6	-1.8	-3.2	4.2	-546	-0.8	0.0
Textiles	16.6	16.5	19.9	14.2	4403	-0.5	-0.4
Apparel	-6.1	-6.1	-4.6	17.8	-339	-0.4	-0.6
Light manufacturing	2.9	2.8	4.5	6.6	153	-1.1	-0.7
Petrochemical industry	4.8	4.7	11.6	6.5	1927	-0.7	-0.3
Metals	-1.8	-1.9	3.3	8.5	-621	-0.7	-0.3
Autos	-7.3	-7.4	13.1	20.6	-867	-2.0	-3.6
Electronics	-1.2	-1.3	-1.2	-0.3	-701	-0.6	0.1
Other manufactures	0.9	0.7	5.3	3.9	542	-0.6	-0.3
Trade and transport	-0.3	-0.4	-1.1	3.8	-375	0.0	0.6
Construction	0.3	0.2	-2.3	10.3	-86	-0.3	0.5
Communication	-0.5	-0.6	-4.2	-2.1	-7	-0.1	0.6
Commercial services	-0.8	-0.9	-4.4	7.2	-705	0.0	0.8
Other services	-0.5	-0.6	-4.4	12.3	-537	0.0	0.5
Total	0.1	N/A	4.4	5.6	551	-0.4	0.9

Impacts on Major Partners

Industrialized and newly industrialized economies benefit from China's accession to the WTO (Tables 6 and 7). Most of these benefits are associated with trade liberalization and MFA quota removal, which translate into gains from terms of trade improvements for these economies after 2001.

The world as a whole and key developing economies that trade directly with China benefit from China's accession, but developing economies in South East Asia, South Asia and Latin America whose primary interactions with China involve competition in third markets may lose from the removal of textile and apparel quotas after 2001. The losses will be largest for Vietnam – an economy that is following in China's footsteps and has a similar pattern of comparative advantage in the production and export of labor-intensive products. The welfare loss for Vietnam is estimated to be US$453 million or a 1.4 percent drop in per capita income (Tables 6 and 7). The losses to other regions are negligible.

Complementary Policy Reforms

While the overall impacts of WTO accession on China's economy are generally positive, there are some concerns, particularly associated with the declines in real returns to farm labor, which may exacerbate problems of poverty in rural areas. Approaches that deal directly with these problems are much more likely to succeed than approaches that attempt to withdraw from or minimize China's trade policy reforms. Two policy approaches that lend themselves to analysis within the framework used in this paper are relaxation of the barriers to labor migration from rural to urban sectors, and improvements in the skill levels of workers in rural areas.

The first experiment considered in this paper is the abolition of the hukou system or, more generally, the abolition of the barriers against mobility from rural to urban sectors such as the removal of residence permits, social insurance and land reforms. The second experiment involves an increase in the supply of skilled workers—perhaps brought about through an improvement in the availability of education. Third, we consider the combined impact of improvement in the availability of education and the abolition of the hukou system.

Impact of removing the 'hukou' system. In this experiment, the tax wedge reflecting the impact of the hukou system as a barrier to movement from farm to nonfarm employment, is reduced to zero. A key feature of this reform would be the substantial increase in the real returns to rural workers. As shown in Table 9, the real wages of farm workers (and hence the family incomes of self-employed farmers) would increase by

almost 17 percent if this reform were undertaken in conjunction with accession. This contrasts sharply with the reduction of 0.7 percent in real farm wages with accession and without hukou reform. Rents to farmland would decline, with higher farm wages leaving a smaller residual return to farmland. Real urban unskilled wages would decline by an estimated 3.8 percent. Clearly, there would be scope for partial reform of these arrangements that could leave both farm and nonfarm unskilled workers better off than in the absence of labor market reform.

Table 9. Change in real factor prices due to accession (% change for the period 2001-2007)

	Accession alone	With hukou removal	With increases in education	With hukou abolition and increases in education
Farm unskilled wages	-0.7	16.8	1.6	19.4
Rental price of land	-5.5	-9.7	-6.4	-10.5
Nonfarm unskilled wages	1.2	-3.8	2.7	-2.5
Skilled labor wages	0.8	-1.7	-6.3	-8.7
Rental price of capital	1.3	-1.4	0.9	-1.8
Price of capital goods	-0.9	-3.6	-1.1	-3.9
Migration*	6	28	10	32
National welfare**	10.0	11.0	10.0	11.0

*Number of people, in millions, expected to move from farm to non-farm jobs.
**Change in national welfare in 1997 USD billion.

The results of this experiment suggest that this reform would have a significant impact on the number of people leaving their farm jobs for jobs in the nonfarm sectors and on the industry composition of China's economy. Approximately 28 million people would leave their farm jobs if the government removed the tax barrier to labor movement from rural to urban centers (Table 9).[21] This estimate is much higher than the estimated 6 million people moving from farm to nonfarm activities as a result of WTO accession reform between 2001 and 2007 in the absence of hukou reform. As can be seen from Table 10, the impact on the composition of Chinese industrial output is also substantial if the hukou system is abolished. WTO accession will have a much stronger positive impact on China's manufacturing sectors if the "hukou" system is abolished. This would allow

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[21] Since the tax on nonfarm employment of 34 percent represents a bundle of policies that act as a barrier to rural/urban migration, this estimate is representative of the likely impact and could change depending on the policy mix the government is willing to adopt.

not only apparel production to expand more but also metals, automobiles, electronics, machinery and other manufactures and construction, all at the expense of reductions in some agricultural sectors.

Impact of an increase in skill levels. One of the key problems facing rural workers is their generally low levels of education. One simple way to gain some indication of the likely impacts of improving the access of rural people to education is to consider the impact of increases in skill levels on the performance of the Chinese economy. This experiment provides a lower-bound estimate of the impact of improvements in the availability of education in that it ignores any potential benefit to rural households of improvements in the terms of access for their children to education—such as any reductions in school fees.

An increase in education spending that would result in an increase in annual growth rates for skilled and unskilled labor from 4.15% and 1.26% to 5% and 1.1%, respectively, was considered in the quantitative analysis. This was found to have favorable impacts on the structure of the Chinese economy. A comparison of column 4 and column 2 of Table 10 shows that an increase in skilled labor leads to a stronger expansion, or a smaller contraction, of the manufacturing sectors that are more intensive in skilled labor compared to accession in which there is no change in education spending (column 2). The following industries receive a boost – metals, automobiles, electronics, other manufactures (equipment and machinery).

Even though the primary impact of the expansion of the stock of skills is on the composition of output (through so-called Rybczynski effects), real wages of skilled workers do fall as supply of skilled workers increases (Table 9), and world prices of the outputs they produce decline. This contrasts with the case of no increase in education spending, where real wages of skilled workers rose. However, real wages of the, generally much poorer, unskilled workers rise with increased education (Table 9). Wages of unskilled farm workers, rise less than wages of unskilled nonfarm workers. Of course, the wages of those who are able to transfer from agriculture to non-agricultural employment as a result of the increase in educational opportunities are likely to be substantially better off. Overall, it is clear that increased education spending will generally induce pro-poor growth and decrease poverty. It certainly has the opportunity

to substantially offset the adverse impacts on rural labor of the trade reforms associated with accession. Finally, increased education boosts the need for migration as demand for unskilled workers increases in the large urban areas. The number of farm workers expected to change farm jobs for nonfarm ones is about 10 million (Table 9). Impact on consumer prices is small – positive for farm products and negative for manufactured commodities.

Table 10. Change in output due to accession (% change over the period 2001-2007)

	Output				Employment			
	Without hukou removal	With hukou removal	With increase in skill level	With hukou removal & increase in skill level	Without hukou removal	With hukou removal	With increase in skill level	With hukou removal & increase in skill level
Rice	-2.1	-4.3	-2.4	-4.6	-2.3	-7.4	-3.1	-8.2
Wheat	-2.0	-11.5	-3.3	-12.9	-2.3	-13.3	-3.9	-14.9
Feedgrains	-2.3	-7.8	-3.1	-8.6	-2.6	-9.7	-3.7	-10.6
Vegetables and fruits	-3.4	-7.1	-3.9	-7.7	-3.7	-8.9	-4.6	-9.7
Oilseeds	-7.9	-18.4	-9.4	-19.8	-8.4	-20.4	-10.2	-22.0
Sugar	-6.5	-17.1	-8.0	-18.4	-7.4	-22.4	-9.6	-24.2
Plant based fibers	15.8	12.8	15.1	12.1	16.4	11.6	15.5	10.6
Livestock & meat	1.3	-3.3	0.6	-4.0	1.1	-7.0	-0.3	-8.2
Dairy	-2.0	-9.4	-3.1	-10.5	-2.4	-14.4	-4.3	-16.0
Other food	-5.9	-13.4	-7.0	-14.5	-6.4	-13.2	-8.9	-15.5
Beverages & tobacco	-33.0	-38.7	-33.7	-39.5	-33.1	-37.6	-35.0	-39.5
Extractive industries	-1.0	0.1	-1.2	-0.1	-1.3	0.2	-1.7	-0.2
Textiles	15.6	14.7	15.3	14.3	15.5	16.8	12.7	14.0
Apparel	57.3	61.4	56.7	60.7	56.1	62.6	52.7	59.1
Light manufacturing	3.7	-6.8	2.1	-8.5	3.7	-5.4	0.1	-8.9
Petrochemical industry	-2.3	-1.3	-2.3	-1.2	-2.3	0.7	-4.4	-1.4
Metals	-2.1	0.8	-1.8	1.2	-2.1	2.4	-3.9	0.7
Autos	1.4	4.1	1.8	4.4	-2.2	2.3	-4.0	0.5
Electronics	0.6	4.5	1.1	5.1	0.4	6.3	-1.3	4.6
Other manufactures	-2.1	0.3	-1.9	0.6	-2.2	2.2	-4.0	0.3
Trade and transport	0.0	0.8	0.1	1.0	0.0	3.4	-3.1	0.4
Construction	0.9	2.0	0.9	1.9	0.9	3.4	-1.4	1.0
Communication	-0.5	0.6	-0.3	0.9	-0.5	3.4	-3.0	0.8
Commercial services	-2.0	-1.4	-1.8	-1.2	-2.0	1.0	-4.7	-1.8
Other services	-1.7	-0.5	-0.9	0.3	-1.8	1.5	-6.2	-2.9

Impact of an increase in skill levels and removal of the 'hukou' system. A combined removal of the 'hukou' system and increased education spending is the most favorable scenario for unskilled farm labor leading to the largest increase in real farm wages

(19.4%, see Table 9). In this case, farm output contracts more compared to the case with hukou removal alone, while industries intensive in skilled labor such as metals, automobiles, electronics, other manufactures and services, expand more than in either the case of hukou removal or the case of increased education spending (Table 10). Under this scenario we estimate that about 32 million farm workers would leave their farm jobs for jobs in urban areas (Table 9). The results suggest that the government should consider both the removal of policy barriers to labor movement and changes in the composition of government expenditure that favor education in order to generate pro-poor growth in China over the next decade. Not only would these policies facilitate the evolution of China's economy towards services and high-tech manufacturing sectors, they have the potential to much more than offset any negative impacts of accession on rural wages and rural incomes generally.

Conclusions

Our analysis suggests that China will be the biggest beneficiary of accession to the WTO, followed by Chinese Taipei and the industrialized economies. Accession will boost the labor-intensive manufacturing sectors in China and especially the textile and apparel sectors that will benefit directly from the removal of quotas on textiles and apparel exports to North American and Western European markets. Fiber production will benefit indirectly as demand for fibers increases with the expansion of the textile sector.

Accession will have important distributional consequences. Wages of skilled workers and wages of unskilled nonfarm workers will rise in real terms and relative to wages of farm workers. Without reductions in the policy barriers against mobility from rural to urban markets, an estimated 6 million people will leave their farm jobs in pursuit of employment in industry and services. Real farm wages and land rental rates decline. The decline in farm incomes and the rise in the real retail prices of many nonfarm products suggests that some farmers may be hurt by WTO accession after 2001—an issue explored by Chen and Ravallion..

To help offset these adverse impacts on farmers the Chinese government might make changes in its labor market policies. We estimate that an increase in education spending would have a positive impact on the structure of the Chinese economy. Real

wages of skilled workers would fall as the supply of skilled workers increased, without an increase in education spending, real wages of skilled workers were rising. Real wages of unskilled workers rise with increased education spending. Thus, on the income side it is clear that increased education spending will induce pro-poor growth and decrease poverty.

Another policy reform that the Chinese government may consider is abolition or reform of the hukou system. We estimate that the removal of the hukou system would raise farm wages and allow 28 million people to migrate to nonfarm jobs in search of a better life. It will lead to an even bigger expansion of the labor-intensive manufacturing sector, which however may result in a bigger deterioration in China's terms of trade.

Chinese Taipei's accession to the WTO is estimated to stimulate domestic competition and encourage domestic consumption by reducing production costs, and real wholesale and retail prices. Accession will boost domestic production and employment of leading sectors such as petrochemicals, light manufactures, textiles, and equipment. It will raise the standard of living by boosting wages and the rental rates for capital.

China's and Chinese Taipei's WTO accession will have a noticeable impact on global trade and trade pattern. With accession, China will become a much bigger player in world markets. Apparel exports will lead the export expansion, followed by textiles, and automobiles. In addition to being an important source of traded goods, China will become an important destination for other economies' products. Imports of beverages and tobacco will more than double, followed by imports of food products, textiles, agricultural products, automobile parts and commercial services. The expansion of textiles, light manufactures, petrochemicals and equipment exports from Taiwan will be driven almost entirely by demand for these products in China.

China has already benefited from the massive liberalization and restructuring that took place between 1995 and 2001 and that was part of the preparatory process toward accession. The remaining reforms are going to lead to an additional smaller gain (US$ 9.5 billion) largely due to the remaining tariff cuts, the removal of textile and apparel quotas in North American and Western European markets, and services liberalization. Chinese Taipei has also benefited from own trade liberalization prior to 2002. The remaining reforms are going to lead to additional (US$1.4 billion) in welfare gain largely due to

tariff cuts and quota removal. Industrial economies are expected to benefit from the removal of textile and apparel quotas, while developing economies that compete with China in third markets such as Vietnam may encounter some losses. However, the world as a whole will benefit approximately US$28bn.

The gains to China are understated because tariff aggregation hides much of the variation in tariffs and the welfare gains from reducing this variation within our product aggregates (Bach and Martin, 2001). When Bach, Martin and Stevens (1996) adjusted for this in a partial equilibrium context, gains to China almost doubled when appropriate aggregators were used. Furthermore, while we have improved this paper relative to our earlier work by having a better idea about the extent of liberalization in agriculture and services and the changes in the automobile sector, there are still areas that we have ignored. One is the nontariff barriers in the manufacturing sectors other than the MFA quotas. The other one is the impact of accession on foreign investment and the hard-to-measure efficiency gains in services that are associated with this increased investment.

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Appendix

Table A.1. Tariff Lines Subject to Import NTBs, China, 2001

	Licenses & Quotas	Tender-ing	Licensing only	State Trading	Designated Trading	Unrestricted	Any NTB	Total Tariff lines
Paddy rice	0	0	3	3	0	0	3	3
Wheat	0	0	3	3	0	0	3	3
Cereal grains nec	0	0	1	2	0	9	2	11
Vegetables, fruit, nuts	0	0	0	0	0	109	0	109
Oil seeds	0	0	0	0	0	25	0	25
Sugar cane, sugar beet	0	0	0	0	0	1	0	1
Plant-based fibers	1	0	0	1	0	6	1	7
Crops nec	5	0	0	5	0	96	5	101
Cattle, sheep, goat, horse	0	0	0	0	0	6	0	6
Animal products, nec	0	0	0	0	0	62	0	62
Wool, silk-worm cocoons	3	0	0	1	2	9	3	12
Forestry	0	0	0	0	12	23	12	35
Fishing	0	0	0	0	0	57	0	57
Coal	0	0	0	0	0	6	0	6
Oil	0	0	2	1	0	1	3	4
Gas	1	0	0	1	0	1	1	2
Minerals nec	0	0	0	0	0	106	0	106
Meat: cattle, sheep, goat	0	0	0	0	0	26	0	26
Meat products nec	0	0	0	0	0	47	0	47
Vegetable oils and fats	0	0	12	7	0	32	12	44
Dairy Products	0	0	0	0	0	24	0	24
Processed rice	0	0	2	2	0	0	2	2
Sugar	7	0	0	9	0	3	9	12
Food products nec	0	0	0	8	0	311	8	319
Beverages and tobacco	1	0	9	5	1	17	15	32
Textiles	39	0	0	3	25	711	46	757
Wearing apparel	0	0	0	0	0	289	0	289
Leather products	11	16	0	0	0	73	27	100
Wood products	0	0	0	0	18	106	18	124
Paper products, publishing	0	0	0	3	0	160	3	163
Petroleum, coal prod.	8	0	0	7	0	25	8	33
Chemical, rubber, plastic	35	0	15	21	5	1248	51	1299
Mineral products nec	0	0	0	0	0	198	0	198
Ferrous metals	0	0	0	0	181	49	181	230
Metals nec	0	0	0	0	0	190	0	190
Metal products	0	0	0	0	1	264	1	265
Motor vehicles and parts	64	0	0	0	0	93	64	157
Transport equipment nec	7	10	0	0	0	72	17	89
Electronic equipment	36	17	0	0	0	205	53	258
Machinery and equipment	39	77	0	2	0	1199	116	1315
Manufactures nec	0	0	0	0	0	219	0	219
Electricity	0	0	0	0	0	1	0	1
Gas manuf, distribution	0	0	0	0	0	1	0	1
Total	257	120	47	84	245	6080	664	6744

Source: WTO 2001. Commodity definitions are for GTAP-5, see www.gtap.org for concordances.

Table A.2. The Import Coverage of Nontariff Barriers in China, 2001

	Licenses & Quotas	Tender -ing	Licensing only	State Trading	Designated Trading	Any NTB	Unrestricted Trading	Total
	%	%	%	%	%	%	%	%
Paddy rice	100	0	100	100	0	100	0	100
Wheat	100	0	100	100	0	100	0	100
Cereal grains nec	0	0	0	0	0	0	100	100
Vegetables, fruit, nuts	0	0	0	0	0	0	100	100
Oil seeds	0	0	0	0	0	0	100	100
Sugar cane, sugar beet	0	0	0	0	0	0	100	100
Plant-based fibers	93	0	0	93	0	93	7	100
Crops nec	48	0	0	48	0	48	52	100
Cattle, sheep and goats, horses	0	0	0	0	0	0	100	100
Animal products, nec	0	0	0	0	0	0	100	100
Wool, silk-worm cocoons	0	0	0	0	95	95	5	100
Forestry	0	0	0	0	94	94	6	100
Fishing	0	0	0	0	0	0	100	100
Coal	0	0	0	0	0	0	100	100
Oil	100	0	0	100	0	100	0	100
Gas	0	0	0	0	0	0	100	100
Minerals nec	0	0	0	0	0	0	100	100
Meat: cattle, sheep, goats, horse	0	0	0	0	0	0	100	100
Meat products nec	0	0	0	0	0	0	100	100
Vegetable oils and fats	59	0	60	59	0	60	40	100
Dairy Products	0	0	0	0	0	0	100	100
Processed rice	100	0	100	100	0	100	0	100
Sugar	85	0	0	85	0	85	15	100
Food products nec	1	0	0	1	0	1	99	100
Beverages and tobacco products	20	0	16	20	0	36	64	100
Textiles	9	0	0	0	8	14	86	100
Wearing apparel	0	0	0	0	0	0	100	100
Leather products	0	0	0	0	0	0	100	100
Wood products	0	0	0	0	55	55	45	100
Paper products, publishing	0	0	0	0	0	0	100	100
Petroleum, coal products	58	0	0	58	0	58	42	100
Chemical, rubber, plastic prods	5	0	1	5	2	7	93	100
Mineral products nec	0	0	0	0	0	0	100	100
Ferrous metals	0	0	0	0	85	85	16	100
Metals nec	0	0	0	0	0	0	100	100
Metal products	0	0	0	0	1	1	99	100
Motor vehicles and parts	32	0	0	0	0	32	68	100
Transport equipment nec	1	3	0	0	0	4	96	100
Electronic equipment	9	5	0	0	0	14	86	100
Machinery and equipment nec	1	8	0	0	0	10	90	100
Manufactures nec	0	0	0	0	0	0	100	100
Total Import Coverage	12.8	2.7	0.5	9.5	6.2	21.6	78.4	100

Note: Based on WTO (2001) and import data from China Customs for 2000

Table A.3. Commodity Import Shares by NTB Measure

	Licenses & Quotas	Tendering	Licensing only	State Trading	Designated Trading	Any NTB	Unrestricted Trading	Total
	%	%	%	%	%	%	%	
Paddy rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wheat	0.0	0.0	13.0	0.7	0.0	0.6	0.0	0.1
Cereal grains nec	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Vegetables, fruit, nuts	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Oil seeds	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.5
Sugar cane, sugar beet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plant-based fibers	0.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Crops nec	1.1	0.0	0.0	0.8	0.0	0.0	0.1	0.1
Cattle, sheep and goats	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Animal products, nec	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4
Wool, silk	4.3	0.0	0.0	0.0	4.7	0.7	0.0	0.1
Forestry	0.0	0.0	0.0	0.0	11.7	2.4	0.1	0.3
Fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil	0.0	0.0	0.0	69.4	0.0	48.9	0.0	5.6
Gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minerals nec	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.2
Meat: cattle, sheep, goat	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Meat products nec	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
Vegetable oils and fats	0.0	0.0	55.0	2.8	0.0	0.7	0.2	0.3
Dairy Products	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Processed rice	0.0	0.0	9.9	0.5	0.0	0.5	0.0	0.1
Sugar	0.8	0.0	0.0	0.5	0.0	0.4	0.0	0.1
Food products nec	0.0	0.0	0.0	0.1	0.0	0.0	1.4	1.2
Beverages and tobacco	0.0	0.0	2.9	0.2	0.0	0.2	0.1	0.1
Textiles	16.2	0.0	0.0	1.3	8.2	0.7	7.1	6.3
Wearing apparel	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5
Leather products	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.4
Wood products	0.0	0.0	0.0	0.0	8.8	0.8	0.6	0.6
Paper products	0.0	0.0	0.0	0.1	0.0	0.0	4.0	3.5
Petroleum, coal prods	20.8	0.0	0.0	14.8	0.0	3.4	1.3	1.6
Chemical, rubber, plastic	17.0	0.0	19.1	8.1	4.2	0.5	17.9	15.9
Mineral products nec	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.0
Ferrous metals	0.0	0.0	0.0	0.0	62.1	29.9	0.9	4.3
Metals nec	0.0	0.0	0.0	0.0	0.0	0.0	5.2	4.6
Metal products	0.0	0.0	0.0	0.0	0.3	0.0	2.0	1.7
Motor vehicles and parts	8.7	0.0	0.0	0.0	0.0	2.4	1.6	1.7
Transport equipment nec	0.2	1.6	0.0	0.0	0.0	0.1	1.8	1.6
Electronic equipment	26.8	41.1	0.0	0.0	0.0	6.0	23.8	21.7
Machinery and equip	3.8	57.3	0.0	0.3	0.0	1.6	22.2	19.8
Manufactures nec	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A.4. Elasticity of substitution and changes in real consumer prices due to China's WTO Accession

	Elasticity of Substitution between Domestic Products & imports*	Short Run Closure		Long Run Closure	
		1995-2007	2001-2007	1995-2007	2001-2007
Rice	4.4	2.2	0.7	2.5	1.0
Wheat	4.4	-0.8	0.7	0.4	0.4
Feedgrains	4.4	13	2.1	13.5	1.9
Vegetables and fruits	4.4	0.9	-0.6	1.4	-0.1
Oilseeds	4.4	-6.7	-5.9	-4.8	-4.6
Sugar	4.4	-2.1	-3.5	-1.8	-3.1
Plant based fibers	4.4	2.1	4.1	3.1	3.1
Livestock & meat	5.0	3.8	0.7	2.4	0.2
Dairy	4.4	2	-0.5	2	0.2
Other food	4.4	0.3	-2.7	0.4	-1.8
Beverages & tobacco	6.2	-14.3	-7.7	-10.8	-6.9
Extractive industries	5.6	2.5	1.7	2.3	1.2
Textiles	4.4	-10.3	-1.5	-10.5	-3.1
Apparel	8.8	-6.7	0.8	-8.6	-1.9
Light manufacturing	8.8	-2	0.5	-2.6	0.0
Petrochemical industry	4.1	0.7	0.8	0.9	0.9
Metals	5.6	1.2	1.3	1.3	1.3
Autos	10.4	-23.6	-4.0	-22.2	-4.2
Electronics	5.6	-5.3	-1.4	-5.8	-1.7
Other manufactures	5.5	0.5	0.8	0.4	0.9
Trade and transport	3.8	3	1.7	2.6	1.7
Construction	3.8	2.8	1.7	2.5	1.7
Communication	3.8	3.6	1.7	2.8	1.9
Commercial services	3.8	2.7	0.9	3.2	1.9
Other services	4.0	2.4	1.3	2.5	1.6

Table A.5. Changes in China's key economic indicators due to WTO accession for the period before 2001 (1995-2001).

	Output %	Employment %	Exports %	Imports %	Trade Balance US$ m.	Wholesale Prices %	Consumer Prices %
Rice	-0.7	-0.7	9.5	-11.3	101	0.5	1.5
Wheat	-2.8	-2.9	14.9	39.1	-484	0.1	0.0
Feedgrains	2.3	2.4	2.5	-20.9	244	0.8	11.4
Vegetables and fruits	-0.6	-0.7	8.6	-26.5	486	0.5	1.5
Oilseeds	-1.8	-1.9	10.9	16.6	-549	0.5	-0.2
Sugar	-0.1	-0.2	9.1	3.3	8	0.6	1.3
Plant based fibers	-11.6	-12.2	29.6	-9.8	264	-1.2	0.0
Livestock & meat	1.3	1.4	8.7	-27.3	1888	1.1	2.2
Dairy	2.0	2.2	10.3	2.6	-10	0.8	1.8
Other food	4.6	4.8	10.9	-26.3	3537	0.3	2.2
Beverages & tobacco	-23.8	-23.8	16.8	614.9	-10656	-0.5	-4.2
Extractive industries	-0.4	-0.5	16.6	1.9	-781	0.1	1.1
Textiles	-12.1	-12.2	16.7	35.5	-9556	-3.0	-7.6
Apparel	-3.4	-3.9	23.7	344.6	-344	-1.9	-6.8
Light manufacturing	3.7	3.6	14.6	48.9	2008	-0.5	-2.6
Petrochemical industry	-0.7	-0.7	12.9	11.3	-4433	-0.6	0.0
Metals	-0.5	-0.5	20.9	23.5	-3051	-0.6	0.0
Autos	2.8	-13.2	326.8	195.5	2935	-15.9	-18.8
Electronics	3.8	3.6	18.4	16.2	2657	-1.8	-4.2
Other manufactures	1.9	1.9	17.6	22.2	8511	-0.8	-0.5
Trade and transport	1.3	1.3	10.1	-7.3	5284	-0.2	0.9
Construction	2.2	2.2	14.8	-6.3	301	-0.2	0.8
Communication	1.0	1.0	11.1	-7.4	229	-0.1	0.9
Commercial services	0.8	0.8	10.5	-6.3	798	0.3	1.3
Other services	0.3	0.4	12.7	-8.1	749	-0.1	0.9
Total	2.0	N/A	20.3	22.0	138	-1.4	-0.8

Table A.6. Changes in China's key economic indicators in the baseline, without WTO accession, for the period 1995-2007.

	Output %	Employment %	Exports %	Imports %
Rice	63.8	-11.5	134.7	-8.8
Wheat	81.4	6.4	-15.2	126.3
Feedgrains	109.5	23.8	-0.6	95.9
Vegetables and fruits	98.2	16.8	-10.8	122.1
Oilseeds	100.9	18.4	-36	151.7
Sugar	112.5	14.5	109.4	88.7
Plant based fibers	137.2	41.1	-8.5	146.1
Livestock & meat	121.9	25.6	12.8	135.3
Dairy	122.5	18.8	60.5	100.3
Other food	110.8	-1.5	76.8	58.5
Beverages & tobacco	114.6	-9	166.7	65.9
Extractive industries	77.8	67.2	-88	554.2
Textiles	142.2	-1.7	95	70.4
Apparel	110.5	-1.7	100.8	47.2
Light manufacturing	135.8	11	117.3	60.1
Petrochemical industry	126.7	-5.6	80.2	101.5
Metals	144.4	11.5	114.4	99.6
Autos	157.5	2.2	419.7	105.3
Electronics	186.5	13.1	168.1	112.1
Other manufactures	161.1	6.4	195.1	51.3
Trade and transport	129.4	-3.3	129.4	69.3
Construction	113.3	26.5	77.4	85.6
Communication	133.2	-12.4	452.9	11.9
Commercial services	133.4	1.8	211.7	55.1
Other services	113.6	21	101.1	75.1
Total	120.2	N/A	131.7	97

Table A.7. Sensitivity analysis with respect to the elasticity of transformation σ (2.67) (percentage changes in China after 2001)

	Output %	Employment %	Exports %	Imports %	Wholesale prices %	Consumer prices %
Rice	-2.2	-2.5	4.2	-6.3	-0.8	1.1
Wheat	-2.4	-2.8	15.6	-9.2	-1.5	0.6
Feedgrains	-2.5	-2.9	-78.2	-1.9	-1.7	1.8
Vegetables and fruits	-3.5	-3.9	12.3	-5.4	-1.7	0.1
Oilseeds	-8.3	-8.9	26.8	21.3	-2.6	-4.5
Sugar	-6.9	-8.1	11.8	24.4	-1.7	-3.0
Plant based fibers	15.7	16.3	-52.3	8.0	0.1	3.1
Livestock & meat	1.2	0.8	12.6	-7.6	-1.4	0.4
Dairy	-2.3	-2.9	11.5	24.4	-1.3	0.3
Other food	-6.2	-6.7	10.2	63.3	-1.7	-1.8
Beverages & tobacco	-33.2	-33.2	8.8	112.9	-1.9	-7.0
Extractive industries	-0.9	-1.2	7.6	-4.4	-0.8	1.1
Textiles	15.6	15.6	32.6	38.6	-1.8	-3.2
Apparel	57.4	56.4	106.1	30.7	-0.7	-2.0
Light manufacturing	3.3	3.3	5.5	6.9	-0.9	0.0
Petrochemical industry	-2.3	-2.2	3.2	11.7	-0.8	0.7
Metals	-2.0	-1.9	4.0	6.8	-0.5	1.2
Autos	1.5	-2.0	27.9	24.1	-4.0	-4.3
Electronics	0.8	0.7	6.8	6.9	-1.4	-1.8
Other manufactures	-2.0	-2.0	4.3	18.8	-0.7	0.7
Trade and transport	0.0	0.1	1.0	-0.4	-0.3	1.5
Construction	0.9	1.0	3.0	17.4	-0.3	1.6
Communication	-0.5	-0.3	-0.3	10.9	0.0	1.8
Commercial services	-2.0	-1.9	-0.2	35.4	0.1	1.8
Other services	-1.6	-1.7	1.7	33.5	-0.2	1.5
Total	1.0	0	17.5	17.2	-0.8	-0.1
Nonfarm unskilled wages	1.08	Migration	7*	Unskilled wage	0.7	
Farm unskilled wage	-0.02	Land rent	-5.7	Skilled wage	0.8	
Price of capital goods	-0.95	Capital rent	1.2	Welfare	9728**	

*1997 US millions.
**Millions of workers leaving their farm jobs for non-farm jobs.