

## Agricultural trade liberalization and poverty in China

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### Abstract

The overall goal of this paper is to examine the impacts of trade liberalization on China's agriculture, in general, and poverty, in particular. The impacts on agriculture are analyzed by commodity and by region. Because different farmers (especially those in different income brackets) produce diverse sets of commodities, the main part of our paper analyzes the effects on households and their implications for the poverty through the simulation of household production and consumption changes in response to the trade-induced market prices changes on a disaggregated (by province), household-level basis. The results of our analysis lead to the conclusion that, unlike fears expressed in the popular press and by some scholars, the positive impacts of trade liberalization are actually greater than the negative ones. Although other effects on the rural economy from trade liberalization of other subsectors (such as textiles) may be equally large or even larger, this study's focus on the agricultural sector shows that there will be an impact from agricultural trade liberalization and that the net impact is positive for the average farm household in China. However, policymakers still need to be concerned. Not all households and not all commodities will be treated equally. Our findings show that poorer households, especially those in the provinces in the western parts of China, will be hurt. The main reason is that the farmers in Western China are currently producing commodities that are receiving positive rates of protection, rates of protection that will fall with additional trade liberalization. Hence, if policy makers want to minimize the impacts, there needs to be an effort to minimize the effect on these households either by direct assistance or by eliminating constraints that are keeping households from becoming more efficient by shifting their production more towards those commodities that will benefit from trade liberalization.

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## 1. Introduction

China's economy has experienced remarkable growth since the economic reforms were initiated in the late 1970s, a shift in policy that has led to a sharp decline in the nation's poverty. The annual growth rate of gross domestic product (GDP) was nearly 9% in 1979–2003 (NSBC, 2003a). In the past two and half decades, based on China's official poverty line, more than 230 million rural residents have escaped poverty; the absolute level of poverty fell from 260 million in 1978 to less than 30 million in 2002 (NSBC, 2003b). The incidence of rural poverty has fallen equally fast, plunging from 32.9% in 1978 to less than 3% in 2002.

While China's past record of economic growth and poverty reduction is impressive, there are still great challenges ahead. The agricultural growth rate has declined since the late 1980s. Rising input levels in many areas of China and diminishing marginal returns mean that increasing inputs will not provide large increases in output. Water shortages and increasing competition from industry and domestic use for the remaining scarce supplies do not provide much hope for large gains in area or yields from new irrigation expansion. In the future, many have predicted that almost all gains will be productivity driven and these will have to come from second- and third-generation Green Revolution technologies (Huang, Rozelle, Pray, & Wang, 2002).

Despite the fall in poverty rates, the growth of the economy during the past 25 years also was accompanied by the large income disparities. The income gaps among regions, between urban and rural and among households within the same location have increased steadily since the middle 1980s (Riskin and Khan, 2001). By 2002 the ratio of urban to rural incomes exceeded 3.4 (NSBC, 2003a). Income disparities have risen within rural areas. The rising income disparity within rural areas is seen by rising Gini coefficients, which increased from 0.24 in 1980 to 0.35 in 2000 (NSBC, 2003b).

Trade liberalization, perhaps more than any other dimension of China's policy environment, presents some of the greatest challenges to the future of China's agriculture and rural economy. Agriculture was at (will be at) the center of discussion of China's entry into the WTO (future trade liberalization talks) for two reasons. First, there is a general perception that the actors in the rural economy are particularly vulnerable to opening competition with the agricultural economies elsewhere in the world. Second, despite the low and falling share that agriculture contributes to GDP in China and other nations, the importance of the agricultural sector are disproportionately great in political economy terms (in both China and other nations).

Because of the magnitude and sensitivity of the challenge, debates on the future of China's agriculture continue. Some argue that the impact of WTO accession on China's agriculture will be substantial, adversely affecting hundreds of millions of farmers (Carter & Estrin, 2001; Li, Zhai, Wang, & Development Research Center, 1999). Others believe that, although some impacts will be negative, and even severe in specific areas, the overall effect of accession on agriculture will be modest (Anderson, Huang, & Ianchovichina, 2004; Martin, 2002). Although the general absence of empirically-based research on these issues is ultimately underlying the reason why those on different sides of the debate see things so differently, Huang, Rozelle, and Chang (2004) argue that the confusion about the ultimate impact of WTO accession, specifically, and trade liberalization, in general, on agriculture can be traced to a general lack of understanding of the policy changes that accession will engender (Huang et al., 2004). Moreover, the misunderstanding of the policy effects themselves can be traced to a lack of understanding of the fundamental facts about the nature of the distortions to China's economy on the eve of its WTO entry.

Although China's joining the World Trade Organization (WTO) may have significant implications to world trade and China's economy, trade economists have produce little empirical

research that are able to answer even the most basic questions about the expected effects of China's entry in the WTO on the poor. In our previous work (Huang, Li, & Rozelle, 2003), we showed that, on balance, the nation's accession to WTO helps rural residents and improves incomes. However, these studies themselves have shortcomings that limit the analytical power to coarse, aggregate conclusions.

The overall goal of this paper is to have a better understanding of China's agriculture and examine the impacts of trade liberalization on China's agriculture, in general, and poverty, in particular. The impacts on agriculture are analyzed by commodity and by region of the country. Because different farmers (especially those in different income brackets) produce diverse sets of commodities, the main part of our paper analyzes the impacts on households and their implications for the poverty through the simulation of household production and consumption changes in response to the market prices changes on a disaggregated (by province), household-level basis.

The paper is organized as follows. In Section 2, we briefly describe an overview of China's past trade liberalization efforts as a way to describe the environment within which the WTO accession was taking place. Section 3 presents a new set of nominal protection rates (NPRs) that we estimate for late 2001, a time right before China's accession to the WTO. We use these NPR estimates as a baseline against which we can measure the effect of trade liberalization between 2001 and 2004. A description of China's WTO accession is presented in Section 4 and Section 5 describes the methodologies and data used in this study. The results showing our findings on the impact of WTO on China's agriculture and poverty are presented in Sections 6 and 7. Section 8 concludes.

## **2. International trade liberalization prior to China's WTO accession**

Although analysts that have examined China's accession to the WTO often write as if the tariff reductions and WTO-specific policies are a watershed event in China, in fact, China's leaders have been pushing trade liberalization for many years prior to China's entry into the WTO and have used different policy instruments in their efforts to integrate China's domestic economy with the rest of the world (although it should be realized that part of the impetus for the earlier changes were precisely because China was interested in joining the WTO). In this section we look at a number of these policies: exchange rate policy; the liberalization of the right to import without a license; the reduction in export subsidies; and the reduction of tariff rates.

### *2.1. Foreign exchange policy*

Historically, the overvaluation of domestic currency for trade protection purposes was responsible for reducing agricultural incentives (Huang & Chen, 1999). Real exchange rates remained constant and even appreciated during the 30 years prior to reforms (during the 1950s, 1960s and 1970s). Hence, on the eve the reforms, given the tradable status of agricultural commodities, China's exchange rate policy was working against the agricultural sector.

After reform, however, the exchange rate depreciated rapidly. With the exception of several years of domestic price inflation during the mid-1980s, from 1978 to 1992 the real exchange rate depreciated on almost a yearly basis, falling by more than 400%. Falling exchange rates increased the export agriculture's competitiveness, contributing to China's record of rapid export growth (especially in non-grain commodities) and the robust economic performance of the 1980s.

The situation, however, has shifted since the early 1990s. Between 1992 and 1997 the real exchange rate actually appreciated by about 30%. Moreover, the pressure to appreciate the RMB (or Chinese yuan) from its major trade partners is growing. So far, except for a minor adjustment

in 2004, China's government has elected to maintain its current exchange rate policies; national leaders at the current time believe that a stabilized foreign exchange rate is one of the keys to maintaining a stable national economy. Hence, in the past (and certainly in the future) China's exchange rate policy has affected the agricultural sector and its trade.

There also have been other exchange rate-associated policies beyond managing the rate itself. For example, China has accelerated the reform of foreign exchange management. The nation's use of export subsidies also fell prior to WTO accession. Moreover, China is considering to gradually eliminate export tax rebates in order to avoid the sharp increases in its holding of foreign exchange reserves.

## 2.2. Liberalizing international trade

Foreign trade liberalization has gone far beyond the relaxation of China's foreign currency controls. During the same period, China was in the process of implementing a series of measures to liberalize its international trading system. In the initial years most of the fall in protection came from a reduction in the number of commodities that were controlled by single desk state traders (Huang & Chen, 1999). In the case of many products, competition among non-state foreign trade corporations began to stimulate imports and exports (Martin, 2002). Although several major agricultural commodities were not included in the move to decentralize trade, the new trade liberalization efforts spurred the export on many agricultural goods. Policy shifts in the 1980s and 1990s also changed the trading behavior of state traders. Finally, in the 1980s and 1990s, leaders allowed the state traders to increase imports.

The implementation of the subsidy reform policy, however, was not implemented evenly across crops (Huang et al., 2004). For example, by the mid- to late-1980s, payment of export subsidies to traders were reduced for crops such as rice (during most years). However, on the eve of China's accession to the WTO, field surveys found that budgetary authorities were still providing exporters of cotton and maize between 10 and 30% or more of the value of the crop after each export transaction. Clearly, then, to the extent that China's WTO agreement is expected to have an impact due to its commitment to reduce export subsidies, the impact will affect cotton and maize farmers more, not because rice exports were never subsidized, but mainly because the subsidies had already been reduced by the time the accession agreement took effect.

Moves to relax rights of access to import markets and to reduce distorting export subsidies were matched by actions to reduce the taxes on imports that were being assessed at the border. In fact, China's leaders began to systematically reduce tariff rates in the early 1990s. From 1992 to 1998 the simple average agricultural import tariff fell from 42 to 24%. Between 1998 and 2001 the average rate further fell to 21% (MOFTEC, 2002).

It should be noted, however, that like the reduction in the payment of the export subsidies, the tariff rate reductions differed by crop. Some, such as soybeans, had fallen to 3% by 2001. Others, such as those on sugar and dairy products, were still well above 30%. Also, as is the case for the payment of exports, the differences across products in tariff rate protection mean that the effect of WTO tariff cuts will differ by crop and the accession's liberalization should affect farmers in different areas differently.

## 2.3. Impacts on trade

In the same way that trade liberalization has affected growth in the domestic economy (Lardy, 2001), changes in the external economy have affected the nature of China's trade patterns (Huang

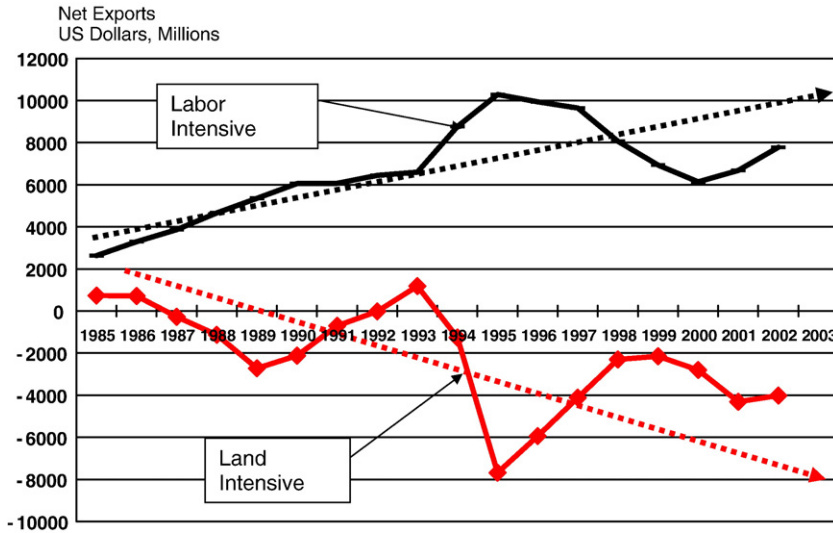


Fig. 1. Agricultural trade balance by factor intensity (mil US\$), 1985–2003. Source: data are from various publications of China's National Statistical Bureau and China's Custom Authority. Land intensity products include grain, oils, sugar and cotton and wool; labor intensity products include livestock, fish, horticulture and beverages.

& Chen, 1999). Whereas the share of primary (mainly agricultural) products in total exports was over 50% in 1980, it fell to only 10% after 2001 (NSBC, 2003a). Over the same period, the share of food exports in total exports fell from 17 to 5%. The share of food imports fell from 15 to 2%.

Disaggregated, crop-specific trade trends show equally sharp shifts and suggest that exports and imports increasingly are moving in a direction toward products in which China has a comparative advantage and therefore have also facilitated the structural changes in the nation's agriculture (Anderson et al., 2004). The net exports of land-intensive bulk commodities (that is, those commodities in which the labor share of total production cost is low when based on factor intensity), such as grains, oilseeds and sugar crops, have fallen; exports of higher-valued, more labor-intensive products, such as horticultural and animal (including aquaculture) products, have risen (Fig. 1). This also can be seen in other ways. For example, the proportion of grain exports, which was only around 20% of total agricultural exports in the 1990s, was less than half of what it was in the early 1980s. By the late 1990s horticultural products and animal and aquatic products accounted for about 80% of agricultural exports (Huang & Chen, 1999).

### 3. Nominal protection rates

Estimating nominal protection rates (NPRs—or the difference between the domestic price of commodity in a port city of China and the price of the imported commodity, CIF, also in the port city) in the period of time immediately before China acceded to the WTO is a key part of establishing a baseline against which to compare the effect of China's recent trade liberalization efforts. Hence, the first step of our analysis is to estimate a set of NPRs for each commodity for 2001, prior to the time that China joined the WTO. For those commodities that either China simultaneously imports and exports (e.g., rice and maize) or for those commodities in which the difference of imports and exports over the past decades has not been large (e.g., certain types of cash crops and meat products—e.g., cotton and beef), we estimated NPRs based on both CIF and

Table 1

Nominal protection rates (NPRs) and sources of policy distortions (tariff rates, the value added tax—VAT – and non-tariff barriers—NTBs) in China, 2001

	Import tariff equivalents				Export subsidy equivalents			
	Tariff rate	VAT	NTB China	NPR	Tax rebate	Subsidy	NTB abroad	NPR
Rice	1	13	3	17	1	0	–9	–8
Wheat	1	13	1	15				
Maize	1	13	8	22	32		0	32
Other grains	1	13	1	15				
Soybean	3	13	1	17				
Cotton	3	13	2	18	5	10	0	20
Oilseed	13	13	21	47				
Sugar crops	25	15	10	50				
Vegetable					1	0	–11	–10
Fruits					1	0	–11	–10
Pork (meat)					5	0	–25	–20
Beef	45	15	0	60	5	0	–13	–8
Mutton					5	0	–10	–5
Poultry (meat)	20	15	0	35	13	0	–30	–17
Egg					1	0	–5	–4
Milk	50	17	0	67				
Fish					5	0	–20	–15

FOB prices. Because there are differences among major varieties of individual agricultural commodities (e.g., the NPR of a high quality hard white wheat is more than 20%; while the NPR of soft red wheat is less than 10%), we weigh the NPRs of the different varieties of each major commodity to get an average NPR. Crop commodities are weighted by estimates of each variety's sown area; meat products are weighted by production share.<sup>1</sup> The results for all of China's major commodities are summarized in Table 1.<sup>2</sup>

The findings of the NPR analysis are, in fact, of interest in themselves. Our findings show not only that significantly positive rates of protection exist for a number of China's major field crops, but also that they vary according to the position in which China finds itself (as a net importer or as a net exporter). For example, China's domestic maize prices, according to exporters (and other informants), were more than 30%, on average, above world prices. In other words, traders would have lost more than 30% of the value of their shipment, if the government did not subsidize maize export transactions. It is interesting to note that the level of protection of maize almost exactly corresponds to total export subsidies and tax rebates that were being paid to exporters of maize during the fall of 2001 (Table 1). Protection rates when considering maize as an import differed among regions, however. For example, traders in the northeast told our survey team that if they

<sup>1</sup> After this procedure is carried out, each product that has what appears to be a traditional NPR. For example, the NPR for wheat—as a whole—is 15%, but this is really only an average of the NPRs of seven different varieties of wheat that were weighted by their area shares. The actual interpretation is that on average, the price of all varieties of domestically produced wheat that are sold in the domestic markets of China's major port cities are 15% above the average CIF price of all types of imported wheat varieties.

<sup>2</sup> In this paper our NPRs are calculated from prices—domestic and international—in China's port cities. Because in other work we have found that China's domestic commodity markets are remarkably integrated (Huang et al., 2004), we assume in the rest of the analysis that shifts in prices that are experienced at the border are largely transmitted to farmers nationwide, including into China's poor areas. If this were not the case, the NPRs would have to be created for each and every location in China. For a discussion of these issues, see Corden (1997).

were not exporting and foreign maize was to come into China, the importer could make, on average, 22%.

Table 1 also shows that despite the large volume of increase of soybean imports in recent years, there is still a difference between the CIF and domestic price in the port. The average difference between the domestic price and the international price was 17%. In one sense, the fact that there is a remaining price gap is remarkable given that China imported 20 MMTs of soybeans in 2003, the official tariff is only 3% and the commodity can be traded by any foreign trade company (that is, trading firms do not need to secure a license or quota allocation). On the other hand, the remaining price gap reminds us that there may be other reasons for distortions beyond tariffs and state trading. In fact, the gap between the domestic and international price fully demonstrates the effect of China's policy of assessing a value-added tax on imported soybeans at the border (13% of CIF).

Beside maize, other commodities, such as cotton, edible oil seeds and sugar, were also fairly highly protected in 2001 (Table 1). The distortions for these commodities in the fall of 2001 came from several sources. In some cases, for example, sugar, the official tariff rate remained high. The value added tax (VAT)—which was being assessed on imports, but not necessarily domestic purchases—accounted for a large share of the cotton NPR. There were still significantly high non-tariff barriers for edible oil seeds, such as canola and palm oil in 2001.

Our results also find that there are a number of commodities, besides rice, that had negative NPRs in 2001. When a commodity has a negative NPR, one interpretation is that a country is having its commodities implicitly taxed or that something is keeping exports volume from rising and keeping the domestic price from moving up to the international price. Specifically, our data show that vegetables, fruit, pork and poultry are facing significant NTBs from the rest of the world.

#### **4. China's WTO accession**

In its most basic terms, the WTO commitments in the agricultural sector can be classified into 3 major categories: market access, domestic support and export subsidies. The commitments on market accession will lower tariffs of all agricultural products, increase access to China's markets by foreign producers of some commodities through tariff rate quotas (TRQs) and remove quantitative restrictions on others. In return, China is supposed to gain better access to foreign markets for its agricultural products, as well as a number of other indirect benefits. Domestic support and export subsidies are the other two critical issues that arose during the course of negotiations. Together with a number of other market-access commitments make China's WTO accession unique among all other developing countries that have been admitted to the WTO's new environment.

Because of the nation's earlier efforts to liberalize trade (discussed above), some of the direct import market-access commitments that China has made to WTO members actually do not appear to be substantial. After acceding to WTO, overall agricultural import tariffs (in terms of its simple average) declined from about 21% in 2001 to 17% by 2004. As seen in the previous discussion, in fact, this was really just a continuance of earlier trends. Although important, when taken in the context of the discussion in the previous section about China's external economy reforms of the last two decades, in simplest terms, WTO is not really imposing radical changes on China. In other words, one would really have to conclude that the WTO accession commitments are merely extensions of China's past changes; WTO accession can be thought of as another step on China's economic opening.

Table 2

Import tariff rates on major agricultural products which are subject to tariff-only protection in China

	Actual tariff rates in 2001	Effective as of 1 January	
		2002	2004
Barley	114 (3) <sup>a</sup>	3	3
Soybean	3 <sup>b</sup>	3	3
Citrus	40	20	12
Other fruits	30–40	13–20	10–13
Vegetables	30–50	13–29	10–15
Beef	45	23.2	12
Pork	20	18.4	12
Poultry meat	20	18.4	10
Dairy products	50	20–37	10–12
Wine	65	45	14
Tobacco	34	28	10

Source: China's WTO *Protocol of Accession*, November 2001.

<sup>a</sup> Barley imports originally were limited by strict licensing and import quotas; the tariff rate was 3% for imports within the quota; those beyond the quota were subject to a 114% tariff.

<sup>b</sup> The tariff rate was as high as 114% before 2000, but was lowered to 3% in early 2000.

Except for national strategic products (grain, cotton, edible oil and sugar), other agricultural products (horticulture, livestock, fishery, wine, tobacco, soybean and barley) have become part of a tariff-only regime (Table 2). For most commodities in this group, effective protection fell by varying amounts after the signing of the agreement in late 2001. After an initial fall that took place, most of the tariff lines were scheduled to fall even further by 2004 (which—by the way, have indeed fallen, showing that China has been keeping at least most of its WTO promises). To the extent that tariffs are binding for some of these commodities, the reductions in tariff rates should have stimulated new imports—however, as discussed above, the expected impact should differ by commodity.

It also is important to note that although published tariff rates fell on all of these commodities, imports should not have been expected to grow summarily. Indeed, as we have seen the NPR of many commodities are currently under the single tariff regime are negative (perhaps implying that China has a comparative advantage in producing such commodities). For example, lower tariffs on horticultural and meats might be expected to affect only a small segment of China's domestic market (e.g., those parts of the market that buy and sell only very high quality products—meats for five-star hotels that cater to foreigners). Although tariffs fall for all products, since China produces and exports many commodities at below world market prices, the reductions for these commodities should not have been expected to affect the individuals in China's economy that produce and trade these commodities.

The situation also is different for a class of commodities called “national strategic products,” which includes commodities such as rice, wheat, maize, edible oils, sugar, cotton and wool. In the case of national strategic commodities, the trade flows can be legally limited no matter what the difference between China's domestic price and the world market price. These commodities are covered under a special set of institutions. Specifically, WTO rules allow officials to manage trade off with tariff rate quotas (TRQs). As shown in Table 3, except for sugar (20%) and edible oils (9%), the in-quota tariff is only 1% for other national strategic commodities (rice, wheat, maize and wool). However, the amount brought in at these tariff levels can be restricted legally. While the levels of the TRQs begin fairly low in 2002, it should be noted that between 2002 and 2004



Table 3  
Tariff rate quotas (TRQs) of agricultural commodities in China after 2001

	TRQ (million tons)		Tariff (%)		Quota for non-state own enterprises (%) 2000–2005
	2002	2005	In-quota	Above-quota	
Wheat	7.3	9.6	1	65	10
Maize	4.5	7.2	1	65	25–40
Rice	2.6	5.3	1	65	50
Cotton	0.743	0.894	–	–	67
Soybean oil	1.7	3.2	9	121	50–90

TRQ volumes grew at annual rates ranging from 4% to 19%. However, it should also be noted that China does not have to bring in this quantity if the prices are not right. However, provisions are in place in China's WTO commitments regarding the administration of TRQs to allow for competition in the import market so if there is demand inside China for the national strategic products at international prices, traders will be able to bring in the commodity up to the TRQ level.

Although TRQs are restrictive, at least theoretically, the WTO accession agreement does contain mechanisms which allow for imports of these commodities after the TRQ is filled. Most poignantly, tariffs on out-of-quota sales (or for volumes in excess of the level of the TRQ) will drop substantially in the first year of accession and fall further between 2002 and 2005. But, during the transition period most people believe such rates are so high (e.g., 65% for grains and sugar in 2004 and edible oils in 2005) that in the coming years they will not bind (Table 3).<sup>3</sup>

After the first five years of accession, a number of other changes will take place. For example, after 2006 China agreed to phase out its TRQ for edible oils. In contrast, there is no such agreement for maize and most observers believe that China is likely to maintain the TRQ for maize after 2005 although the amount of TRQ will be certainly subject to intense negotiations in future trade talks (as is so in the current Doha round talks). State trading monopolies also were phased out for wool products after 2004; it is expected that they also will gradually disappear for most of other agricultural products (Table 3). Although China National Cereals Oil and Foodstuffs Import & Export Co. (or COFCO, as it is commonly referred to) will continue to play an important role in rice, wheat and maize, there will be an increasing degree of competition from private firms in grain imports and exports in the future.

In its commitments made as part of its WTO accession, China also agreed to a number of other items, some of which are special to the case of China. First, China must phase out all export subsidies (as seen, most subsidies were used in maize export in 2001) and not to introduce any of these subsidies on agricultural products in the future. Moreover, despite clearly being a developing country, China's *de minimis* exemption for product-specific support is equivalent to only 8.5% of the total value of production of a basic agricultural product (compared with 10% for other developing countries). Some measures, such as investment subsidies for all farmers and input subsidies for the poor and other resource-scarce farmers, that are generally available for policy makers to use in developing countries, are not allowed in China (i.e., China must include

<sup>3</sup> Although 65% above tariff rates seem high, it is important to note that in fact when compared to other countries, this is low. In most Asian countries (i.e., the ones that are part of WTO) that have a TRQ system, high tariff bindings are 2 or more times higher than this.

any such support as part of its aggregate measurement of support which should be less than 8.5% of agricultural output values).

Because of its Socialist background and the difficulty that the world has had in assessing the scope of the government's intervention into business dealings of all types, China was forced to accept a series of measure governing the way that they will deal with the rest of the world in cases of anti-dumping and countervailing duties. Most simply, special anti-dumping provisions will remain for 15 years. According to these provisions, in cases of anti-dumping China will be subject to a different set of rules than other countries use to prove their dumping allegations against China. In addition, the methods that countries can use against China to enforce anti-dumping claims, when they have won, will differ from most of the world. In essence, this set of measures makes it easier for countries to bring, prove and enforce dumping cases against China. It should be noted, however, that although the rules differ from those governing trade among other countries, China will get the same rights in their dealings with other countries, an element that could help them in some cases with their dealings with dumping matters when they concern their partners' exporting behavior.

## 5. Methodology and data

In order to evaluate the impact of China's WTO accession between 2001 and 2005 and further trade liberalization until 2010 on China's agriculture, poverty and environment (limited to examining the use of chemical inputs), an analytical framework has been developed using the Center for Chinese Agricultural Policy's Agricultural Policy Simulation and Projection Model (CAPSiM). CAPSiM was developed out of need to have a framework for analyzing policies affecting agricultural production, consumption, price and trade at the national level. CAPSiM is a partial equilibrium model. Most of the elasticities used in the CAPSiM are estimated econometrically by ourselves using state-of-the-art econometrics and with assumptions that make our estimated parameters consistent with theory. Both demand and supply elasticities change over time as income elasticities depend on the income level and cross-price elasticities of demand (or supply) depend on the food budget shares (or crop area shares). Details of the model description can be found in [Huang and Li \(2003\)](#) and key assumptions on GDP growth, population rises and productivity increases are summarized in Appendix A.

Because the analysis based on the original CAPSiM framework can only be done *at national level*, we have to modify the original model in order to allow us to disaggregate the national impacts into household production, consumption and poverty effects *at the provincial level* and to assess the impact that trade liberalization will have *on households in different income groups* in the same provinces.

Two scenarios are formulated. The baseline scenario assumes that China's economy continues to operate during the 10 year period, 2001 to 2010, as if there were no trade reform. In other words, we assume that the NPRs that we estimated and discuss above remain fixed at that level and that there is no change to other trade policies. This means two things. First, we are assuming under the baseline that there is no increased access by foreign exports to China's domestic market or to international markets for China's exports. Second, there is no reduction (or change) in NTBs that will affect prices. The alternative scenario assumes that China's NPRs move over the next 10 years to levels that are consistent with the nation's WTO accession agreement.

China's regional production patterns and trends over time differ largely due to the vast variations of climate and natural and human resources across China. Rice is the most important crop in the southern part of China, accounting for far more than half of sown area in provinces

Table 4

Analysis from CapSIM modeling showing impacts of WTO and trade liberalization on agricultural output prices (percentage difference between WTO accession/trade liberalization and the baseline), 2005 and 2010

Commodity	2005	2010
Rice	1.5	2.3
– Japonica	6.8	10.2
– Indica	–0.4	–0.6
Wheat	–1.7	–1.7
Maize	–6.6	–6.6
Sweet potato	–0.9	–0.9
Potato	–0.9	–0.9
Other cereals	–0.9	–0.9
Soybean	–0.9	–2.6
Cotton	–3.4	–3.4
Oil crops	–16.7	–20.2
Sugar crops	–9.3	–16.7
Vegetable	3.7	6.2
Fruits	3.7	6.2
Pork	8.3	13.9
Beef	2.9	4.8
Mutton	1.8	2.9
Poultry	6.8	11.4
Egg	1.4	2.3
Milk	–9.9	–13.7
Fish	5.9	9.8

such as Jiangxi and Hunan. In contrast, wheat is the most important crop in the provinces that make up the North China Plain (e.g., Henan, Shangdong and Hebei) and northwest China (e.g., Qinhai, Gangsu and Ningxia). Soybeans dominate the cropping patterns of Heilongjiang. To an extent much more than other parts of China, provinces on the east coast produce more vegetables and fruit.

In order to make the analysis manageable, we classify all commodities into 12 crop or crop-groups and 7 livestock product and fish groups. Even with these groupings, however, there are still too many to discuss in a concise fashion. As a result the presentation of our commodity analyses, we show only those results for commodity groups that we label as: *exportable* or *importable*. Exportable commodities are those that have negative NPRs; importable commodities are those that have positive NPRs (see Table 1). For certain commodities, such as beef and poultry which are both exported and imported, since their production weighted NPR is negative, they are included in the exportable category.

## 6. Impacts of WTO on China's agriculture

According to our analysis, WTO will affect the prices of nearly all crop and livestock commodities (although some of the effects will be small—Table 4). Compared with the baseline scenario (without WTO accession), WTO accession means that the prices of many crop commodities will have declined due to trade liberalization between 2001 and 2010 (Table 4). For vegetable, fruits, meats and aquaculture commodities, however, prices increase.

While the prices of most cropping commodities (except fruits, vegetables and japonica rice) decline, the extent of the price decline due to trade liberalization varies significantly among commodities (Table 4). For example, for the commodities with low NPRs in 2001, such as indica

Table 5

Analysis from CapSIM modeling showing impacts of WTO and trade liberalization on agricultural production (percentage difference between WTO accession/trade liberalization and the baseline), 2005 and 2010

Commodity	2005	2010
Rice	1.5	2.3
Wheat	-0.2	0.1
Maize	-3.5	-3.1
Soybean	1.0	0.2
Cotton	-0.3	0.1
Oil crops	-7.5	-9.0
Sugar crops	-2.5	-5.6
Vegetable	2.9	4.9
Fruits	3.3	5.4
Pork	7.6	11.0
Beef	3.5	4.8
Poultry	6.9	9.7
Milk	-5.6	-8.4
Fish	4.3	6.6

rice, wheat, coarse grains, soybean and cotton, WTO accession will have (and will continue through 2010) created a relatively mild set of price effects. The extent of the impacts will ultimately be much less than those that had higher NPRs in 2001 (e.g., maize, oil crops and sugar crops). Compared with the baseline, WTO will lower domestic prices of the wheat, soybean and cotton by about 2 to 4% between 2005 and 2010. In contrast, the impacts could be as high as 7 to 20% for maize, oil and sugar crops during the same time period.

On the other hand, trade liberalization will increase domestic prices of those commodities in which China has comparative advantage in international markets (or more precisely for those labor-intensive crops that have negative NPRs). The expected rise in exports of these commodities is forecast to increase their price level domestically. For example, between 2005 and 2010 we estimate that the price of vegetables will be about 4 to 6% higher under WTO scenario than under the baseline. Over the same period, the price of pork and poultry will rise even more, by 4 to 14% (Table 4). A similar increase will occur in the price of aquaculture commodities. Among all livestock products, milk is an exception; our model predicts that the domestic price of milk will decline with trade liberalization after 2005.

Overall, although agricultural producer prices are projected to fall over projection period, the prices for consumers will move the other way (which is explained below). Using a Stone price index (where prices of individual commodities are aggregated using weights constructed with value shares), we can create aggregated agricultural output and consumer price indices (crop + meat + fish). While aggregated crop output price index falls by 2.18% in 2010 under the WTO scenario (compared with the baseline scenario), the consumer agricultural price index rises by 4.37% in 2010 (and the overall price index rises by more than 1%).

The shift in prices due to trade liberalization means that the incentives of agricultural producers—when they are making their crop allocation decisions—will change. Unlike other sector-wide policies (e.g., R&D or irrigation), trade liberalization policies are unique in that they should be expected to change the relative prices of domestic agricultural commodities since the impacts of trade policy differ among commodities. In general, trade liberalization stimulates domestic production of sectors that are producing commodities in which the nation has a comparative advantage while dampening those in which producers do not have an advantage. As

a result, trade policies should lead to different impacts depending on the crop—sometimes negative and sometimes positive.

Table 5 presents the results of our simulations on the impacts of China's WTO accession and further trade liberalization on agricultural production (measured in output terms) in 2005 and 2010. The analyses show that trade liberalization will affect domestic production moderately. Moreover, as in the case of price effects, the signs of the impacts due to trade liberalization are as mostly as expected. Overall, the impact on production is negative for wheat, maize, cotton, oil crops and sugar crops. In contrast, the impact is positive for rice, vegetable, fruits, meat and fish, those commodities in which China has comparative advantage (Table 5).

It is worth to note that not all commodities that experience higher trade policy-induced prices will end up with higher domestic production. This can happen because of the indirect production effects that are associated with both own-price and cross-price substitution impacts. Soybean, a less competitive crop that was liberalized before China's WTO accession in 2001, is a good example of such a crop. The liberalization of soybean trade led to large increases in the level of imports and sharp falls in both the domestic price and production level prior to China's WTO accession (due to pre-WTO accession trade liberalization). Imports in 2001 reached more than 15 million tons, which just about equaled the level of domestic production in that year. While further trade liberalization after China's WTO accession will end up leading to a small fall in the price of soybeans (Table 5), the decline in soybean price is so small that the production impact of the own-price effect is predicted to be less than the negative production impact that arises due to shift of resources (labor, fertilizer, land) toward substitute commodities, such as vegetable, fruit and rice, which experience a sharp price rise in the post WTO era.

As there are both positive and negative impacts of WTO on China's agriculture, we also estimate the impact for the overall agricultural sector for the typical (or average) farmer (Table 6). In contrast to some of the commodity-specific effects that were presented above, the overall effects of China's WTO accession and further trade liberalization are positive. According to our analysis, agricultural output value for average farm will rise by 191 yuan (or by about 26 yuan or US\$ 5.6 per person). This accounts for 2.8% of total agricultural output in 2005 (Table 6). The net benefits in terms of output values will increase to 460 yuan in 2010, which is about 5.6% of the

Table 6

Analysis from CapSIM modeling showing impacts of WTO and trade liberalization on agricultural (production) output and food Consumption (percentage difference between WTO accession/trade liberalization and the baseline) for all commodities (rows 1 and 4) and for importable and exportable commodities, 2005 and 2010

	2005		2010	
	Changes in value (yuan/hh)	Percentage change (%)	Changes in value (yuan/hh)	Percentage change (%)
Agricultural output	191	2.8	460	5.8
Importable sector	-198	-7.2	-264	-8.5
Exportable sector	389	9.3	723	15.1
Food consumption	44	1.1	102	2.3
Importable sector	-16	-2.0	-17	-1.9
Exportable sector	61	1.9	119	3.3

Note: Importable sector includes wheat, maize, all coarse grains, soybean, edible oil, cotton, sugar and milk (all commodities with positive nominal protection rates—NPRs). Exportable sector includes rice, vegetables, fruit, all meat and fish commodities (commodities with negative NPRs).

average household's agricultural output value. Of the positive effects, about 20–30% is due to the rise in prices; the other 70–80% is due to the growth in the real output as China's production patterns change, moving from less competitive to more competitive crops and livestock activities.

The importance of accounting for production responses to changing prices can be seen by noting that the rise in overall production occurs when imports rise and exports expand. Facing the price shifts, producers in China, according to our modeling exercises, respond by moving into the production of commodities which experience price rises and out of commodities that experience price falls. At the end of the period we forecast that enough structural change has occurred so that overall agricultural output ends up rising. By 2005, while the output value of importable products will decline by 7.2% under the WTO scenario (compared with the baseline scenario), exportable products will rise by 9.3% (Table 6).

Interestingly, between 2005 and 2010 the fifth and tenth year after the implementation of WTO, the rate of rise of the average household's agricultural output accelerates (Table 6, columns 3 and 4). Because liberalization continues for both those products that are protected (especially for maize, sugar and edible crops) and those that are exportable (e.g., livestock, fish, vegetables and rice), agricultural output will continue to increase under a more liberalized trade environment in 2005–2010. However, because we have not accounted for the increased production output value that occurs due to the higher input use (which is stimulated by higher prices), the increase in the value of agricultural output should not be considered as the equivalent of increases in agricultural income. When comparing our results to those of other trade models that have simulated the impact of the accession to WTO on China's agriculture (Martin, 2001; Anderson et al., 2004), our results (which are couched in terms of output rather than income) are fairly consistent (around 2–3% agricultural income changes in 2005–2010; if one takes a fraction of output—say 50%—increased profits).

At the same time, the overall effects of China's WTO accession on food consumption are more modest (Table 6, rows 4 to 6). By 2005, total household food expenditures will be 1.1% higher under the WTO scenario than under the baseline; expenditures rise to 2.3% by 2010. However, because overall food prices change with trade liberalization, to examine the impacts of WTO on food consumption, we need to compare the food expenditure share changes with the overall food price changes in the projection period. Because the aggregate food prices will rise by 2.36% in 2005 and 4.37% in 2010 under WTO scenario (compared with the baseline scenario), these imply that increases in food expenditure due to trade liberalization are all from the rise in food prices. Indeed, real food consumption, at constant prices will decline minimally (by about 1% in 2005 and by about 2% in 2010).

## 7. Impacts of WTO on China's rural households and poverty

Because all rural households in China have access to land, a consequence of the nature of the nation's economic reform policy and land rights system, the size of farm in China is small by international standards. For the nation as a whole, the average size of farm is less than 8 mu, or about 0.5 ha. With such small size of farms, households in China have to intensively use their land resources. They use their land both to produce their own staple food and for cash crops for sale into the market.

Sustainable rises in rural labor productivity and household income, however, will require more than income from the average farm in China. As a result, farm households need to find off-farm employments in the off-farm sector. In fact, this is what has been happening in rural China since the early 1980s (deBrauw, Huang, Rozelle, Zhang, & Zhang, 2002). By 2003, the average

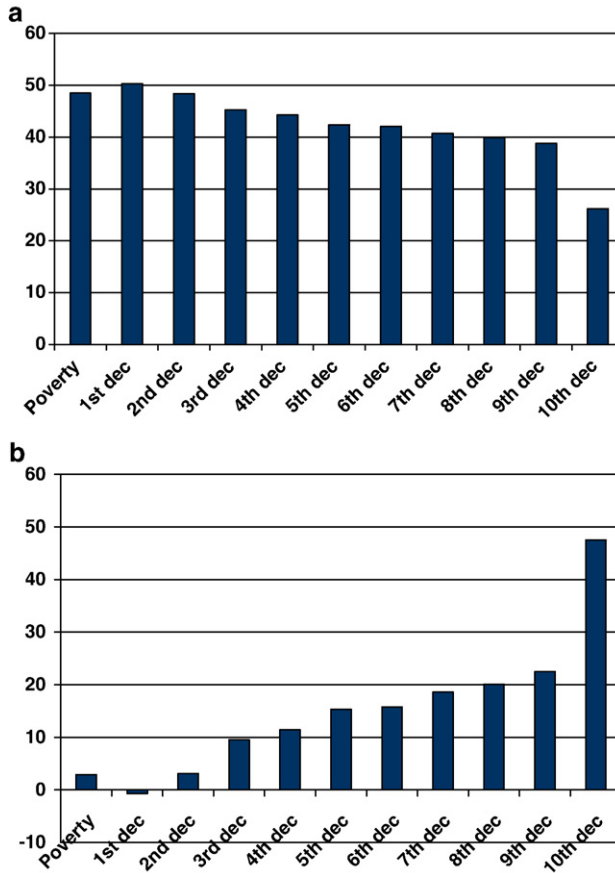


Fig. 2. a. Agricultural production structure by income group in 2003: importable output %. b. Agricultural production structure by income group in 2003: exportable %–importable %.

member of the off-farm rural labor force allocated 36% of his/her time on off-farm activities and earned 56% of the family's income from their work in the non-agricultural sector. Most of the off-farm earnings were in the form of wage earnings; a significant share also was in the form of earnings from family-run microenterprises.

Perhaps not surprisingly the incidence of off-farm employment varies significantly across regions and this is correlated with the wealth/poverty of an area. According to our data, farmers in the east coast earn a larger share of their incomes from off the farm. In contrast, the average farmer in most parts of the western China earned more from agriculture. Because of the large contribution that off-farm employment contributes to total income, income levels in the eastern region are twice as high as those in the west. Income variation among regions also means that the farmer's spending patterns also differ. Hence, the rate of poverty—measured in consumption terms—is higher in the western and central parts of China than in the east.

Our analysis also indicates that agricultural incomes of the poor, prior to China's accession to the WTO, depended more on the production of less competitive advantage commodities than those of the richer households. To show this, we divide the household agricultural production into

Table 7

Analysis from CapSIM modeling showing impacts of WTO and trade liberalization on agricultural production and food consumption (percentage difference between WTO accession/trade liberalization and the baseline), by income categories, 2005 and 2010

	2005		2010	
	Changes in value (yuan)	Percentage change (%)	Changes in value (yuan)	Percentage change (%)
Agricultural output value				
Under int'l poverty line	77	1.7	221	4.4
Importable sector	-138	-6.3	-177	-7.2
Exportable sector	215	9.6	399	15.5
Average farmers	191	2.8	460	5.8
Importable sector	-198	-7.2	-264	-8.5
Exportable sector	389	9.3	723	15.1
Top 10% richest farmers	583	5.3	1205	9.3
Importable sector	-212	-7.5	-304	-9.3
Exportable sector	795	9.7	1509	15.6
Food expenditures				
Under int'l poverty line	25	0.9	76	2.4
Importable sector	-20	-2.3	-21	-2.2
Exportable sector	45	2.4	97	4.4
Average farmers	44	1.1	102	2.3
Importable sector	-16	-2.0	-17	-1.9
Exportable sector	61	1.9	119	3.3
Top 10% richest farmers	62	1.0	134	2.0
Importable sector	-13	-1.5	-12	-1.3
Exportable sector	75	1.4	146	2.6

Notes: The households that are under the international poverty line are all households that have total expenditures less than \$1/day measured in purchasing power parity terms.

2 groups: importable and exportable commodities. Importable commodities are those commodities for which the prices are expected to decline with trade liberalization (or those with NPRs that were positive in 2001); exportable commodities are those for which the prices are expected to rise (or those with NPRs that were negative). Clearly, the results of this analysis shows that as farmers move from higher income categories to lower ones, the share of their output that is from importable commodities (or ones in which the prices will fall after WTO accession) rises. A larger share of agricultural output in richer households, in contrast, comes from exportable commodities (Fig. 2).

It is important to note that the production patterns that we have observed by income category for the nation (that is those that appear in Fig. 2 for the entire nation) do not appear in each region. An analysis of production of different farmers by province reveals some key differences (not shown here for reasons of space considerations). For example, in Shanxi and Jilin, two non-coastal provinces, nearly all farmers (with the exception of the farmers in the richest group) produce more importable commodities. In contrast, farmers in all income categories—both the poorer and richer income groups—in the coastal province of Zhejiang allocate most of their land and production effort to producing exportable commodities. These observations suggest that trade liberalization will have relatively adverse effects on poorer farmers in general since the price of the crops in which they are producing will fall relatively to farmers in richer income categories. However, perhaps even more important is the regional effect. Both non-poor and poor farmers



may gain in many coastal provinces; those in the inland provinces, unfortunately—even those that are not so poor—may be hurt.

### 7.1. Impacts on rural households by income group and by region

According to the analysis, as we saw in the previous section, if China implements its promises for the WTO agreement, the changes in domestic prices will affect both production and consumption of the average rural household; when looking that our simulation analysis by income grouping this finding can be replicated by examining the effect (for all commodities) for the households in the average income category (Table 7, rows 4 and 13). For example, our simulation analysis over the first 5 years of the analysis predicts that agricultural output value of the average household will rise by 2.8% (row 4). During the same period, food expenditures will rise by 1.1% (row 13), albeit at a rate less than the value of production output will increase. Although aggregate food expenditures rise, they do so as a result of increasing food prices; because of this total food consumption falls (not shown). For importable commodities, falling prices increase their consumption. Reductions of expenditure on importable foods mean that the consumers gain from both increases in consumption and declines in prices. For exportable commodities, the consumers lose from the rising prices and decrease their consumption.

Not all farm households, however, benefit equally from China's accession to the WTO. Our results show that in 2005 and 2010, the poor gain much less than the average and richer farmers (Table 7). The agricultural output for the poor increases by 77 yuan per household in 2005 (row 1). At the same time output will be 191 yuan greater for the average farmer and 583 yuan greater for the richest farmers (rows 4 and 7). Even in terms of percentage changes, the rise in agricultural output values for the poor is less than those for the richer. On the other hand, food expenditures increase for all farmers, but in percentage terms the rates of rise are nearly identical in 2005 and fall from rich to poor in 2010 (albeit the differences are small—Table 7, rows 10 to 18).

Although we show that at the national level households in all income groupings gain from trade liberalization, this result does not hold for every province (Table 8). At the national (aggregated) level, the overall impact on production and consumption is small. The main reason is that there are offsetting effects among provinces. But from Table 8, it can be seen that the impacts differ significantly across provinces even for the farmers in the same income categories.

Because trade impacts are more commodity-specific, and because farmers in different income groups in different provinces grow different sets of commodities, we can see that there actually are much sharper regional and income class-specific impacts (Table 8). It also means that such impacts may have implications for equity. In the case of China, while nearly all farmers in many provinces in east and south can be seen to benefit from trade policy, liberalization generally hurts producers in China's western and northern provinces. The reason, of course, is clear when we consider that farmers in western and northern provinces are primarily producing importable commodities, such as maize, wheat, cotton, edible oil, sugar and soybeans. These are precisely the sets of commodities that are most hurt by liberalization.

Interestingly, not all the poor will gain or lose in terms of production with trade liberalization. Our analyses show that the poor in the richer provinces (again in the eastern and southern provinces) gain from trade liberalization, while the poor (and many of the richer farmers) in the western and northern provinces are hurt (Table 8). Therefore, trade liberalization may contribute to poverty alleviation in some parts of China; at the same time it may lead to worse poverty and income distribution problems in other parts of the nation. The other important finding is that the poor will gain less (or lose absolutely more) than the rich in each sector because, despite having

Table 8

CapSIM projections of the impacts of WTO and trade liberalization on per household agricultural output by income category in selected provinces (WTO accession/trade liberalization scenario compared with the baseline), in China, 2005 and 2010

	2005		2010	
	Changes in value (yuan)	Percentage change (%)	Changes in value (yuan)	Percentage change (%)
<b>Zhejiang</b>				
Under int'l poverty	157	6.8	309	11.4
Average farmers	397	7.6	752	12.5
Top 10% richest farmers	951	8.2	1786	13.5
<b>Guangdong</b>				
Under int'l poverty	163	4.4	323	7.7
Average farmers	684	7.6	1348	12.8
Top 10% richest farmers	2936	11.0	5799	17.9
<b>Jilin</b>				
Under int'l poverty	-77	-1.3	61	0.9
Average farmers	-128	-1.2	105	0.9
Top 10% richest farmers	370	1.8	1165	5.0
<b>Jiangxi</b>				
Under int'l poverty	187	4.7	368	8.3
Average farmers	278	4.5	549	8.0
Top 10% richest farmers	476	4.9	913	8.2
<b>Henan</b>				
Under int'l poverty	-7	-0.2	77	1.7
Average farmers	80	1.2	296	3.8
Top 10% richest farmers	818	5.8	1685	10.5
<b>Sichuan</b>				
Under int'l poverty	164	3.8	355	7.2
Average farmers	389	5.9	789	10.6
Top 10% richest farmers	683	7.5	1339	12.7
<b>Ningxia</b>				
Under int'l poverty	42	1.0	166	3.4
Average farmers	-3	0.0	88	0.9
Top 10% richest farmers	-119	-0.7	-238	-1.1
<b>Shaanxi</b>				
Under int'l poverty	27	0.7	123	2.9
Average farmers	101	2.0	280	4.8
Top 10% richest farmers	297	3.5	664	6.7
<b>Guizhou</b>				
Under int'l poverty	138	3.4	317	6.9
Average farmers	270	5.0	565	9.2
Top 10% richest farmers	471	6.8	941	12.0

farms that are of a similar size, their land produces less (or is less productive) than that of farmers in the richer categories. While, in fact, it is unclear if the lower productivity is due to lower quality of land or inability to apply sufficient inputs (or both), it is clear that there is a role of the government in improving the ability of the poor to increase productivity (through more R&D, extension, investment and credit).

The impacts of WTO on food consumption by income group in the selected provinces are shown in Table 9. From the table it can be seen that the effects on rural residents as producers typically are larger than the effects on them as consumers. Moreover, the differences of

Table 9

CapSIM projections of the impacts of WTO and trade liberalization on per household food expenditures by income category in selected provinces (WTO accession/trade liberalization scenario compared with the baseline), in China, 2005 and 2010

	2005		2010	
	Changes in value (yuan)	Percentage change (%)	Changes in value (yuan)	Percentage change (%)
Zhejiang				
Under int'l poverty	65	1.4	133	2.5
Average farmers	88	1.4	170	2.3
Top 10% richest farmers	105	1.1	200	1.8
Guangdong				
Under int'l poverty	67	1.2	141	2.3
Average farmers	123	1.5	243	2.7
Top 10% richest farmers	151	1.4	283	2.4
Jilin				
Under int'l poverty	46	1.5	97	2.8
Average farmers	41	1.3	88	2.6
Top 10% richest farmers	34	0.9	79	2.2
Jiangxi				
Under int'l poverty	32	1.0	70	1.9
Average farmers	47	0.9	98	1.9
Top 10% richest farmers	50	1.0	99	1.8
Henan				
Under int'l poverty	-1	0.0	18	0.7
Average farmers	13	0.4	43	1.3
Top 10% richest farmers	70	1.3	149	2.6
Sichuan				
Under int'l poverty	50	1.4	106	2.7
Average farmers	65	1.6	129	2.9
Top 10% richest farmers	68	1.4	130	2.6
Ningxia				
Under int'l poverty	7	0.2	49	1.4
Average farmers	24	0.7	91	2.4
Top 10% richest farmers	38	1.0	149	3.7
Shaanxi				
Under int'l poverty	-5	-0.3	11	0.4
Average farmers	-1	-0.1	17	0.6
Top 10% richest farmers	2	0.1	22	0.7
Guizhou				
Under int'l poverty	42	1.3	95	2.7
Average farmers	56	1.6	115	3.1
Top 10% richest farmers	64	1.6	126	2.9

consumption impacts among income groups within the same province (Table 9) are much less than those of production impacts (Table 8). Finally, our analysis also shows that the trade effects on commodity types are more important than the region of the country in terms of expenditure impacts.

## 8. Concluding remarks and policy implications

Despite the high level of attention given to China's accession to the WTO, one of our first findings is that, in fact, trade liberalization in China began many years before 2001. In fact, since

the 1980s China made great strides in liberalizing trade. Through nearly 20 years external reform, China's foreign trade regime gradually changed from a highly centralized, planned and import substitution regime to a more decentralized, market-oriented and export promotion regime.

Be that as it may, there was still protection in a number of areas on the eve of China's accession to the WTO. In analyzing the impacts of WTO and future trade liberalization on China's agriculture, we conclude that the positive impacts are more than negative. Although other effects on the rural economy from trade liberalization of other subsectors (such as textiles) may be equally large or even larger, this study's focus on the agricultural sector shows that there will be an impact from agricultural trade liberalization and that the net impact is positive for the average farm household in China.

However, not all households and not all commodities will be treated equally. Our findings on NPRs show that indeed for some agricultural commodities WTO will lead to a fall in prices and a rise in imports. Edible oils, sugar, maize and cotton may be most affected. There are also commodities in which China has considerable comparative advantage—for example, rice, meat and aquaculture commodities and horticulture products. Because of this, WTO and more general trade liberalization could provide benefits to those engaged in the production of exportable commodities. In fact, the ultimate impacts are even more complicated. For example, the prospect of increased imports of feed grains (e.g., maize and soybeans) at lower prices means that livestock producers could become even more competitive.

Our study also shows that as some prices rise and others fall, WTO is encouraging farmers to adjust their agricultural production structure toward more comparative advantage products. In this respect, trade liberalization is pushing the economy to be more efficient. Although in response to the overall rise in food prices, consumers decrease their consumption, with the increased incomes that accompany the shift of farmers to more profitable agricultural products, most of the farming sector likely will be better off (although we do not measure the indirect rise in consumption due to the income effects of higher agricultural profits).

We also demonstrate that although the absolute effects of trade liberalization will not be very large (and, indeed, will be positive), policy makers should be concerned about the poverty and equity effects. We show this through several of our findings. First, according to the analysis, although, on average, farmers at national level will benefit from WTO, it does not hold for all provinces. Average farmers in many less developed provinces in western and northern parts of China will not gain from trade liberalization. The main reason is that the farmers in eastern and southern provinces produce more exportable products, unlike their counterparts in the rest of China. The net impacts on agricultural production of average farmers in several western and northern provinces indeed are negative. Instead of halting all liberalization, we believe the main policy implication is that policy makers need to target those that are being hurt the most with assistance programs and by eliminating the constraints that are keeping them from shifting into more competitive crops.

Second, it also is important to target regionally when thinking about the effects on the poor. While in the nation as a whole, the average poor person will benefit, not all of the poor in each region will gain from trade liberalization. We find that the poor in many provinces in western and northern provinces lose in both agricultural production and consumption.

In the final analysis, of course, it has to be remembered that the impact on agriculture, is only part of the story. Although we do not analyze the non-farm impacts, trade liberalization is expected to also affect the access of households to non-farm employment and the wages they earn for being in the off-farm market. In general, China will gain a lot from trade liberalization. Rising

exports of manufacturing goods will lead to the hiring of a lot of rural labor. In countries, such as China, raising the demand for off-farm labor is probably the most important thing that can happen in the economy. The nation needs to keep promoting policies that facilitate investment and allows rural households to move to these jobs without constraint. Targeting education and health programs to poor areas to allow them to have better access to those jobs is of the utmost importance.

### Appendix A. Key assumptions for CAPSIM model baseline scenario

The baseline scenario assumes that the average annual GDP growth rates in 2001–2005 will reach 8.9% in 2001–2005 and then slightly fall over the entire projection period. The higher growth of GDP in 2001–2005 than that in 1996–2000 is because average annual growth rate already reached 8.7% in 2001–2004 and China's economy is likely to grow at more than 9% in 2005. After 2005, annual growth rate is assumed to decline from 8.9% in 2001–2005 to 8% in the 2006–2010 (Table A1). By 2010, China's economy will be more nearly twice as large as that in 2000, which also implies that China will meet its development goal of doubling its economy in the ten year period between 2001 and 2010.

In this study, we adopt a recent population projection conducted by IASA (Toth et al. 2003). Toth et. al. forecast several population growth scenarios for China in 2001–2030. One of their scenarios, Central Line Scenario, has been adopted in our study. For per capita GDP growth, which is derived by deducting population growth from total GDP growth, the likely growth scenario presents an annual growth rate of 8.2% in 2001–2005. Average annual per capita GDP growth rates will remain at about 7–8% until 2010 (Table A1).

The growth of total GDP and population assumed under this scenario imply that China's per capita GDP in 2000 price will rise from 7 084 yuan in 2000 to 14 974 yuan in 2010 (Table 8). If we apply the official exchange rates in 2000 for base year and current rate for 2010, the per capita GDP will increase from US\$ 856 in 2000 to US\$ 1 849 in 2010. If we further consider the purchasing power parity, the above projection would mean that China's per capita income will be in between almost at the level of a middle-income country in 2020 (World Bank 2003).

On the production side our key assumption is that China will maintain the current rate of increase in supply productivity that it has over the past 25+ years. We assume that productivity will increase by 2% annually during the projections period. This rate of supply increase is similar to the rates used in other models (Martin, 2001; Anderson et al., 2004).

Table A1  
Key baseline assumptions for projection of China's economy in 2001–2010

Annual growth rates	1985–95	1996–2000	2001–2005	2006–2010
GDP	9.7	8.2	8.9	8.0
Per capita GDP	8.3	7.2	8.2	7.4
Population	1.37	0.91	0.72	0.61
Per capita GDP		2000	2005	2010
Yuan (RMB)		7086	10528	14974
USD		856	1300	1849
Population (billion)		1.267	1.308	1.348

Note: Values are in 2000 constant prices.

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