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ABSTRACT

Will China's WTO Accession Worsen Rural Poverty?*

Many fear China's accession to WTO will impoverish its farmers, via greater import competition in its agricultural markets. We explore that possibility bearing in mind that, even if producer prices of some (land-intensive) farm products fall, prices of other (labour-intensive) farm and non-farm products could rise. New estimates, from the global, economy-wide numerical simulation model known as GTAP, of the likely changes in agricultural and other product prices as a result of WTO accession are drawn on to examine empirically the real income implications of China's WTO accession. The results suggest farm/non-farm income inequality may well rise within China but rural-urban income inequality need not. The Paper concludes with some policy suggestions for alleviating any pockets of farm household poverty that may emerge as a result of WTO accession.

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Will China's WTO Accession Worsen Rural Poverty? *

After fifteen years of negotiations, China acceded to the WTO at the end of 2001. During those negotiations, China was continually opening up and reforming its economy, and further reforms will be introduced over the next few years to fulfill the legal obligations China has committed to in its WTO Protocol of Accession (WTO 2001). Such reform necessarily involves structural adjustments by households, firms and bureaucracies, and while the economy as a whole can gain substantially from those adjustments, losses and even hardship can result for some households unless complementary domestic policies are in place to facilitate adjustment and/or compensate losers. That underscores the importance of first analyzing the likely distributional consequences of the reforms themselves, and then considering what complementary policies are needed to provide adequate safety nets for potential losers. Of particular concern in China's case is that the reforms may cause farm incomes to fall, exacerbating the rise since the mid-1980s in farm-nonfarm and inland-coastal aggregate income inequality and possibly reversing the decline since the late 1970s in rural poverty (reported in Kanbur and Zhang 2001).

The policy changes still to be made to fulfill its WTO obligations include major changes in China's farm trade policies by 2005 – protection cuts that appear far greater, and faster, than any other developing country was required to commit to in the Uruguay Round Agreement on Agriculture. With one-quarter of rural households in China living on less than \$1 a day in 1999

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(c.f. 1 per cent of urban households) such that more than three-quarters of all poor Chinese people live in rural areas (Chen 2003), concerns about the impact of WTO accession on rural poverty are understandable. However, while imports of numerous land-intensive farm products may well increase, reduced protectionism may also boost output and exports of some labor-intensive farm products in which China still has a comparative advantage.² In addition, farm households will be affected indirectly by many of the other commitments China has made in its WTO Accession Protocol. Especially important will be the arrangements for phasing out the ‘voluntary’ export restraints on China’s textile and clothing trade, and the reductions in protection of the motor vehicles and parts industry. Those changes, together with the promised increase in a wide range of agricultural imports, will allow China to exploit more fully its strong comparative advantage in unskilled labor-intensive products – both farm and non-farm.

To assess the impact on farmer incomes and on rural areas of the remaining reforms required to meet China’s commitments to the WTO membership, this paper provides some indication of the likely effects on different factor markets and hence on the welfare of different types of farm households of the reforms to be implemented between 2002 and 2007. Even the direction, let alone the magnitude, of some of the effects cannot be discerned from theory (McCulloch, Winters and Cirera 2001), so we use the numerical simulation model known as GTAP to address these issues. The experimental design goes beyond previous studies (see the

² The difficulties China has had in exporting food products to, for example, Japan, Korea and the United Kingdom in recent years because of those countries’ quarantine/SPS measures should ease following WTO accession, or at least be challengeable under WTO Dispute Settlement provisions. Since those measures are notoriously difficult to predict, they are ignored in our empirical analysis (as are prospective changes to other non-tariff measures that may limit China’s access to foreign markets for farm or non-farm products). So too is the possibility that China itself may use quarantine measures to limit its imports of farm products.

survey by Gilbert and Wahl 2002) in several respects: it focuses just on the liberalization required to meet China's WTO accession commitments from 2002 (by projecting the GTAP database to 2001 with China's prior reforms and all countries' Uruguay Round commitments implemented); it incorporates new estimates of nominal rates of agricultural protection as of 2001 and at the end of accession; it takes account of existing duty drawbacks so as not to overstate the extent of reform; it binds the government budget by adding a uniform consumption tax to offset the loss of tariff revenue; it takes account of differences between farm and non-farm unskilled labour; and it examines the real income effects on different types of farm households. The paper concludes by drawing out implications for Chinese policy makers wishing to pre-empt any increases in food insecurity or rural poverty.

The setting: recent and prospective policies affecting rural areas

As in most developing countries,³ agriculture in China was squeezed at early stages of industrialization with gross fiscal contributions to the sector being more than outweighed by implicit taxation in the form of depressed prices for farm products, neglect of public infrastructure in rural relative to urban areas, and capital outflows via the financial system (Huang and Ma 1998). More recently policies have favored some agricultural industries, while others remain discouraged. As a result, nominal rates of agricultural protection in China (the percentage by which domestic prices exceed prices at the country's border) are both positive and negative.

Table 1, which shows new estimates by Huang, Rozelle and Chang (2004) of nominal protection rates for key agricultural commodities, suggests rice, meat, fish and fruit and

³ See Sah and Stiglitz (1992) and Anderson (1995).

vegetables have been priced at less than border prices recently while other grains, oilseeds, sugar, cotton and milk have been priced at one-fifth to two-fifths above border prices. Maize and cotton also enjoyed export subsidies in 2001 (amounting to one-third and one-tenth of f.o.b. prices, respectively). That table also shows what China has committed to in its WTO Protocol of Accession: tariff rate quota will apply to grains, sugar and cotton for which out-of-quota tariffs are quite high, but otherwise, after the phase-in period, the tariffs range between just 1 and 15 per cent – representing substantial liberalizations over 2001 levels. As well, producers of major crops may continue to be affected by commodity-specific policies of government procurement of a portion of the crop at lower than market prices (as in the past – see Sicular 1988) or at higher than market prices (as in 1998 – see Huang 1998).

What will those reforms mean for agricultural trade? Many analysts have been expecting China to become ever-more dependent on agricultural imports in the course of the economy's rapid industrialization over the past two-plus decades. Some extremists (e.g., Brown 1995) have even suggested China could seriously deprive other developing countries of food. Yet net food import growth has not yet happened, at least not in a sustained way, and China has continued to be a net exporter of meat, fish, fruit and vegetables. Indeed on occasions in the latter 1990s, China also was a net exporter of grain and cotton. How much of that is due to government policies that constrained domestic demand, including occasional export subsidies, is a moot point.

In its WTO Protocol of Accession (WTO 2001), China has agreed to have no agricultural export subsidies, and to limit its domestic support to farmers to 8.5 per cent of the value of production (compared with 10 per cent for other developing countries). The import market access commitments China has made to WTO members look substantial on paper. Tariff rate

quotas will be retained only on wheat, rice, maize, edible oils, sugar, cotton and wool, domestic production of which in aggregate comprises only about one-sixth of China's agricultural GDP. The quota volumes are to grow over the next three years at annual rates ranging from 5 to 19 per cent. A further commitment by China is that monopolies previously held by state trading enterprises will be weakened (except for tobacco): even though some state trading enterprises will continue to operate, there will be some competition from private firms in the importing and exporting of farm products, at least within the tariff-rate-quotas.

Farmers and the rural sector more broadly will be affected also by China's commitment to provide improved and WTO-bound market access for industrial products. Mineral and manufacturing tariffs will be bound and generally reduced on a broad basis, with many tariffs falling to 10% or less. Tariffs will be cut on accession and further cuts will be phased in by 2005 (with just a few exceptions). Furthermore, for industrial products, China will reduce significantly its non-tariff measures and eliminate all quotas, tendering and import licensing on non-farm merchandise by no later than 2005. Quotas on Chinese imports of automobiles and parts will grow by 15% annually from a level of around US\$6 billion in 2000, and these quotas will be eliminated by 2005. For textiles and clothing, however, the current 'voluntary' export restraints will be phased out by end-2004 (although importing countries will be able to re-impose quotas under a special textile safeguard mechanism until the end of 2008). Commitments to open up services markets in China also have been made.

Over the 1990s the average scheduled tariff rates for manufacturing initially exceeded but fell more than for agriculture, and by 2010 the manufacturing average will be well below that for agriculture (a simple average of 9 per cent, versus 16 per cent for agriculture – see WTO 2003, Appendix Table IIB). That does not give a true indication of the extent of change in protection

that is taking place, though, because in the 1990s many manufactures have been entering China at reduced or zero tariffs via duty drawbacks, to encourage foreign investment in processing of imported intermediate goods for subsequent export. Some agricultural products also have entered at less than the scheduled rate, including through smuggling.

What all this means for incentives for each industry is difficult to discern precisely, but it provides better information than has been available to date for analyzing empirically the economic effects of the reforms associated with China's WTO accession, including the impact on factor rewards and consumer prices from which inferences about real income distributional effects can be made.

Applying the GTAP model

Version 5 of the computable general equilibrium model of the global economy known as GTAP is used here.⁴ Being an economy-wide model, GTAP describes both the vertical and horizontal linkages between all product markets within the model's individual countries and regions as well as between countries and regions via their bilateral trade flows. For present purposes the 1997 data base is aggregated to 25 sectors and 20 regions and projected forward first to 2001 and then to 2007, using World Bank projections of population, income, and endowments of productive factors (agricultural land, other natural resources, unskilled labor, skilled labor, and other capital). The initial base case assumes China retains its protection policies as of 1995 and Taiwan

⁴ The GTAP (Global Trade Analysis Project) model is a multi-regional, static, applied general equilibrium model based on neo-classical microeconomic theory including full employment of all factors of production, constant returns to scale and perfect competition. For a discussion of the prospect of greater unemployment during the accession period, see Zhai and Wang (2002). The numeraire is the world price of exports. See Hertel (1997) for comprehensive documentation. The Version 5 data base is described at www.gtap.org.

retains its protection as of 1997, but that all other countries fully implement their Uruguay Round obligations on schedule before 2005. China's trade policy changes between 1995 and 2001 are assumed to have been in anticipation of the requirements of, and hence part of, China's WTO accession. These are analyzed in detail in Ianchovichina and Martin (2004), together with the effects of implementing over the next few years the remainder of China's commitments as recorded in its WTO Protocol of Accession.⁵ In this paper we focus on just the additional reform commitments to be implemented after 2001 (relative to the revised base case in which China's reforms only up to 2001 are in place and there are no further reforms to 2007). For key agricultural import policies these remaining reform commitments are assumed to shift nominal rates of protection (NRPs) from column 3 to column 6 of Table 1. As well, the export subsidies in place in 2001 (34 per cent for maize, 10 per cent for cotton) are eliminated, and we assume no new farm production subsidies are introduced.⁶ The choices of new agricultural NRPs fall into three categories: no change if they were negative in 2001 (rice, meats, vegetables and fruits), a move to part-way between the in-quota and out-of-quota tariffs if the TRQs bite (wheat, coarse

⁵ A particularly important feature of their analysis is the inclusion of China's duty exemptions in the base scenario, because otherwise the model would overstate the gains from tariff reductions. Tariff cuts are from 2001 applied rates to post-accession bound rates (or zero if the latter exceed the former). In this application the aggregate trade balance and government tax revenue are both assumed to remain a fixed share of GDP. The 2001 trade data are from the UN's COMTRADE database, and the 2001 applied tariffs for China are from CDS Consulting Co. (2002).

⁶ Three non-farm reforms of importance are worthy of mention. The 'voluntary' export restraint on China's textile and clothing exports to the U.S. and EU, expressed in the base scenario as taxes on those exports, are removed; restructuring of the motor vehicles and parts industry following WTO accession is modelled as a 20 per cent productivity boost to vehicle assembly, following Francois and Spinanger (2004); and liberalization of China's services trade also follows Francois and Spinanger (2004).

grains, sugar, cotton), and otherwise a move down to the new in-quota tariffs (oilseeds, milk). Sensitivity of the results concerning the first two categories are explored in the results section.

If this reform were to require a movement of unskilled labor out of farm activities, three impediments need to be kept in mind. One is that those farm workers would be less than perfect substitutes for those already in non-farm pursuits. Econometric work by Sicular and Zhao (2004) suggests that restraints on mobility could be approximated via a CET function with an elasticity of transformation of 1.32.⁷ We have therefore incorporated that in the GTAP model for China. Another impediment to off-farm migration is that urban social welfare benefits such as subsidies to housing, food, education and health care are not available to non-urban people, except by purchasing a residence permit, or *hukou* (Zhao 1999). And the third impediment is that farm workers who permanently cut their ties with agriculture may lose entitlement to returns from their family's land, and even the direct support and assistance of family members (Hussain 2004). These latter two impediments have contributed to the persistence of a large gap in farm versus non-farm returns to unskilled labor. We model that gap as a 'tax' wedge that raises the cost of labor to urban employers, with urban unskilled workers receiving the tax-inclusive wage.

The closure adopted is a long-run one in which, in addition to the above assumptions about unskilled labor, we assume agricultural land is mobile between industries within the agricultural sector, and skilled labor and capital are mobile within and between sectors. It keeps the aggregate trade balance and government tax revenue as a fixed share of GDP (with little

⁷ In a subsequent analysis, Sicular and Zhao provide estimates of 2.67 for the "push" elasticity of transformation from changes in agricultural returns to changes in the supply of labor out of agriculture but only 0.6 from changes in non-agricultural returns. Ianchovichina and Martin (2004) conduct sensitivity analysis on the implications of changes in these parameters, and find the results are not altered greatly.

change in net international capital flows), and holds employment constant so that wages adjust endogenously.

What do the results show?

The core WTO accession scenario

To begin with the bottom line of the main scenario before revealing the details, the core empirical results suggest WTO accession will increase farm-nonfarm income inequality. The main reason for this is that the relative producer prices of farm products are projected by the GTAP model to fall more than the prices of labor intensive non-farm products following the completion of WTO accession reforms (Table 2).

The removal of the ‘voluntary’ export restraint on sales of textile products to the U.S. and European Union is not the only boost to unskilled labor off farms. There is in addition a lower cost structure in unskilled labor intensive manufacturing activities, for three reasons: the lower demand for labor on farms lowers the cost of unskilled labor in manufacturing; import taxes on the intermediate inputs used in those manufacturing activities are lower due to the accession process; and the real exchange rate effect of the tariff reductions lowers the cost of nontraded goods and other factors used as inputs into manufacturing production. As a result, the quantity of unskilled non-farm labor demanded is greater (by 0.8 per cent). However, lower farm product prices mean the quantity of unskilled farm labor demanded is less (by 1.7 per cent), resulting in a 0.7 per cent fall in the real wage for unskilled farm labor and a rise in real wages for unskilled non-farm labor of 1.2 per cent (after adjusting for the change in the aggregate cost of living).

Farmers are also made worse off by the lower demand for farm land, the return from which is 5.5 per cent lower in 2007 following WTO accession reforms. Meanwhile, the real wages of skilled labor increase by 0.8 per cent, and the rewards to non-farm capital are 1.3 per cent higher.

Together these results suggest the owners of non-farm capital gain almost the same in proportional terms as unskilled laborers in non-farm employment, but the latter do better than skilled workers. Hence on balance income inequality may improve slightly among non-farm households dependent mainly on labor income.¹¹

However, income distribution can be expected to slightly worsen as between farm and non-farm households, although the degree depends on the proportion of farm household income earned off the farm. With only 1.7 per cent of (or about 6 million) unskilled farm workers leaving agriculture for non-farm work, and with land returns depressed by 5.5 per cent in addition to farm labor returns being 0.7 per cent lower, the gap between farm and non-farm incomes even within rural areas, and certainly between rural and urban areas, looks set to rise slightly unless remedial policy action is forthcoming. For farm households entirely dependent on earnings from agriculture (type A in Table 3), income would fall 1.6 per cent on average. This would differ little across the country since product shares for farm output – when fish products are ignored – are reasonably similar in western, central and eastern provinces; however, if we look at northern and southern provinces in China, differences could be larger since wheat, maize, soybean and cotton are planted primarily in northern China while rice, horticulture, livestock and

¹¹ Wages of skilled workers might increase more than suggested here as we do not capture the endogenous productivity growth resulting from the substantial liberalization of the service sectors. For a recent study that does incorporate that effect using a dynamic version of the GTAP model, see Ianchovichina and Walmsley (2003).

fish are raised mainly in southern China. For farm households earning 30 per cent of their income from nonfarm unskilled work, however, that income fall is only half as large (0.8 per cent); and for farm households earning 60 per cent of their income from nonfarm unskilled work, their incomes would not decline at all (types B and C in Table 3 -- see rows 7 and 8).

Sectoral details of the GTAP results are summarized in Table 2. Real consumer prices (relative to the CPI) are lowered most by WTO accession for motor vehicles, oilseeds and sugar (and for beverages and tobacco, although if China was using import taxes on those items as a form of consumption tax and their decline were to be matched by an increase in domestic sales taxation, those price declines may not materialize). They are also lowered for textile products and to a lesser extent clothing. Among the farm products, consumer prices are raised slightly for livestock products, somewhat more for grains, and significantly for cotton (plant-based fibres).

Producer prices (also shown relative to the CPI) fall more than consumer prices because of a uniform consumption tax of 1.9 percent that is levied to compensate for the loss of import tariff revenue. They are down more for farm products than for most other products except autos though. Also, farm output is down for all but cotton and meat. Moreover, feedgrain exports shrink by three-quarters and cotton exports by half with the abolition of export subsidies. The difference in the effects on production and consumption shown in Table 2 reveal that China's food, feed and fibre self-sufficiency will be reduced at least slightly by these reforms. But the extent is really quite minor: the trade balance column in Table 2 suggests that for all agricultural and food products, net imports would be greater because of the remaining accession reforms by

¹² However, if we look at northern and southern provinces in China, differences could be large since wheat, maize, soybean and cotton are planted primarily in northern China, while rice, horticulture, livestock and fish are raised mostly in southern China.

only \$3.96 billion per year by 2007 (in 1997 US dollars), which represents only 1 per cent of total imports.

The above results depend as always on the assumptions in the model. To check the sensitivity of some of those assumptions, two alternative scenarios were run to compare their results with those in the base accession scenario: one with greater agricultural protection cuts and the other removing negative agricultural protection.

Alternative scenario 1: greater agricultural protection cuts

What if the grain, sugar and cotton NRPs were to drop to the in-quota tariff levels shown in Table 1, for example? An additional GTAP simulation was run and the differences for factor rewards are not huge in aggregate but they would be in the direction of worsening income inequality: unskilled farm wages would fall 0.9 instead of 0.7 per cent and rewards to farm land would fall 6.4 instead of 5.5 per cent on the one hand, while on the other non-farm wages would rise 1.4 instead of 1.2 per cent for the unskilled and 1.0 instead of 0.8 per cent for skilled workers (Table 3). These changes would attract only another million workers from farms. But while agricultural incomes would be lower, farm household income would not fall if at least 60 per cent of its income came from wages of non-farm unskilled labor (see row 8 of Table 3). Domestic production of grains, sugar and cotton would be less though, and domestic consumption greater, so self-sufficiency in those products would be slightly lower. Even so, net imports of all food and agricultural products would be greater by only \$1.5 billion per year by 2007 (\$5.43 instead of \$3.96 billion). Such an import increase would be within the tariff rate quotas for those items with the possible exception of maize (depending on the extent to which other feedgrains that are not TRQ-restricted, such as barley, are substitutable for maize).

National economic welfare would be only very slightly greater in this case as compared with the core scenario (see bottom row of Table 3).

Alternative scenario 2: removing negative agricultural protection

If the negative NRPs for rice, meats, vegetables and fruits were to be raised to zero, the income distributional effects would go in the opposite direction to those in the previous alternative scenario (less inequality between farm and non-farm households). The changes are not great though, even though these products account for nearly 40 per cent of the value of food and agricultural output in China. As can be seen by comparing columns 1, 2 and 3 of Table 3, they would involve about as much improvement in income distribution as the previous alternative scenario would worsen it. This case involves a 3 per cent larger national economic welfare gain than the core case (bottom row of Table 3).

Conclusions and policy implications

Our initial analysis suggests rural non-farm incomes will rise on average absolutely and possibly even relative to urban incomes in the case of households depending just on labor income (assuming urban laborers are more skilled). However, some farm households facing increased import competition may be worse off in this case, *ceteris paribus*, if they are:

- ?? unable to send household members to jobs in expanding industrial and service industries;
- ?? are too poorly served with infrastructure to attract such activities to their own region;
- ?? are unable to diversify into producing farm goods whose relative price has risen; and/or
- ?? do not have relatives able to repatriate non-farm earnings to them.

¹³ Evidence of increased flexibility in China's labor markets in recent times is presented in Lohmar (2001).

Thus in the core scenario the incidence of rural non-farm poverty will fall mainly because of the growth in wages for unskilled workers in rural non-farm activities, while poverty may well increase in agriculturally based hinterland provinces a long way from markets and in regions poorly served with the necessary infrastructure to attract investment in such expanding activities as textiles and clothing.

The first alternative scenario shows that this situation would be exacerbated slightly if the TRQ-protected items (grains, sugar and cotton) were to become even less protected than we initially assumed. By way of contrast, the second alternative scenario suggests the situation could be made slightly less extreme by removing the negative protection affecting rice, meats, vegetables and fruits. But both of these alternatives only involve small changes to the magnitudes of effects, rather than altering the sign of those effects, and both add only a small amount to the aggregate gains from trade liberalization.

National self-sufficiency in farm products would decrease slightly, particularly for feedgrains and cotton as demand for livestock products grows with income gains from trade reform and as production of natural fibre-based textiles and clothing expand. But overall, most of the declines in domestic agricultural production as a consequence of the remaining reforms that are required following WTO accession are relatively very small in magnitude, especially when compared with the growth in farm output that would occur as a result of normal economic growth (compare columns 1 and 5 of Table 4).

¹⁴ These alternative results for the long run complement the findings of Chen and Ravallion (2002) for the short-run. What they underscore is that whether a particular group gains or loses from a shock such as WTO accession in the long run depends heavily on their sources of household income and their capacity to adapt to the changed economic circumstances.

What should be done if some farmers' incomes are to worsen relative to those of non-farm households, and if there is concern about the fall in agricultural self-sufficiency? Rather than arguing against trade reform, first-best ways should be sought for dealing with those concerns (and with any transitory unemployment that might follow reform). The most efficient policy responses are likely to involve investments in rural human capital, rural infrastructure and agricultural R&D (Fan, Zhang and Zhang 2002), improvements in the land tenure system and rural financial markets, reductions in informal taxes/levies on farmers by local governments, and changes in grain marketing.

First, the government might consider further investments in basic rural education and health services to reduce the adverse effect of trade reform on poverty incidence and perceived food security. Better education and health for farmers' children not only boosts their farm productivity should they choose to stay on the farm after finishing school; it also increases their capacity to find more-lucrative off-farm work and to adjust to non-agricultural employment and living (Schultz 1975; Zhang et al., 2002). In addition to those longer-term benefits, there could also be an immediate poverty alleviating effect if the government were to cut basic school fees and make up the shortfall with a bigger direct grant to rural primary and middle schools.

Second, improvements in rural infrastructure such as roads and rail mean that a larger share of the price eventually received at the end of the marketing chain for farm products can be passed back to farmers. Such improvements also lower the barrier for off-farm work by members of farm households, making it easier for them to take advantage of expanding employment opportunities in rural townships.

Third, agricultural R&D can ease both urban and rural poverty (see Fan, Fang and Zhang 2001; Hazell and Haddad 2001). A boost in agricultural productivity could significantly offset

the 2-8 per cent drop in agricultural production that is estimated in the core scenario to result from WTO accession. An important policy issue here is whether China should deny itself the use of GMOs in food production.¹⁶

Fourth, improvements in the land tenure system would not only increase the incentive to invest more in land but would also enhance the collateral of farm households. If accompanied by improvements in rural financial markets, investments by farmers back into agriculture would rise. They would rise further if returns were increased via reductions in informal taxes/levies on farmers by local governments.¹⁷

And fifth, the government might reduce its regulation of grain marketing and in particular cease compulsory procurement from farmers at less than market prices and reduce the provision of grain to urban consumers at less than market prices. De-emphasizing the Governors' grain responsibility system (provincial self-sufficiency) would allow more exploitation of comparative advantage within China too.

If all that was considered insufficient support for incomes of the poorest farm households, short-term adjustment assistance via infra-marginal (and hence not output-inducing) producer price subsidies could be provided as an efficient way to boost their farm incomes without boosting farm output (in an equal but opposite way to that used to tax farmers in earlier decades – see Shea 2003). Such an intervention could well be deemed WTO-consistent because of its decoupled nature, and in any case if it was just targeted to poor farmers it is unlikely to ever

¹⁶ For an empirical analysis using GTAP of the impact on China, India and other countries of them not adopting versus adopting GM varieties of first maize and oilseeds and then also rice and wheat, see Anderson and Jackson (2003).

¹⁷ According to Lin et al. (2002), such levies amount to as much as one-quarter of the net incomes of poorer farmers in the hinterland.

exceed 8.5 per cent of the value of China's output of the product concerned (its *de minimis* exemption limit for product-specific support under Article 6.4 of the WTO's Agreement on Agriculture).

Finally, now that China is in the WTO it has the opportunity to take part in new rounds of multilateral trade negotiations, whereby it can seek increased market access for its exports of farm (and other) products abroad. While not taken into account in the present analysis, if WTO membership enhances China's chances of expanding its access to agricultural more than other markets abroad in the future, that would be a positive benefit of WTO accession for China's farmers and rural areas. Martin (2002) points out that Chinese farm exports face particularly high barriers abroad, so this potential benefit is non-trivial in principle (although in practice it may be difficult to secure, especially if the main barriers are SPS measures). That proposition is tested by Yu and Frandsen (2002), also using the GTAP model. They find that reductions in barriers to agricultural imports and in domestic support to farmers in OECD countries reduces the extent to which China's farm output would fall with WTO accession and in some cases leads to outputs expanding instead of contracting. As a consequence, China's agricultural imports are reduced slightly and its agricultural exports are greater: Yu and Frandsen's results show that not only would China's food self-sufficiency be higher with than without agricultural protection in the EU, US and Japan, but the difference in most cases would be more than enough to offset the fall in self sufficiency that is estimated to result from China's WTO accession. Such reform in the OECD would clearly benefit farm households in China, providing a further pro-poor consequence of trade reform.

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Table 1: Nominal rates of protection (applied tariff or tariff equivalent), agricultural products, China, 1995 to 2007

(per cent)

	1995	1997	2001	2007 in-quota tariff	2007 out-of- quota tariff	Assumed NRP in 2007 (core scenario)
Rice	-5	-5	-3	1	65	-3
Wheat	25	17	12	1	65	12
Coarse grains	20	28	32	1	65	32
Vegetables & fruit	-10	-8	-4	11	11	-4
Oilseeds	30	28	20	3	3	3
Sugar	44	42	40	15	50	20
Cotton	20	17	17	1	40	20
Meats	-20	-19	-15	12	12	-15
Milk	30	30	30	11	11	11

Source: Based on research subsequently reported in summary form in Huang, Rozelle and Chang (2004).

Table 2: Sectoral volume effects of China's WTO accession reforms (core case), 2002 to 2007

(per cent and 1997 US\$million)

	Output	Employment	Household consumption	Exports	Imports	Trade Balance (\$m)	Producer Prices	Consumer prices
Rice	-2.1	-2.3	-0.1	6.1	-7.1	64	-0.9	0.9
Wheat	-2.0	-2.3	0.0	18.9	-10.1	174	-1.7	0.4
Feedgrains	-2.3	-2.6	-0.1	-77.8	-2.4	-596	-1.9	1.9
Vegetables and fruits	-3.4	-3.7	0.1	14.6	-6.3	214	-1.9	-0.1
Oilseeds	-7.9	-8.4	0.9	29.8	20.9	-789	-2.8	-4.7
Sugar	-6.5	-7.4	0.6	13.9	24.1	-73	-1.9	-3.1
Plant based fibers	15.8	16.4	-0.6	-51.8	7.7	-189	0.1	3.1
Livestock & meat	1.3	1.1	0.0	15.5	-8.9	837	-1.6	0.2
Dairy	-2.0	-2.4	0.0	13.5	23.8	-143	-1.5	0.2
Other food	-5.9	-6.4	0.4	11.4	62.6	-3460	-1.7	-1.8
Beverages & tobacco	-33.0	-33.1	1.5	9.7	112.4	-14222	-1.8	-6.9
Extractive industries	-1.0	-1.3	-0.2	7.5	-4.4	2088	-0.7	1.2
Textiles	15.6	15.5	0.7	32.7	38.5	-10366	-1.7	-3.2
Apparel	57.3	56.1	0.5	105.8	30.9	49690	-0.5	-1.9
Light manufacturing	3.7	3.7	0.0	5.9	6.8	1786	-0.9	0.0
Petrochemical industry	-2.3	-2.3	-0.2	3.1	11.8	-8810	-0.7	0.8
Metals	-2.1	-2.1	-0.3	3.7	6.8	-1893	-0.4	1.3
Autos	1.4	-2.2	1.0	27.7	24.0	516	-3.9	-4.2
Electronics	0.6	0.4	0.5	6.7	6.8	453	-1.3	-1.7
Other manufactures	-2.1	-2.2	-0.2	4.1	18.9	-11291	-0.5	0.8
Trade and transport	0.0	0.0	-0.3	0.8	-0.4	493	-0.2	1.6
Construction	0.9	0.9	-0.4	2.7	17.5	-436	-0.2	1.7
Communication	-0.5	-0.5	-0.4	-0.5	10.9	-56	0.1	1.9
Commercial services	-2.0	-2.0	-0.5	-0.4	35.4	-1749	0.2	1.9
Other services	-1.7	-1.8	-0.3	1.4	33.6	-1525	-0.1	1.6

Source: Authors' GTAP results.

Table 3: Change in China's real factor prices and national economic welfare due to WTO accession, 2001 to 2007

(per cent, welfare in 1997 US\$ billions)

	Core accession case	Alternative 1: greater agricultural protection cuts	Alternative 2: core case plus also removing negative agric protection
Farm unskilled wages	-0.7	-0.9	-0.5
Rental price of land	-5.5	-6.4	-4.7
Nonfarm unskilled wages	1.2	1.4	1.1
Skilled labor wages	0.8	1.0	1.5
Rental price of capital	1.3	1.5	1.5
Farm household ^a income-A	-1.6	-1.9	-1.3
Farm household ^a income-B	-0.8	-0.9	-0.6
Farm household ^a income-C	0.1	0.1	0.1
National economic welfare (\$ billion increase)	9.56	9.57	9.87

^a Farm income from agriculture is made up of 57% from unskilled labor, 26% from land and 17% from capital, according to the GTAP database. In 1999 on average 51% of rural household income in China was earned outside agriculture, mostly from unskilled labor. Therefore, to illustrate the importance of those off-farm earnings, three types of farm households are shown in this table: it is assumed nonfarm unskilled labor contributes 0% of farm household income for type A, 30% for type B, and 60% for type C. We assume all households have the same expenditure pattern and so all changes are net of the CPI change.

Source: Calculated from the authors' GTAP results.

Table 4: Changes in China's farm output, employment and trade volumes (a) without WTO accession for the period 1995-2007 and (b) due to China's WTO accession reforms, 2002-07

(per cent)

	(a) Changes w'out WTO accession, 1995-2007				(b) Changes due to WTO accession, 2002-07			
	Output	Empl't	Exports	Imports	Output	Empl't	Exports	Imports
Rice	63.8	-11.5	134.7	-8.8	-2.1	-2.3	6.1	-7.1
Wheat	81.4	6.4	-15.2	126.3	-2.0	-2.3	18.9	-10.1
Feedgrains	109.5	23.8	-0.6	95.9	-2.3	-2.6	-77.8	-2.4
Vegetables and fruits	98.2	16.8	-10.8	122.1	-3.4	-3.7	14.6	-6.3
Oilseeds	100.9	18.4	-36	151.7	-7.9	-8.4	29.8	20.9
Sugar	112.5	14.5	109.4	88.7	-6.5	-7.4	13.9	24.1
Plant based fibers	137.2	41.1	-8.5	146.1	15.8	16.4	-51.8	7.7
Livestock & meat	121.9	25.6	12.8	135.3	1.3	1.1	15.5	-8.9
Dairy products	122.5	18.8	60.5	100.3	-2.0	-2.4	13.5	23.8
Other food	110.8	-1.5	76.8	58.5	-5.9	-6.4	11.4	62.6

Source: Authors' GTAP results