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**Impacts of Trade Liberalization on
Agriculture and Poverty in China**

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Foreword

With a population in excess of one billion and one of the fastest-growing economies in the world, China will without doubt exert enormous future change on the structure of international agricultural and food trade. It is for this reason that the Centre has established a research programme on China's agriculture and trade.

Professor Jikun Huang visited Massey University as a 2005 Venture Trust International Travel Fellow. Professor Huang is one of China's outstanding younger economists. Since graduating PhD in 1990, he has received many awards in China, the latest being the Outstanding Achievement Award for Overseas Returning Chinese (2003). He has been a Policy Advisor to several Chinese government and non-government organisations including The State Council, Ministry of Agriculture and the State Development and Planning Commission. Dr Huang is an extremely active and successful researcher. He has an impressive list of publications, including 40 in international journals and 75 presentations to international conferences since 2000. He also has extensive consulting experience for many international organisations including World Bank, FAO, OECD, ADB and the EU.

This Discussion Paper is based on the public seminar he presented at Massey University.

Allan N Rae
Director

Impacts of Trade Liberalisation on Agriculture and Poverty in China

Jikun Huang, Scott Rozelle, Zhigang Xu, and Ninghui Li

I. Introduction

China's economy has experienced remarkable growth since the economic reform was initiated in the late 1970s, which has led to significant decline in the nation's poverty. The annual growth rate of gross domestic product (GDP) was nearly 9 percent in 1979-2003 (NSBC, 2003a). In the past two and half decades, based on China's official poverty line, more than 230 million Chinese rural residents have escaped poverty, the absolute level of poverty has fallen 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 percent in 1978 to less than 3 percent in 2002.

While economic growth and reduction of rural poverty in the past are impressive, there are still great challenges ahead. The agricultural growth rate has declined since the late 1980s. High 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 do not provide much hope for large gains in area and yield from irrigation expansion. In the future, many have predicted that almost all gains will have to come from new technologies that could significantly improve agricultural productivity (Huang et al., 2002).

The economic growth is accompanied by large income disparities. The income gap among regions, between urban and rural, and among households within the same location has been continually increasing since the mid-1980s (Rozelle, 1996). The rural-to-urban income ratio exceeds 3.4 in 2002 (NSBC, 2003a). Income disparities have risen within rural areas. The rising income disparity in rural areas is indicated by rising Gini coefficients, which increased from 0.24 in 1980 to 0.35 in 2000 and 0.32 in 2001 (NSBC, 2003b).

Trade liberalisation further challenges China's agricultural and rural economy. Agriculture has been at the centre of discussion of China's entry into the WTO, due in part to the vulnerability of parts of the rural economy and in part to the importance of agriculture in the political economy of a number of developed nations with whom China negotiated its accession to the World Trade Organisation (WTO). However, 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 and Estrin 2001; Li et al., 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 et al., 2004; Martin, 2002). In part, the confusion about the ultimate impact of WTO accession on agriculture can be traced to a general lack of understanding of the policy changes that accession will engender (Huang et al., 2004). Perhaps to a greater degree, the lack of clarity of the debate 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 Organisation (WTO) may have significant implications for world trade and China's economy, little empirical work has sought to

answer basic questions about the expected effects of China's entry on the poor. In our previous work (Huang et al., 2003), we showed that, on balance, the nation's accession to WTO helps rural residents and improves incomes. Despite our earlier impact studies that were conducted for 11 rural income groups of farmers in three regions (Western, Central and Eastern China), the analyses are still too aggregated as farmers and agricultural production differ significantly among provinces within the same region.

The overall goals of this paper are to develop a better understanding of China's agriculture and examine the impacts of trade liberalisation on China's agriculture and poverty. While this study focuses on agriculture, it does not mean that the impacts on other sectors are not important. Indeed, several recent studies have shown that the impacts of trade liberalisation on the rest of economy are substantial and have been well documented (Ianchovichina and Martin, 2004; Anderson et al., 2004; Wang, 2003). In this study, the impacts on agriculture are analysed by commodities. Because different provinces and different farmers in the same province produce diverse commodities, we analyse the impacts on households and their implications for poverty through simulation of household production and consumption changes in response to market price changes.

The paper is organised as follows. In the next section, we briefly give an overview of China's trade liberalisation. China's WTO accession and future trade liberalisation are described in the third section. The fourth section describes the methodologies and data used in this study. The results on the impacts of trade liberalisation on China's agriculture and poverty in China's post-WTO era are presented in sections 5 and 6. The final section concludes the study.

II. Foreign Trade Liberalisation Prior to China's WTO Accession

Foreign Exchange Policy

China's open door policy contributed to the rapid growth of its external economy. The expansion of the external economy has become one of the major driving forces of China's economic growth. The growth of trade also results in greater reliance on both domestic and international trade to meet consumer demand.

Historically, the overvaluation of the domestic currency for trade protection purposes reduced agricultural incentives. Real exchange rates remained constant and even appreciated during the 30 years prior to reforms. Tradable commodities in the agricultural sector encountered a high level of state intervention (Huang and Chen, 1999).

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 400 percent. Falling exchange rates increased export competitiveness and have contributed to China's phenomenal export growth record (i.e. non-grain food products) and the spectacular national economic performance of the 1980s.

The situation, however, has changed since the early 1990s. From 1992 to 1997, the real exchange rate appreciated by about 30 percent. Moreover, the pressure to appreciate the RMB (or Chinese yuan) from the major trade partners, particularly the USA, is growing. The Chinese government, however, has insisted on maintaining its

current exchange rate policies as the national leaders consider that a stabilised foreign exchange rate is a key to national economic stabilisation. Meanwhile, China has been accelerating the reform of foreign exchange management through further liberalisation of foreign exchange demand and supply and is considering gradually eliminating export tax rebates in order to avoid sharp increases in its foreign exchange reserve.

Liberalising International Trade

Changes in the exchange rate system occurred at the same time that China also began to liberalise its international trading system. In the initial years, most of the fall in protection came from a reduction in the commodities that were controlled by single desk state traders (Huang and 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 decentralise trade, the moves spurred the export of many agricultural goods. In addition, policy shifts in the 1980s and 1990s also changed the behaviour of state traders. Leaders allowed the state traders to increase imports in the 1980s and 1990s.

Maize and cotton are two major commodities in which liberalisation had been minimal. For example, China used export subsidies in the years prior to its WTO accession to increase exports of maize and cotton. By providing exporters with payments to encourage the export of maize, leaders had increased the protection of domestic producers by raising the price of domestic commodities. During interviews in the field in 2001, we found that maize and cotton exporters respectively received subsidies that averaged 34 percent and 10 percent of their export prices. However, China eliminated export subsidies for cotton in 2002 and maize in early 2004.

Moves to relax rights of access to import and export markets were matched by actions to reduce the taxes that were being assessed at the border. After the fall of restrictions on imports and exports of many of China's agricultural commodities, a new effort began in the early 1990s to reduce the level of formal protection. From 1992 to 1998, the simple average agricultural import tariff fell from 42.2 percent in 1992 to 23.6 percent in 1998 to 21 percent in 2001 (MOFTEC, 2002).

Impacts on Trade

In the same way that trade liberalisation has affected growth in the domestic economy (Lardy, 2001), changes in the external economy have affected the nature of China's trade patterns (Huang and Chen, 1999). Whereas the share of primary (mainly agricultural) products in total exports was over 50 percent in 1980, it fell to only 10 percent in 2002 (NSBC, 2003a). Over the same period, the share of food exports in total exports fell from 17 to 5 percent and the share of food imports fell from 15 to 2 percent.

Disaggregated, crop-specific trade trends show equally sharp shifts and suggest that exports and imports increasingly are moving in a direction that trend toward products in which China has a comparative advantage and therefore have also facilitated the structural changes of its agriculture (Anderson et al., 2004). The net exports of land-intensive bulk commodities, such as grains, oilseeds and sugar crops, have fallen;

exports of higher-valued, more labour-intensive products, such as horticultural and animal (including aquaculture) products, have risen. The proportion of grain exports, which was only around 20 percent of total agricultural exports in the 1990s, is 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 percent of agricultural exports (Huang and Chen, 1999). These trends are even more evident when reorganising the trade data by grouping them on the basis of factor intensity (Figure 1). Figure 1 also shows that trade liberalisation has improved resource allocation and increased the net export situation of China's agricultural sector.

Nominal Protection Rates (NPR)

Nominal protection rate is defined as the percentage difference between the price on the domestic market and the price at the border for the same commodity. NPRs for each commodity were estimated in 2001 when China joined WTO. For those commodities that either they simultaneously import and export significantly or where the difference of import and export is not large in the past decades, we estimated NPRs based on both CIF (imported commodity) and FOB (exported commodity) prices. These include rice, maize, cotton and beef. Because there are differences among major types of any individual agricultural commodity, we weighted to get average NPRs by either their sown area (for crops) or production shares (for meats), and sets of more traditional, by-commodity, aggregate NPRs can be created. Wheat, for example, has an NPR of 15 percent when the individual NPRs are weighted by their area shares. 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 percent above the average CIF price of all types of imported wheat varieties. The results are summarised in Table 1.

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). Maize prices, according to exporters, were more than 30 percent, on average, above world prices. In other words, traders would have lost more than 30 percent of the value of their shipment, if the government did not subsidise the transaction. 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 were not exporting and foreign maize was to come into China, the importer could make, on average, 22 percent.

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 at the port. The average difference between the domestic price and the international price was 17 percent. 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 percent, 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 percent of CIF).

Beside maize, some other commodities such as cotton, edible seeds and sugar were also fairly highly protected in 2001 (Table 1). The distortions for these commodities in the fall of 2001 came from the official tariff rate, value added tax (VAT), and NTBs (for sugar and edible oil seeds).

Our results also show that there are a number of commodities, beside rice, that had negative NPRs in 2001. Vegetable, fruits, pork, and poultry are facing significant non-trade tariff barriers from the rest of the world where they are importing these commodities from China.

III. 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, they make China's WTO accession unique among all other developing countries that have been admitted to the WTO's new environment.

Some of the direct import market access commitments that China has made to WTO members actually do not appear to be substantial. Overall agricultural import tariffs (in terms of its simple average) declined from about 21 percent in 2001 to 17 percent by 2004. A continuance of earlier trends, the simple average agricultural import tariff fell from 42.2 percent in 1992 to 23.6 percent in 1998. 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, one would have to conclude that the commitments are merely an extension of China's past changes. WTO in this way can be thought of as just another step on China's road to opening up its economy.

Except for national strategic products, such as 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 by January 2002; most tariffs will fall even further by 2004. To the extent that tariffs are binding for some of these commodities, the reductions in tariff rates should stimulate new imports.

It is important to note, however, that although published tariff rates will fall on all of these commodities, imports will not necessarily grow summarily. Indeed, China has comparative advantage in many commodities under the single tariff regime. For example, lower tariffs on horticultural products and meats might impact only a small portion of the 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 will not affect producers or traders.

Such movements, however, will almost certainly be (and can legally be) limited for a class of commodities called “national strategic products.” China’s WTO agreement allows officials to manage trade of rice, wheat, maize, edible oils, sugar, cotton and wool with tariff rate quotas (TRQs). These commodities are covered under a special set of institutions. As shown in Table 3, except for sugar (20 percent) and edible oils (9 percent), the in-quota tariff is only 1 percent for rice, wheat, maize, and wool. However, the amount brought in at these tariff levels is restricted. The in-quota volumes, however, are to grow over a three year period (2002 to 2004) at annual rates ranging from 4 percent to 19 percent. China does not have to bring in this quantity, but provisions are in place that there is supposed to be 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.

At the same time, there are still ways theoretically to import these commodities after the TRQ is filled. Most poignantly, tariffs on out-of-quota sales 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 percent for grains and sugar in 2004 and edible oils in 2005) that in the coming years they will not bind (Table 3).¹

After the first four to 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. But China is likely to maintain the TRQ for maize after 2005 though the amount of TRQ will certainly be raised. State trading monopolies also will be phased out for wools after 2004 and gradually disappear for most other agricultural products (Table 3). Although China National Cereals Oil and Foodstuffs Import & Export Co. will continue to play an important role in rice, wheat and maize, there will be an increasing degree of competition from private firms in the importing and exporting of grains in the future.

In its commitments to 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 (most subsidies were used in maize export in 2001) and not to introduce any new 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 percent of the total value of production of agricultural products (compared with 10 percent 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 any such support as part of its aggregate measure of support which should be less than 8.5 percent of agricultural output values).

¹ Although 65% tariff rates seem high, it is important to note that in fact when compared to other countries, this is low. Most Asian countries that have a TRQ system, high tariff bindings are 2 or more times higher than this.

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 measures governing the way that it 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 that countries can use to prove their dumping allegations. 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 behaviour.

IV. Methodology and Data

In order to evaluate the impact of China's WTO accession in 2001-2005 and further trade liberalisation until 2010 on China's agriculture and poverty in China, a quantitative method has been developed based on CCAP's Agricultural Policy Simulation and Projection Model (CAPSiM). CAPSiM was developed out of a need to have a framework for analysing 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 were 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. Income elasticities depend on income level and cross-price elasticities of demand (or supply) depend on food budget shares (or crop area shares). Details of the model description can be found in Huang and Li (2003, in Chinese with updated version) and Huang and Chen (1999, in English in more simple version).

The analysis based on the original CAPSiM framework can only be done at the national level because it was designed to simulate the future effects of policy shifts in China as a whole. We modified the original model 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 liberalisation will have on households in different income groups in the same provinces. Major modifications include the development of the price transmission model (to transmit prices from implicit national market to local or provincial markets) and the household agricultural production and food consumption database by province and income categories.

Two scenarios were formulated. The baseline scenario assumes that China's economy continues to operate during the next 10 years as if there were no trade reform. The alternative scenario, trade liberalisation scenario, assumes that China's NPRs move over the next 10 years to levels that are consistent with its WTO accession agreement in 2001-2005, and remaining import tariffs are cut by half in 2005-2010.

China's regional agricultural production differs largely due to its vast variation of climate and natural resources. For example, rice is the most important crop in

Southern China and accounts for more than half of crop areas in Jiangxi and Hunan, while wheat is the more important crop in the North China plain (e.g., Henan, Shangdong and Hebei) and Northwest China (e.g., Qinhai, Gangsu, and Ningxia), and soybeans dominate in Heilongjiang. Eastern China produces more vegetables and fruits than central and western China.

In order to make the analysis manageable we classify all commodities into 12 crops or crop-groups and 7 livestock-product and fish groups. Presenting the results for all 19 commodities and groups is difficult. To simplify the presentation, we aggregate all commodities into 2 groups: importable and exportable. Exportable commodities are those that have negative NPRs and importable commodities are those have positive NPRs (see Table 1). For beef and poultry that are both exported and imported, we include them in the exportable category.

V. Impacts of Trade Liberalisation on China's Agriculture

According to our analysis, China's WTO accession and further trade liberalisation will have impacts on the prices for nearly all crop and livestock commodities. Compared with the baseline (without WTO accession and any further trade liberalisation after 2001), the prices of most crop commodities decline in the coming decade (Table 4). For vegetable, fruits, meats and fish, however, the prices increase.

While the declining patterns over time for most crops (exceptions are japonica rice, vegetables and fruits) are similar, the extent of price decline due to trade liberalisation varies significantly among commodities (Table 4). For example, for the commodities with small NPRs in 2001, such as indica rice, wheat, coarse grains, soybean and cotton, although trade liberalisation will affect domestic prices, the extent of impacts is much less than those that had higher NPRs in 2001 (e.g., maize, oil crops and sugar crops). Compared with the baseline, China's WTO accession and further trade liberalisation will lower domestic prices of wheat, soybean and cotton by about 2-4% in 2005-2010. The impacts could be as high as 7-20% for maize, oil and sugar crops in the same time period.

On the other hand, trade liberalisation will increase domestic prices of those commodities in which China has comparative advantage in the international market. The expected rise in exports of these commodities increases their domestic prices. For example, we estimate that the prices of vegetables will be about 4-6% higher in the trade liberalisation scenario than the baseline in 2005 and 2010. Over the same period, the prices of pork and poultry will rise even more (by 4-14%, Table 4). A similar pattern will occur in fish prices. Among all animal products, milk is an exception. Its domestic price will decline with trade liberalisation.

Overall, agricultural producer and food prices are projected to rise slightly over the projection period. A Stone price index (where prices of individual commodities are aggregated using weights constructed with value shares) was used to generate aggregated agricultural (crop + meat + fish) output prices, crop output prices and food prices. While the aggregated crop output price level falls by 2.26% in 2005 and 2.18% in 2010 under the trade liberalisation scenario (compared with baseline scenario), overall agricultural prices will rise by 0.48% in 2005 and 1.8% in 2010 though the changes are minimal. That overall agricultural prices do not fall with more

trade liberalisation when the crop output prices do is simply because the prices of most of meats and fish rise with trade liberalisation (Table 4). For aggregated food prices, we estimate a higher rate of increase under the trade liberalisation scenario because some crops with falling prices (e.g., cotton and most maize) are not consumed as food. Compared with the baseline scenario, overall food prices with trade liberalisation will rise by 2.36% in 2005 and 4.37% in 2010.

The shift in prices due to trade liberalisation means that the incentives for agricultural producers will change, but unlike sector-wide policies, trade liberalisation policies are unique in that they frequently change the relative prices of domestic agricultural commodities because the impacts of trade policy differ among commodities. In general, trade liberalisation 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 can lead to different impacts, sometimes negative and sometimes positive. Moreover, because most of the commodities are competing for domestic resources, such as land, labour and capital, cross-commodity substitutions could result from a policy targeting one commodity having an effect on another.

Table 5 presents the results of our simulations on the impacts of China's WTO accession and further trade liberalisation on agricultural production in 2005 and 2010. The analyses show that trade liberalisation will affect domestic production moderately. The signs of impacts due to trade liberalisation are 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 those commodities in which China has comparative advantage such as rice, vegetable, fruits, meat and fish (Table 5). Increased prices of these commodities due to trade liberalisation will generally stimulate their domestic production.

It is worth noting that not all commodities with higher prices will exhibit increases in domestic production. The production impacts are associated with both own-price and cross-price substitution impacts. Soybean, a crop that had been liberalised before China's WTO accession in 2001, is an interesting case for understanding the impact of trade liberalisation. Liberalisation of soybean had led to a substantial increase of imports and declines in domestic price and production prior to China's WTO accession. Imports reached more than 15 million tons to a level similar to domestic production at the time China joined WTO. While further trade liberalisation after China's WTO accession will reduce soybean price marginally (Table 5), the decline in soybean price is so small that the impact of its own price is less than the impacts due to changes in the prices of substitute commodities such as vegetable, fruits, rice and some coarse grains, and changes in input prices (e.g., fertiliser and pesticide) in the post-WTO era.

As there are both positive and negative impacts of trade liberalisation on China's agriculture, we estimate overall positive impacts for the whole agricultural sector for average farmers (Table 6). When examining the overall effects of trade on agricultural production, several facts become clear. In contrast to some of the commodity-specific effects that were presented above, the overall effects of China's WTO accession and further trade liberalisation are positive. According to our analysis, agricultural output value for the average farm will rise 191 yuan (about 46 yuan or US\$ 5.6 per person),

accounting 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 household's agricultural output values. These results are consistent with other studies that applied the general equilibrium models such as GTAP, the Global Trade Analysis Project (Hertel, 1997), which showed that the impacts of China's WTO accession on its agricultural output range from 4% to 6% (Ianchovichina and Martin, 2004; Anderson et al., 2004; Wang, 2003; van Tongeren and Huang, 2004). About 20-30% of the benefit is due to the rise in prices and the other 70-80% is due to the growth in real output through changes in production patterns—from less comparative advantage agricultural products to more comparative advantage ones.

The importance of accounting for production responses to changing prices can be seen by noting the rise in overall production that occurs when imports rise and exports expand. Facing the price shifts, producers in China according to our simulation will 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 will have occurred that overall agricultural output ends up rising. By 2005, while output value of importable products will decline by 7.2% under the trade liberalisation scenario (compared with the baseline scenario), exportable products will rise by 9.3% (the 2nd column, Table 6).

Between 2005 and 2010, the fifth and tenth years after the implementation of WTO accession, the rate of rise of household's agricultural output accelerates (Table 6, columns 3 and 4). Because liberalisation 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 continues to increase under a more liberalised trade environment in 2005-2010. However, because we have not accounted for the increased production output values that occur due to the higher inputs, increases in agricultural output values should not be considered as 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, 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%—as increased profits).

Our simulations show that per capita food consumption of importable commodities rises as their prices fall with trade liberalisation, while per capita food consumption of the exportable commodities will decline. The large impacts are found in edible oils, sugar, vegetables, fruits, livestock products and fish. The overall effects of trade liberalisation on food expenditures for average rural households are summarised in Table 6. Compared with production impacts, the overall effects of China's WTO accession on food consumption are more modest (4-6th rows, Table 6). By 2005, total household food expenditure will be 1.1% higher in the trade liberalisation scenario than that under the baseline. The impact will rise to 2.3% in 2010.

Because overall food prices change with trade liberalisation, to examine the impacts of trade liberalisation on food consumption, we need to compare the food expenditure share changes with the overall food price changes in the projection period. Because aggregate food prices will rise by 2.36% in 2005 and 4.37% in 2010 under the trade liberalisation scenario (compared with the baseline scenario), these imply that

increases in food expenditure due to trade liberalisation are all from the rise in food prices. Real food consumption at constant prices indeed will decline by about 1% in 2005 and 2% in 2010 due to trade liberalisation.

Baseline projections show that self-sufficiency of all land-intensive crops except for rice will fall in the coming decade, and the trade liberalisation will further lower the self-sufficiency levels of these commodities (Table 6). Under the trade liberalisation scenario, cereal imports will rise from 3 million tons in 2001 to 41 million tons in 2010. Most of the imports are feed grain. Although exports (mainly rice) will also increase, net imports will reach 32 million in 2010, accounting for about 7% of domestic consumption. In other words, the self-sufficiency level of cereals will fall from 101% in 2001 to 93% by 2010, which would be 96% if China were not a member of WTO in 2001-2010 (Table 7).

The self-sufficiency levels of other land-intensive crops such as oil and sugar crops will fall even more than those of cereal crops. The imports of edible oils will account for 31% (100%-69%, Table 7) of domestic consumption under the trade liberalisation scenario in 2010, about 20% (89%-69%) higher than that under the baseline scenario. By 2010, China will also have to import nearly 30% of its sugar from the world market.

On the other hand, China can benefit substantially from trade liberalisation for rice and labour-intensive products such as vegetables, fruits, meats and fish. Self-sufficiency of rice will be improved by 4% with its WTO membership (107-103%, Table 7). China can export 5-6% of its horticultural products to international markets, compared to the baseline of nearly zero net export. Export expansion of meat and fish products will be even larger than in horticulture.

In sum, while grain self-sufficiency levels will fall with trade liberalisation, food grain (excluding feed grain) and overall food self-sufficiency will rise. Trade liberalisation will facilitate China's agricultural diversification and transformation of China's agriculture from less comparative advantage sectors to more comparative advantage ones.

VI. Impacts of Trade Liberalisation on China's Rural Households and Poverty

Characteristics of Rural Households

Because all rural households have access to land, the size of farm in China is small by international standards. For the nation as a whole, the average size of farm is 7.9 mu, or 0.53 hectare (15 mu = 1 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 increases in rural labour productivity and household income, however, will require more than income from the average farm in China. As a result, farm households need to find employment in the off-farm sector. In fact, this is what has been happening in rural China since the early 1980s (deBrauw et al., 2002). By 2003, the average farmer allocated 35.6 percent of his/her time to off-farm activities and

earned 56 percent of the family's income from the non-agricultural sector. Most of the off-farm earnings were in the form of wages.

There is significant regional variation in economic activities, sources of income and patterns of spending. Income levels in the eastern region are twice as high as those in the west. The average farmer in most of the west earned more from agriculture than other sources. Income variation among regions also means that the patterns of spending by farmers also differ. Poverty incidence is higher in the west and centre than in the east.

Our analyses also indicate that agricultural income of the poor depends more on the less competitive commodities than that of the richer groups. To show this, we divide household agricultural production into 2 groups: importable and exportable commodities. Prices for importable commodities will decline with trade liberalisation, while prices will rise for the exportable commodities (or their NPRs were negative in 2001, see previous section for detail). The results of this analysis are presented in Figure 2a-b, which show that as farmers move from the lower income categories to the higher ones, the shares of their importable commodity output in total production declines or exportable increases.

Production patterns that we have observed by income category for the nation (Figure 2) do not appear in each region. Careful analysis of production of different farmers by province reveals some key differences. For example, in Shanxi and Jilin, nearly all farmers (except the richest) produce more commodities in which China has less comparative advantage, while farmers in all categories regardless of poor or richer in Zhejiang province produce products for which prices will rise with trade liberalisation. These results suggest that future trade liberalisation will affect poor farmers in the poor areas since it will invariably lead to lower prices of the products they are highly reliant on. On the other hand, both poor and non-poor farmers may gain equally in many coastal and southern provinces with China's WTO membership.

Impacts on Rural Households by Income Group and by Region

According to the analysis, if China implements its promises for the WTO agreement, the changes in domestic prices will affect both production and consumption of all rural households (Table 8). As discussed above, our simulation analysis predicts that, after five years for the average farm, agricultural output value will rise 2.8% (4th row, Table 8). During the same period, food expenditures will rise by 1.1% (13th row), albeit at a rate less than the production output value increase. Aggregate food expenditures also rise as the result of overall food price increase and reduction of total food consumption. For importable commodities, falling prices increase their consumption. Reduction of expenditure on importable foods means that consumers gain from both increased consumption and the decline in price. For exportable commodities consumers lose from rising prices.

Not all farm households, however, benefit equally from China's trade liberalisation. Our results show that in 2005 and 2010, the poor gain much less than the average and richer farmers. Agricultural output values for the poor will increase by 77 yuan per household in 2005, while they will be 191 yuan for the average farmer and 583 yuan for the top 10% richest farmers (1st column, Table 8). Even in percentage changes, the rise in agricultural output values for the poor is less than those for the richer. On the other

hand, food expenditure increases 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 a very small difference).

Despite the gains from trade liberalisation for average farmers in each group at the national level, farmers in western and northern China are negatively affected. Indeed the gains we estimated for China as a whole are mainly due to the positive effects that occur in southern and coastal provinces. Agricultural output value per household will decline as much as 100-340 yuan (or 1-4.5% of output) in Northwest and Northeast China, while it will increase 100-500 yuan (1-8%) in southern China (Table 9). This is not surprising as the production patterns differ significantly across regions. The provinces with positive effects from trade liberalisations are those that produce more exportable commodities than importable commodities (Table 9).

At the national level, we show that average farmers, including the poor, will gain from trade liberalisation. However, this result does not hold for every province (Table 10). From Table 8 we see that at the national aggregate level, the overall impact is small. The main reason is that there are offsetting effects among provinces. But from Table 10, the impacts differ significantly across provinces even for farmers in the same income categories.

Because trade impacts are commodity-specific, and because farmers in different income groups in different provinces grow different sets of commodities, there are sharp regional and income class-specific impacts (Table 10). This also means that they affect equity. While nearly all farmers in many provinces in the east and south will benefit from trade policy, liberalisation will hurt producers in the west and north primarily because the region is the largest producer of maize, wheat, cotton, edible oil, sugar and soybean, the sets of commodities that are most hurt by trade liberalisation.

Interestingly, not all of the poor will gain or lose income with trade liberalisation. Our analyses show that the poor in the rich areas (again in the south and east) gain from trade liberalisation, while the poor in the poor areas (west and north) are hurt (Table 10). Therefore, trade liberalisation may contribute to poverty alleviation in some parts of China, but it may worsen income distribution in other parts of the nation. Another important finding is that the poor will gain (or lose less) than the rich for each sector because despite having farms that are of a similar size, their land produces less than that of the richer producers. It could be that lower production is due to inferior land and climate resources. It could also be that poorer producers have access to fewer inputs. If so, the clear policy implications are that the government needs to provide ways for farmers to access better technology, water control and credit.

The impacts of trade liberalisation on food consumption by income group in the selected provinces are shown in Table 11. Several observations can be made from these results. First, the effect on rural residents as producers typically is larger than the effect on them as consumers. Production shifts (both positive and negative) are larger than shifts in expenditures because, while the rural resident as producer enjoys (suffers) all of the gain (loss) from the price rise (fall), the rural resident as consumer only is affected marginally since much of the output is sold to consumers in the city. Second, the difference in consumption impacts among income groups within the same province (Table 11) is much less than those of production impacts (Table 10). This is

explained by the fact that variation in consumption patterns among income groups is much less than the variation in production patterns.

Finally, our analysis also shows that the trade effects on commodity type are more important than the region of the country in terms of expenditure impacts (Table 11). In other words, when examining our results by province, we find that there are only slight differences among provinces. Evidently, because markets are fairly well integrated, all consumers in China consume a basket of goods that is fairly similar, but production baskets differ greatly. The farm households in the north and west of the country obviously produce a product mix that will be hurt more by trade liberalisation.

VII. Concluding Remarks and Policy Implications

China's trade liberalisation has progressed smoothly since the late 1980s. Through nearly 20 years of external reform, China's foreign trade regime has gradually changed from a highly centralised, planned and import substitution regime to a more decentralised, market-oriented and export promotion regime.

Although the effects of China's WTO accession and further trade liberalisation on the rural economy from other sub-sectors may be equally large or even larger in its post-WTO era, this study's focus on the agricultural sector showed that there will be an impact and the net impacts are positive for average farmers in China. Our findings on the NPRs show that for some agricultural commodities WTO accession 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 – e.g., japonica rice, meats, and horticulture products-- and, hence, WTO accession could provide benefits to those engaged in these activities. 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, the trade liberalisation is encouraging farmers to adjust their agricultural production structure toward more comparative advantage products. In response to an overall food price rise, consumers decrease their consumption. However, 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 demonstrate that although the absolute effects of trade liberalisation will not be very large, policy makers should be concerned about the poverty and equity effects. We show this through several findings. First, although on average farmers at the national level will benefit from trade liberalisation, it does not hold for all provinces. Farmers in many less developed provinces in the west and north will not gain from trade liberalisation. The main reason is that farmers in the east and south produce more products in which China has comparative advantage. The net impacts on agricultural production of average farmers in several west and north provinces indeed are negative. Second, while for the nation as a whole the poor will benefit, not all of the poor in each region will gain from trade liberalisation. We find that the poor in many provinces in the west and north will lose in agricultural production (income).

Third, in nearly all provinces where there are gains, the richer will gain more than the poor. The main reason for the advantage of rich farmers in the same province is that the rich farmers produce higher yields for the same commodity and more output (e.g., more horticulture, meats and fish).

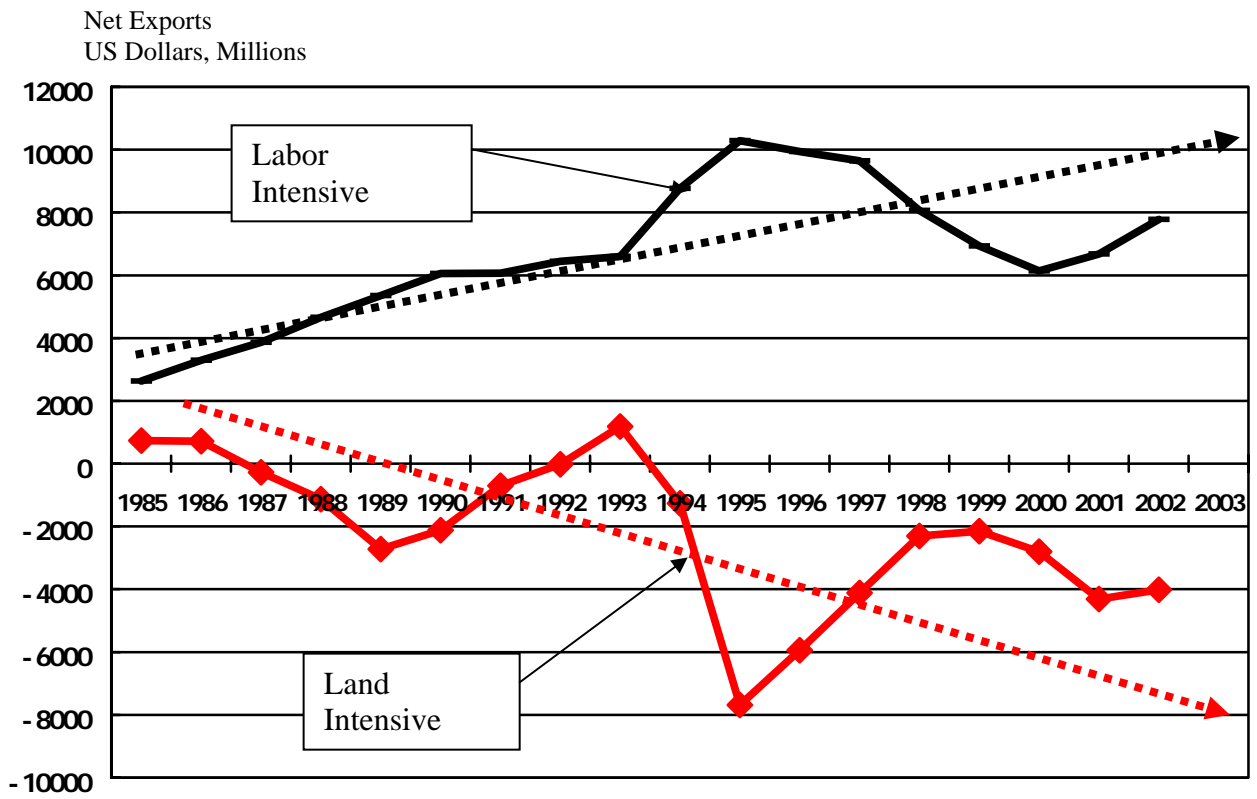
As a consequence of equity issues, policy makers need to take one of two actions. First, they need to try to encourage farmers in poorer, inland areas to shift their production (where appropriate) to more competitive crops. Second, officials may also need to take other, non-trade actions to increase the livelihood of farmers in these areas. In many areas, farmers do not have profitable opportunities in any farming activity. In such areas rural education, better communications and other policies that facilitate their shift into the non-farm sector may be the most beneficial policy.

The impact on agriculture, however, is only part of the story. Although we do not analyse the non-farm impacts, trade liberalisation is expected to also affect the access of households to non-farm employment and the wage they earn for being in the off-farm market. In general, China will gain a lot from trade liberalisation. Rising exports of manufacturing goods will need a lot of rural labour. In a country like China, raising the demand for off-farm labour 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 constraints.

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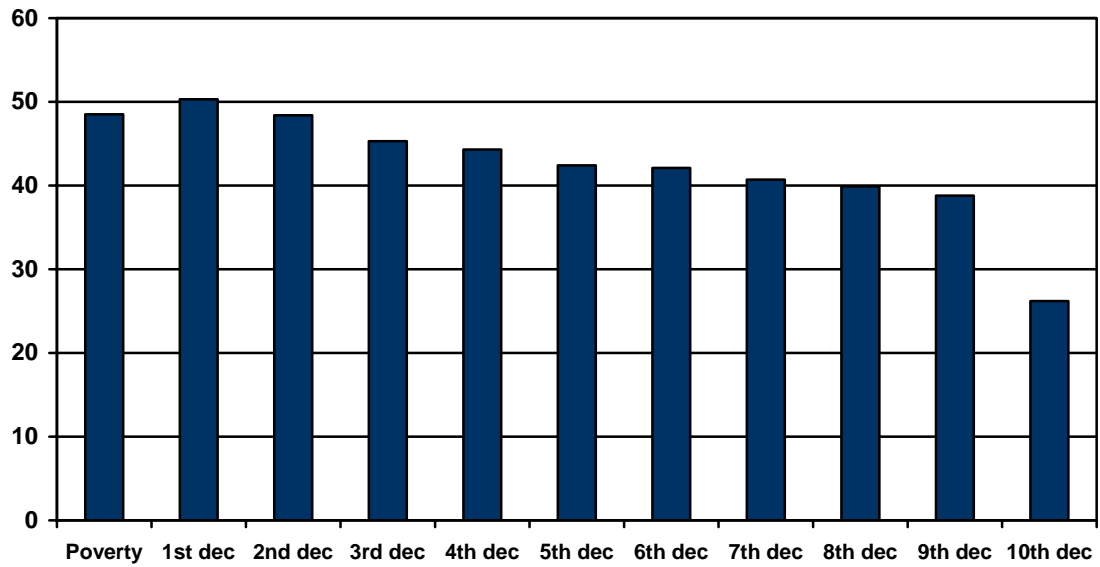
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Source: Data are from various publications of China's National Statistical Bureau and China's Custom Authority. Land intensity products include grain, oils, sugar and cotton and wools; Labor intensity products include livestock, fish, horticulture and beverages.

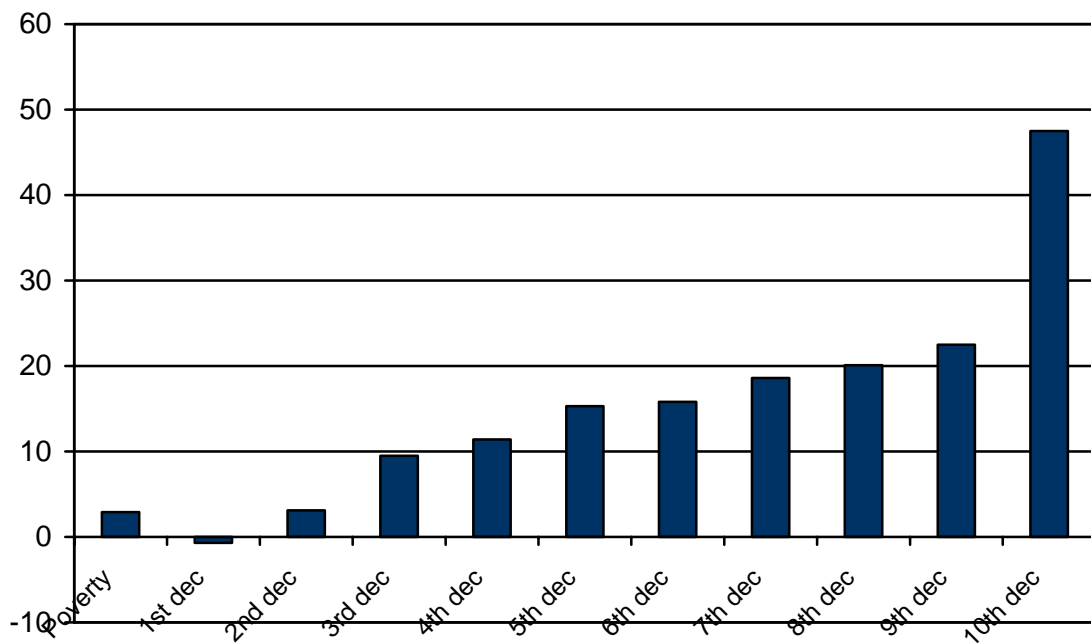
Figure 1. Agricultural trade balance by factor Intensity (mil US\$), 1985-2003

Figure 2a. Agricultural production structure by income group in 2003:
Importable output %



Source: NSBC, Rural Income and Expenditure Survey, 2004.

Figure 2b. Agricultural production structure by income group in 2003:
Exportable% - importable %



Source: NSBC, Rural Income and Expenditure Survey, 2004.

Table 1. NPRs and sources of policy distortion in China, 2001.

	Import tariff equivalent				Export subsidy equivalent			
	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

Source: Huang et al. (2004) and the authors' estimation.

Table 2. Import tariff rates on major agricultural products subject to tariff-only protection in China.

	Actual tariff rates in 2001	Effective as of 1 January	
		2002	2004
Barley	114 (3) ^a	3	3
Soybean	3 ^b	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

a: Barley was subjected to licence and import quota, the tariff rate was 3% for import within the quota and no above-quota barley with 114% tariff was imported in 2001.

b: Tariff rate was as high as 114% before 2000 and lowered to 3% in after the early of 2000.

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

Table 3. Tariff Rate Quota of agricultural products.

	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

Table 4. Impacts of China's WTO accession and further trade liberalisation on agricultural output prices, percentage compared with the baseline, 2005-2010.

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

Table 5. Impacts of China's WTO accession and further trade liberalisation on agricultural production, percentage change compared with the baseline, 2005-2010.

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

Table 6. Impacts of China's WTO accession and further trade liberalisation on agricultural output value and food consumption expenditure for average farm household in China, compared with the baseline, in 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. Exportable sector include rice, vegetable, fruits, all meats and fish.

Table 7. Self-sufficiency under the baseline and trade liberalisation scenarios in 2005 and 2010.

Commodity	2001	2010	
		Baseline	Trade liberalisation
Cereal Crops	101	96	93
Rice	101	103	107
Wheat	100	97	96
Maize	105	90	80
Soybean	53	49	47
Oil crops	83	89	69
Sugar crops	89	80	71
Vegetable	101	100	105
Fruits	100	99	106

Table 8. Impacts of China's WTO accession and further trade liberalisation on per household food expenditure by income category in China, compared with the baseline, in 2005 and 2010.

	2005		2010	
	Changes in value (yuan)	Percentage change (%)	Changes in value (yuan)	Percentage change (%)
Agricultural output value				
Under int'l poverty	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 consumption				
Under int'l poverty	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

Table 9. Agricultural production structure, importable and exportable shares (%), by province in China in 2001.

	Agricultural sector			Crop sub-sector		
	Importable	Exportable	Net exportable	Rice	Horticulture	Importable
Tibet	88	12	-75	0	1	99
Xinjiang	72	28	-44	2	9	90
Gansu	67	33	-35	0	3	97
Inner Mongolia	66	34	-31	2	3	96
Heilongjiang	65	35	-30	12	3	86
Hebei	63	37	-27	1	4	95
Jilin	60	40	-20	14	4	82
Shanxi	57	43	-13	0	6	94
Henan	56	44	-13	4	5	91
Qinghai	56	44	-12	0	2	98
Ningxia	53	47	-7	7	8	86
Shandong	53	47	-6	0	18	81
Shaanxi	48	52	3	2	7	91
Anhui	41	59	18	29	8	63
Liaoning	40	60	19	14	8	78
Tianjin	39	61	23	0	1	99
Beijing	31	69	37	1	13	87
Hubei	31	69	37	38	7	55
Yunnan	30	70	40	25	9	66
Jiangsu	28	72	45	33	11	56
Guizhou	27	73	45	23	12	65
Chongqing	24	76	51	30	21	49
Sichuan	24	76	51	25	14	61
Guangxi	23	77	54	51	9	40
Jiangxi	10	90	79	77	8	15
Hunan	10	90	79	70	9	21
Hainan	10	90	80	62	14	24
Shanghai	9	91	81	56	17	27
Guangdong	8	92	85	64	21	15
Zhejiang	4	96	91	34	58	8
Fujian	3	97	93	70	14	16
National	40	60	19	18	8	74

Source: Computed by the authors based on the rural household income and expenditure survey conducted by National Statistical Bureau of China.

Table 10. Impacts of China's WTO accession and further trade liberalisation on per household agricultural output value by income category in the selected provinces, compared with the baseline, in 2005 and 2010.

	2005		2010	
	Changes in	Percentage	Changes in	Percentage
	value (yuan)	change (%)	value (yuan)	change (%)
Zhejiang				
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
Guangdong				
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
Jilin				
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
Jiangxi				
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
Henan				
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
Sichuan				
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
Ningxia				
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
Shaanxi				
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
Guizhou				
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

Table 11. Impacts of China's WTO accession and further trade liberalisation on per household food expenditure by income category in the selected provinces, compared with the baseline, in 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