

ACHIEVING FOOD SECURITY IN CHINA: IMPLICATIONS OF WTO ACCESSION

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Abstract

The results of a three-year study of the implications of China's accession to the WTO for its agricultural sector and policy options to maximise the benefits of the trade reforms are reported. The most important message from the study is that macro-economic and other non-agriculture specific policies can do much to improve the outcome for rural households and thereby improve food security. These policies include the promotion of urban development in inland areas and gradual reform of monetary policy. However, agricultural policies need further reform, including abandoning of price support and regional self-sufficiency policies, reform of monopolistic agricultural marketing and distribution activities, and reform of the state grain storage system. Hopefully, WTO membership will assist implementation of these reforms.

Contributed paper presented at the 48th Annual Conference of the Australian
Agricultural and Resource Economics Society, Melbourne, February 11-13,
2004

Achieving Food Security in China: Implications of WTO Accession¹

Introduction

This paper reports the results of a three-year collaborative research project that has explored various implications of China's accession to the WTO, particularly those relating to agricultural policy and the agricultural sector, and to the issue of food security. The collaboration has been between researchers at the National Centre for Development Studies and the School of Economics at The Australian National University and researchers at the China Center for Economic Research, Peking University.

The project was begun prior to China's accession to the WTO. It was anticipated that the accession application would be successful and that it was important therefore to understand fully the impact that the accession commitments could have within China. There was a concern to see that Chinese policy makers appreciated the benefits that would flow from the trade liberalisation. At the same time it was understood that the trade reforms would lead to structural adjustments that would involve the reduction of some activities with the ensuing loss of employment and asset values. It was felt that it was preferable for policy makers to have an understanding of these consequences as such understanding would reduce the chances of the adoption of poor policies in response to any perceived or actual adverse impacts. Another objective of the project was to analyse various policy options in order to offer input into China's policy-making process.

China made substantial commitments to freer trade in agriculture in its accession agreement. Underlying these commitments, therefore, is a substantial shift away from its previous basic agricultural policy position, which had an emphasis on food "self sufficiency". As might be expected, there remains strong support in favour of food self sufficiency. Therefore, one of the aims of this research project was to demonstrate the costs of food self-sufficiency policies to reduce the chances of any move back towards such policies.

Other issues that the project planned to research were: (i) the nature of the transition from the *status quo* to the implementation of the accession commitments; (ii) the agricultural commodity impacts of the commitments; and (iii) the distributional impacts of the commitments, specifically the rural-

¹ The research reported in this paper has been funded by the Australian Centre for International Agricultural Research (ACIAR Project No. ADP/1998/128. The funding has provided support to researchers at The Australian National University and the China Center for Economic Research, Peking University, Beijing.

urban income impacts and the regional impacts. Importantly, the project has had a strong general equilibrium focus, which has been followed through the use of global and China-specific computable general equilibrium models and the analysis of the impact of all of China's WTO accession commitments, not only its agricultural commitments. The focus on general equilibrium research has two, related justifications. First, when analysing the impacts of agricultural policies, we should look beyond the agricultural sector because agricultural policies will have economy-wide impacts. Analogously, trade policy initiatives in other sector will have impacts on the agricultural sector. Further, the impact of macro-economic policies on particular sectors can be as important, if not more important, than sector-specific policies. Second, it is clear from recent experience in developing countries that incomes of rural households are increased more by increases in off-farm income earned by household members than by increases in on-farm income. Therefore, in examining the welfare implications for farm households of the trade liberalisation, it is important to examine all the ways in which farm household incomes may be affected through the structural adjustments to the trade reforms.

The research project was designed to give particular attention to the differences among regions and households. China is a very large country with significantly different sub-economies, having different patterns of factor endowments and therefore different comparative advantages; and there are large differences among regions with respect to their stage of development. Agricultural policy reform (and other policy changes) will therefore impact differently on the different sub-economies and regions. Likewise, the urban and regional households with different factor endowments and different income levels will be affected differently by the policy reforms. In order to examine these regional and household effects, a CGE model of the Chinese economy was constructed with regional and household differentiation.

In effect, the project has four dimensions. First, there is the commodity dimension—the analysis of which agricultural industries gain and which lose from the trade liberalisation. Second, there is the household dimension. The concern for food security must relate to household incomes, not individual incomes. Moreover, as rural poverty will be largely overcome through the earning of off-farm income by households, there has to be an economy-wide approach to this issue. The growing gap between urban and rural incomes is a matter of great concern in China. Therefore, the analysis allowed for differentiation of representative rural and urban households to study the impacts of policies on both kinds of households. Third, as noted above, the regional dimension is important in the examination of commodity effects and income effects. Finally, the problems within the agricultural sector will not necessarily be resolved through agricultural policies. Problems such as rural poverty and the increasing urban-rural income gap may be best overcome through macro-economic policies or through policies affecting other sectors such as industrial policies, education policies, or internal migration policies.

This paper reports the results of the research carried out in terms of these four dimensions of the project. However, first there is a discussion of the issues of food self sufficiency and food security in China.

Food self sufficiency and food security

Maintenance of grain self sufficiency has long been a major plank of China's agricultural policy. As recently as 1996, the Vice-Minister of Agriculture, Wan Baorui (1996), announced that the grain self-sufficiency rate was to be maintained at above 95 per cent. Along with the widening of per capita income disparities between rural and urban areas, the rhetoric of food self-sufficiency is the most prominent weapon of China's protectionists. There has been a concern that China will go the way of Japan, Korea and Taiwan and protect its agricultural sector as the sector shrinks in relative importance and national per capita incomes increase. China's accession to the WTO may have come just in time to make this possibility less likely. However, while WTO accession lessens the risk that they will succeed, the agriculture ministry has been assigned a prominent role in trade policy formation and negotiation, with the power to press for further agricultural protection on self-sufficiency as well as distributional grounds (Anderson *et al.* 2002, Tong 2003).

That there exists genuine concern for food self-sufficiency in China is understandable. Widespread famines have been experienced, although, in hindsight, these have probably been due more to bad policies than to bad weather. Concern over the possibility of food trade embargoes can also be understood; although, again, experience has shown that trade embargoes are very difficult to implement (Lu 1997, Yang 2000). The difficulty of financing large volumes of food imports would also have been a legitimate concern in the past. However, this is no longer the case. In 2000, China's total export revenue was around US\$250 billion. Imports of 22 million tons of grain (the WTO import quota commitment) would cost US\$3-4 billion—only a small fraction of total export earnings.

But food self-sufficiency is not the same as food security. Food security is a matter of whether households have sufficient income to maintain an adequate diet. The important question with respect to food self-sufficiency for China is the extent to which it is prepared to rely upon the international market for the gap between its domestic production and its effective demand. China is such a large country that, inevitably, most of the goods and services consumed have to be produced domestically.

To illustrate the economic costs of adopting policies that aim to maintain grain self-sufficiency near the present level or to increase it, protectionist scenarios were modelled by Duncan *et al* (2003) using an adaptation of the GTAP model², a global, multi-region, multi-product general equilibrium model. Following Yang and Tyers (2000), to the standard GTAP base was added independent representations of governments' fiscal regimes, with both

² A detailed description of the original model is provided by Hertel (1997).

direct and indirect taxation, as well as separate assets in each region (currency and bonds) and monetary policies with a range of alternative targets.

In earlier analysis, Yang and Tyers (1989) used a global agricultural sector model to examine the impact of rapid income growth in China on the composition of food consumption and the implications of this for food self-sufficiency. They found that the anticipated redistribution of consumption toward livestock products would raise import demand for feed grains and that this would make the maintenance of self-sufficiency through protection very costly. Because their analysis was restricted to the agricultural sector, however, they could not examine the redistribution and economy-wide effects of the protection needed to maintain self-sufficiency. The use of the GTAP model overcomes these limitations.

The modeling first projects the base case to 2010 under conservative output and productivity growth assumptions and then asks two questions. First, if China's present food self-sufficiency rates are to be held constant to 2010, will increases in protection be required? Second, what increases in protection would be required to achieve full food self-sufficiency by 2010 and what would be the economy-wide and distributional effects of this protection? Consistent with Yang and Tyers (1989) the base case projection to 2010 shows substantial declines in Chinese food self-sufficiency (see Table 1), particularly for beverages, livestock products and feed grains (basically as the result of income growth), so that substantial increases in protection are needed to maintain the 2001 levels. To achieve self-sufficiency in all agricultural products by 2010, considerable further protection would be required. In both cases this protection would be contractionary and redistributive, and it would retard growth in other sectors. The strength of the results notwithstanding, sensitivity analysis shows they rest quite heavily on some parameters, particularly the income elasticity of demand for livestock products.

Table 1: Food self-sufficiency in China, 2001 to 2010 (percentages)

<u>Commodity</u>	<u>2001</u>	<u>2010</u>
Rice	100	100
Beverages	99	91
Other crops	94	89
Livestock	99	95
Processed food	88	83
Fish	99	99
Minerals	95	94
Energy	80	80

Source: Duncan, *et al* (2003).

The model employs the original GTAP CDE (constant difference of elasticities of substitution) system. Its non-homotheticity is an asset in that it permits a range of income elasticities to exist either side of unity. While this system is more general than the homothetic ones often used in such models,

it is still restrictive in the width of the parameter range compared to still more general systems. The CDE system is employed here because of its parametric economy. Because of the restrictiveness of the CDE system the lower bound for the income elasticity of rice cannot be set below 0.1, despite evidence suggesting that it is now negative (Ito *et al.* 1989, Peterson *et al.* 1991). As a result, the differences between the model's income elasticities of livestock products and processed foods, which are superior goods, and those of grains are likely to be smaller than they actually are. One consequence of this is that the results likely underestimate the growth in demand for livestock products and processed foods and hence they underestimate the associated derived demand for cereal feeds and other agricultural inputs. This means it is likely there is a downward bias in the estimates of the cost of achieving and maintaining agricultural self-sufficiency.

Because the declines in self-sufficiency in the base case projection to 2010 are significant, the tariffs necessary to retain 2001 self-sufficiency rates are substantial, particularly for the beverages, "other crops" and livestock product groups (see Table 2). These taxes on imports are, effectively, taxes on all China's trade. Thus they also reduce China's exports, causing exporting industries to contract. Overall, the increased protection induces a one per cent contraction in GDP along with some restructuring across industrial sectors. The more heavily protected agricultural industries are favoured, mostly at the expense of manufacturing, particularly light manufacturing.

The additional tariffs required to achieve full food self-sufficiency by 2010 are very large, particularly on imports in the livestock products, processed food and "other crops" groups (see Table 2). These distort incentives in the economy substantially, shifting resources into agriculture and contracting both the manufacturing and service sectors. Throughout the economy this decline in allocative efficiency reduces returns to installed capital and therefore investment. The level of 2010 GDP is reduced by nearly two per cent. The tariffs that would achieve agricultural self-sufficiency in 2010 reduce exports from China's growth powerhouse, its light manufacturing industries, by one-half. Domestic resources are reallocated to the agricultural sector, raising costs in manufacturing and reducing the international competitiveness of China's manufacturing industries. The resulting misallocation of labour is particularly striking. The higher tariffs cause employment in agricultural and food processing activities to be substantially greater, at the expense primarily of light manufacturing.

Higher agricultural tariffs raise land rents by a considerable margin but reduce real wages and capital returns. Real wages grow less in both agriculture and the modern sector. This is true for both production and skilled workers, and it is also true for the owners of physical capital. The capital losses occur because the industries that are hurt by the tariffs are more capital intensive than agriculture. In the end, land holders are the only winners from the tariffs.

Table 2: Changes in tariffs required for food self-sufficiency by 2010

Commodities	Extra protection to hold self-sufficiency rates at 2001 levels	Extra protection to achieve full self-sufficiency
Rice	0.0	0.0
Beverages	35.4	50.6
Other crops	19.2	72.7
Livestock	39.2	78.7
Processed food	11.1	67.3
Fish	16.1	31.9

Source: Duncan *et al* (2003). The changes in protection are shown as proportional changes to nominal protection coefficients.

We might well ask: what is gained by the self-sufficiency? Would food be more readily available in China? No. China's 2010 prices of imported foods would be increased by up to 60 per cent through the increased tariffs and even home-produced food products would be increased by at least 10 per cent. The key consequence of political significance would be a reduction in interdependence with the global economy. But this cuts two ways. Reduced reliance on food imports means curtailing the principal source of China's overall economic growth since the 1980s—access to foreign markets for its labour-intensive goods. Curtailed exports reduce its capital returns, thereby cutting incentives for investment and, ultimately, the growth rate of its economy.

Commodity, regional, and household impacts of accession

What are the likely impacts of China's WTO accession in terms of agricultural commodities, rural households, and agricultural regions? In a component of the project, Feng Lu (2001) examined the likely commodity/regional impacts of the accession's agricultural commitments. This was done through the calculation of "production concentration indices", which Lu defined as the ratio of the sown area (or output) of the commodity per capita of the agricultural population of a region divided by the same ratio for the country. The interpretation of the index is that a region has a comparative advantage (disadvantage) in the commodity if the production concentration index (PCI) is greater (less) than one (analogous to the use of the export concentration index as a measure of "revealed" comparative advantage).

The calculations show relatively high PCIs for the labour-intensive commodities (vegetables, fruits, meats, and fish products) in the eastern region, relatively low PCIs for these commodities in the western region, and values in between for the central region. On average, the eastern region has comparative advantage in all four labour-intensive commodity groups. The central region has comparative advantage in vegetables and meat products but not in fruits and fish products. The western region does not have comparative advantage in any of the four labour-intensive product groups.

PCIs for the land-intensive products (grains, oil seeds, cotton, and sugar) are relatively high for the western region, relatively low for the eastern region, and in between for the central region. The western region has comparative advantage in all four land-intensive commodity groups, while the central region has comparative advantage in grains, oil seeds and sugar. In the eastern region, only sugar has comparative advantage.

In assessing the adjustment impacts of the reduction in protection for agricultural commodities, Lu (2001) argues that, in line with China's perceived comparative advantage, liberalisation will strengthen the tendency for imports of land-intensive commodities and encourage exports of labour-intensive commodities. He expects that the export promotion effect will follow closely the regional distribution of comparative advantage of labour-intensive commodities. As regards the negative import-substitution effect, he postulates two possibilities: one possibility is that imports of land-intensive products will largely substitute for domestic production in the regions with relatively high domestic production costs for these commodities. The second is that imports will substitute for domestic production in proportion to the existing regional concentration of the commodities.

The two possibilities will have different implications for regional adjustment costs. The first is to be preferred as it allows the principle of comparative advantage to play a larger role in resource allocation. The second, less desirable, possibility is in line with the policy stance that has emphasised provincial grain self-sufficiency. Under the first scenario, those provinces with comparative advantage in both labour- and land-intensive commodities will have relatively small adjustment costs. Those provinces without comparative advantage in labour-intensive or land-intensive commodities are likely to be worst off as they will benefit least from the export expansion and have to bear the largest adjustment costs. The eastern region is seen as likely to be the major beneficiary from export expansion of labour-intensive products, while the inland regions are expected to have much smaller benefits. On the other hand, the coastal regions may experience a larger share of the adjustment costs from the import growth while inland provinces may have less adjustment.

Under the second scenario, the regional distribution of the import-substitution effects changes considerably. A large share of the adjustment costs may be incurred by the central and western regions; i.e., they are likely to have a combination of small export-promoting effects and large adjustment costs. This could result in an increase in the income gap between the coastal and inland regions.

To maximise the likelihood for scenario one to materialise, agricultural policies should be changed in a more market-oriented manner. There should be a move away from the emphasis on regional self-sufficiency. As well, the state monopolies in domestic marketing and distribution of bulk agricultural commodities as well as in transport should be removed to allow goods to flow more freely across provincial borders.

Tingsong Jiang (2002a) examined the growing income gap between the coastal and inland regions over the period 1978 to 2000. He noted that the gap was unchanged or had even declined during 1978-90—the period in which China undertook major agricultural reforms and experienced high growth in the agricultural sector. This development favoured the poorer regions that have higher agricultural shares in total output. In the period 1991-2000, which followed the major industrial reforms, the eastern region benefited most from growth of foreign investment and development of the private sector. During this time the regional income gap between the coastal and inland regions widened considerably. However, the income disparity within the regions declined over this period.

The increasing gaps between rural and urban incomes and between incomes in coastal and inland regions are of considerable concern in China. The likelihood of WTO accession increasing these disparities was a major factor behind resistance to accession. In a contribution to the project, Jiang (2003) examined how WTO accession is likely to affect these income disparities using a multi-commodity general equilibrium model of the Chinese economy. The model included representative rural and urban households in order to study income distribution and regional impacts (for details of the model see Jiang 2002(b) and 2003). The CERD model (China Economy with Regional Details) is based on the model constructed by Yang and Huang (1997) but has been enhanced with the incorporation of provincial input/output tables. For the purposes of this study the I/O tables were aggregated into three regions: eastern, central and western.

In simulations of the WTO accession commitments, crops, food processing, motor vehicles and parts, and machinery sectors are adversely affected by the accession, particularly the motor vehicles and parts sector. Other sectors benefit, particularly the light manufacturing sector. Agricultural production declines most in the eastern region and least in the central region. This result is contrary to that of Lu (2001), who concluded that the eastern region would benefit most with respect to agriculture because of its comparative advantage in labour-intensive activities. Jiang's results show the usefulness of general equilibrium analysis, which has taken account of there being a higher return to labour-intensive activities outside of agriculture in the eastern region. The eastern region does by far the best in overall terms because it realises most of the gains in allocative efficiency. Hence, there is an increase in regional income disparity. Rural household incomes increase most in the eastern region because they have the best opportunities for off-farm income. However, across the regions rural household incomes increase less than urban household incomes.

Jiang (2003) undertook some simulations to examine the impacts of policies that may be adopted to mitigate these adverse effects on farm incomes. One policy option tested is the use of a production subsidy. It was found that if agriculture were to be subsidised to maintain the pre-accession grain self-sufficiency rate, the subsidy would be 7.2 billion yuan. If the target were to maintain the food self-sufficiency rate the subsidy would be 180 billion yuan.

Another policy option tested was an increase in agriculture R&D to improve agricultural productivity. It was estimated that China would have to almost double the level of agricultural R&D in order to maintain the food self-sufficiency rate.

In one of his contributions to the project, Xiaolu Wang (2002) argued that the underlying reason for the widening rural-urban income gap since 1991 is the excess supply of labour in agriculture. This excess supply results in low labour productivity—much lower than in the industrial and tertiary sectors—and slower growth in incomes. As a result of the slower productivity growth and the excess of labour in agriculture, the agricultural share of GDP fell from 51 per cent in 1952 to only 14 per cent by 2002, while the share of agricultural workers in the total work force declined from 84 per cent in 1952 to 50 per cent in 2002. The share of the rural population in the national total declined even more slowly—from 85 per cent in 1953 to 61 per cent in 2002. The excess supply of labour in agriculture has been attributed to the restrictions on the movement of people from rural areas to the cities, accompanied by discrimination in the form of denial of access to housing, education, job training and health facilities.

Because of the development of rural industries, the sources of rural household income have changed remarkably. In 1990 the agricultural share of rural household incomes was 74 per cent. By 2002, this share had fallen to 47 per cent. The development of the rural industrial sector, particularly the township and village enterprise (TVE) sector, was very important in providing opportunities for diversification of rural household incomes. Employment in the TVE sector increased from 28 million to 135 million in the period 1978-96, accounting for more than one-quarter of the rural labour force (Wang and Duncan 2003). Despite this, the number of farmers has increased and there appears to be more surplus agricultural labour than ever. The diversification of rural household incomes varies greatly between the major geographical regions, with the share of off-farm income in rural households in the coastal region around 75 per cent but only around 25 per cent in the western region. Moreover, the rural-urban income disparity has widened most in the western region: between 1980 and 2000 the rural/urban income ratio fell from 54.4 per cent to 43.2 per cent in the eastern region, from 49.5 per cent to 40.1 per cent in the central region, and from 44.9 per cent to 30.4 per cent in the western region (Wang and Duncan 2003).

Development of rural industries slowed in the late 1990s, mainly due to greater market competition, the unfavourable location of rural enterprises, difficulties in accessing external finance, and lack of infrastructure, technical inputs, and human resources. Meanwhile, urbanisation accelerated and larger numbers of rural labourers moved to urban areas in search of jobs. In 2001, the urbanisation rate (the ratio of urban to total population) in China reached 38 per cent, as compared to 26 per cent in 1990 and 19 per cent in 1980.

In spite of the acceleration of urban development, the urbanisation rate in China is, on average, 10-20 percentage points lower than in other countries at

a similar income level—even allowing for the so-called “floating population” (Wang and Xia 1999). In particular, there are relatively few medium and large cities. In 2001, 121 million people, only 9.6 per cent of the population, lived in cities of more than 0.5 million people. In the less-developed western region, only 5.6 per cent of the population lived in cities of that size. If China had an urbanisation rate similar to that of other countries of a similar income level, an additional 120-240 million people would be living in urban areas. This number may be thought of as the excess number of people in the rural economy. The constraints on urbanisation may be a factor behind the increasing urban-rural income disparity.

Wang and Duncan (2003) note that there are positive correlations between rural industrialisation (measured as the share of TVE employment in rural labour) and rural incomes and between the urbanisation rate and rural incomes. They therefore undertook a causality test of the relationship between urbanisation and regional economic growth. Because both urbanisation and rural incomes may be a function of economic growth, the causality test was carried out within an endogenous growth model. The results from the modeling indicate that each percentage point increase in the urbanisation rate increases provincial economic growth by 0.37 percentage points above the already high 7-10 per cent growth rate, i.e., urbanisation has a long-run impact on economic growth. When regional dummies are introduced, there are seen to be significant impacts from urbanisation on economic growth in both the eastern and central regions, but the impact is insignificant in the western region. There may be two reasons for this latter result: the rate of urbanisation in the western region has been low, and the urban economy in the western provinces has not experienced much restructuring, and is therefore less market-oriented and less efficient.

Macro-economic implications of accession

Most other studies of China’s WTO accession have focussed on the medium and long-run impacts of the accession. However, there are important short-run issues, in particular those relating to the macro-economic policy environment in which the reforms take place. The study by Tyers and Rees (2002) therefore examined the short-run impacts of the reforms under scenarios of capital controls, fixed and floating exchange rate regimes, and alternative fiscal policies.

An adaptation of the GTAP model similar to that used in Duncan, Rees and Tyers (2003) was used for the analysis. Because of the inclusion of independent representation of governments’ fiscal regimes (with inclusion of both direct and indirect taxation) and monetary policies with a range of targets, it is possible to study a range of policy regimes. To be representative of short-run conditions, the model also allows for labour market rigidity and departures from full employment.

In order to undertake the short-run analysis, a simulation of the long-run effects of the accession commitments was first carried out. The results allowed for a derivation of investors’ expectations on the assumption that

they take changes in long-run returns on installed capital into account in determining short-run changes in their investment behaviour. The results from the long-run simulation show the expected allocative efficiency gains from the trade reform, which are reflected in increased GDP, and increased returns on installed physical capital that induce greater investment and larger net inflows on the capital account. The increased average long-run return on installed capital is therefore part of investors' expectations in the short run and so tends to increase the level of investment in the short run—even if capital controls are maintained. The trade reforms also cause consumption to switch away from home-produced goods and the relative prices of home-produced goods to fall, and hence there is a real depreciation. There is also an increase in export competitiveness, and exports expand.

Manufacturing, particularly light manufacturing, is the main beneficiary of the trade liberalisation, together with the transport sector. This result, which is contrary to intuition from the Heckscher-Ohlin-Samuelson (HOS) trade model, derives from the model's departure from the HOS model in two ways—first, there is extensive use of intermediate inputs from the same sector (intra-industry trade), and second, competing imports are differentiated from home products. Under these assumptions the tariff reductions on imported intermediate inputs have a direct effect on the home industry's total cost. The indirect effect of the reductions in tariffs on competing but differentiated products depends upon the elasticity of substitution between imports and home produced goods. For manufacturing, the input cost effect of tariff reductions is considerably greater than the impact from the loss of protection against competing imports. Cost reductions of similar origin are the reason for the gains accruing to the domestic transport sector.

As the reforms cause the most substantial reductions in protection in China's food processing sector and therefore lead to long-run contractions in rice and "other crops", there is substantial relocation of employment from agriculture to the manufacturing, energy, and transport and other services sectors.

Simulations of short-run effects

For the short-run base case simulation, China is assumed to maintain a fixed exchange rate against the US dollar and rigid capital controls, while nominal wages are "sticky". The other regions specified in the model have inflation and CPI targeting, no capital controls, full short-run nominal wage rigidity in the industrial countries and fully flexible nominal wages elsewhere. Government spending in all regions is assumed to absorb a fixed proportion of GDP and the rates of direct and indirect taxes are constant, so that government deficits vary in response to shocks.

Five different macro-economic regimes were simulated to study the impact of the trade reforms:

- (i) rigid capital controls and fixed tax rates; monetary policy targets the CPI and the exchange rate floats;

- (ii) fixed exchange rate and fixed tax rates; there are no capital controls;
- (iii) fixed tax rates, monetary policy targets the CPI, the exchange rate floats, and capital controls are removed;
- (iv) rigid capital controls and a fixed exchange rate; the direct tax rate adjusts to maintain the government deficit as a fixed proportion of GDP; and
- (v) the closure is the same as (iv), however, capital controls are removed.

The short-run effects of the trade reform vary considerably under the different macro-economic regimes. When capital controls are in place and the exchange rate is fixed, the allocative gains from the tariff reductions are insufficient to offset the contractionary effects of the deflation that is due to the rise in the relative prices of foreign goods. When capital controls are weak, the trade liberalisation attracts increased inflows on the capital account and mitigates the real depreciation and associated domestic price deflation. The real volume of investment rises irrespective of the target of monetary policy, as does the level of GDP. The choice of monetary policy still matters, however, with CPI targeting leading to a smaller GDP price deflation, more modest gains in the real production wage, and better short-run GDP gains.

As with monetary policy, the impact of the different fiscal policies depends on the strength of capital controls. Given tight capital controls, if tax rates are held constant and the fiscal deficit expands, domestic interest rates rise and private investment is crowded out. Where income tax increases to compensate for the tariff cut, there is less pressure on the domestic capital market and the interest rate increase is less, as is the fall in investment. In the absence of effective capital controls, the case of no increase in the tax rates performs better than the alternative policy. The increased government borrowing draws in international savings at international interest rates and does not crowd out private investment. However, both fiscal policies give superior results in the absence of capital controls.

The key determinant of the short-run structural adjustment resulting from the trade liberalisation is the size of the real depreciation. The real depreciation is larger when capital controls are in place. Traded goods sectors such as light manufacturing are advantaged while non-traded sectors are not. When there are no capital controls, the manufacturing gains are smaller and the non-traded services sectors also benefit. Across the board, however, for the same reasons as in the long-run simulation, agriculture and food processing are disadvantaged by the reforms. It is important to note that some relaxation of the monetary policy regime can reduce the adverse effects in the agricultural sector from the trade reform. When capital controls are in place and the exchange rate is fixed, almost the entire agricultural sector is hurt. Where capital controls are in place but the exchange rate is floated, the “other crops”, livestock and fisheries sectors expand.

Employment in food processing falls regardless of the macro-economic policy regime, however. Significant structural change is required in the short run with the movement of employment from agriculture to manufacturing; however, in the long run, the size of the employment shift is smaller. Under either fiscal regime the greatest contraction in employment in food processing occurs when capital controls are tight and monetary policy targets the nominal exchange rate. Unlike the long run, employment in the other agricultural sectors is not necessarily contractionary—the outcome is dependent upon the macro-economic policy regime.

In summary, if capital controls are too tight and the fixed nominal exchange rate is retained, the reforms are deflationary. If the labour market is slow to adjust, employment growth will slow and the reform package will be contractionary. To obviate this, the government has to allow sufficient net inflow on the capital account to at least maintain the level of domestic investment. If it does not do this, a small nominal depreciation would achieve the same result. The fiscal policy response to the loss of import revenue has comparatively little influence over China's economic performance in the short run. Regardless of whether government spending or the government deficit is held constant, the optimal macro policy environment is a floating exchange rate with no capital controls.

In a follow-up study to Tyers and Rees (2002), Chang and Tyers (2003) analyse the slow-down in China's income growth since the Asian financial crisis. In particular, they examine the slow-down in rural income growth and the widening urban-income gap and ask to what extent this is due to: (i) the remaining obstacles to rural-urban migration (as suggested by Ianchovichina and Martin 2002), (ii) the WTO trade reforms (as suggested by Anderson *et al* 2002), or restrictive macro-economic policies. Using the GTAP model adaptation of Tyers and Rees (2002)³, the researchers test the extent to which China's fixed exchange rate and capital controls, and its WTO accession commitments, have contributed to the relatively poor performance in the rural sector. The Asian crisis was seen as leading to a large (largely illegal) outflow of capital. This capital flight and the trade reforms are hypothesised to have led to a real exchange rate depreciation. The pegging of the *yuan* to the US dollar has therefore necessitated a deflation. If wages are "sticky" and fall more slowly than prices, employment declines. It is hypothesised that the resulting real wage increase in the modern sectors has reduced labour demand and hence "bottled up" workers in the rural sector and reduced rural per capita incomes.

Analysis of the data shows that while restraints on rural-urban migration have been relaxed to some extent, the migration flow has decreased rather than increased. The simulation results support the hypothesis that the fixed exchange rate and the capital controls have restricted the flow of workers from the rural sector. The model shows the rate of migration into the manufacturing sector falling by at least one percentage point per year and

³ The key difference between the long-run analysis in this paper and that in Tyers and Rees (2002) is that in the model used for the simulations reported in this paper there is an assumed positive relationship between the trade reforms and productivity growth.

into the services sector by at least two percentage points per year. In all sectors there is a stark contrast between employment growth under tight capital controls and a fixed exchange rate regime on the one hand and an open capital account and floating currency regime on the other. Indeed, with an expansionary macro-economic policy and optimistic assumptions about the productivity effects associated with the WTO accession reforms, simulated worker relocation demands from the reforms exceed the average of China's recent rural-urban performance. This suggests that there is ample scope for a more rapid rate of migration of labour out of the rural sector, which would help reduce the rural-urban income gap.

Conclusions

Across the wide range of analysis carried out in this project, it is consistently shown that the trade reforms China adopted in order to accede to the WTO will mean substantial structural changes within the agricultural sector. Looked at from a partial equilibrium agricultural perspective, the reforms would be seen to result in substantial negative impacts across the sector and a worsening of food security in the sense of reduced access to income. However, it cannot be stated too strongly that the outcomes of the reform have to be analysed from an economy-wide perspective. In China, as in other rural-based countries, the main factors behind reductions in rural poverty will be the scope for rural households to earn off-farm income and for people to move from rural areas into industrial and services activities in urban centres. Therefore, to a very large extent, the success of the trade reforms will depend upon policies outside of agriculture.

There was considerable internal resistance to China joining the WTO, with concern over food security (more commonly seen in China as food self-sufficiency) and the perceived adverse impacts on the agricultural sector. The analysis carried out in this project has confirmed that structural change driven by productivity growth—which the trade reforms will promote—will lead to agriculture becoming a smaller and smaller part of the economy. As incomes increase, consumption patterns change, and the share of agriculture shrinks, China will become less self-sufficient in many commodities. However, because it has such a large population, China will always have to produce most of the foods that it consumes. As the modeling has shown, trying to hold this development at bay or reverse it would have exorbitant costs (Duncan *et al* 2003). No doubt, however, there will continue to be resistance to the reforms in agriculture. The large proportion of the population that is still supported by agriculture can be a significant political weapon. Unfortunately, resistance to reforms can prevent the potential for their incomes to increase from being exploited, thus providing further ammunition for arguments to provide government support for the sector. It is important, therefore, that the economic arguments against “food self-sufficiency” be made over and over.

The gap between urban and rural incomes has widened over the past decade or so. Partly, this is an outcome of the very rapid growth of the urbanised industrial and services sector. But it is also the result of a slowing of the

growth of rural incomes. This is partly the result of the slowdown in the growth of the TVE sector and the lessened opportunities for rural households to earn off-farm incomes. Incomes in the agricultural sector have not grown as rapidly as they could because of poor agricultural policies, such as ineffective and costly price support policies, regional self-sufficiency policies, and monopolistic marketing and distribution of bulk commodities, fertilisers and seeds (Wang and Duncan 2003). China's accession to the WTO should help to maintain pressure to bring about reforms in these areas.

The current government grain reserve system is inefficient in many respects and very costly. It is run by different government agencies at the central, provincial and municipal levels, each with different interests and not very clearly defined roles. These arrangements give rise to conflicting interests in operations dealing with market instability and cannot serve the goal of food security well. A smaller, well-managed grain reserve system with a clear, single objective would better serve this goal. However, it should be understood that grain markets will never operate efficiently while there is a government-run storage system, as it will crowd out efficient private storage.

The restrictions on rural-urban migration and constraints on the development of urban centres have also restricted opportunities for the rural-urban income gap to be reduced (Wang and Duncan 2003). The research shows that urbanisation has significant positive impacts on rural incomes and regional economic growth. The development of urban centres, particularly in inland regions, appears to be a matter of high priority. The "keep them down on the farm" policy of China (and many other developing countries) seems to be partly due to a concern about problems associated with urban development such as congestion and pollution. However, urban centres should be seen in a positive light. They exist because they provide efficiencies of scale and scope. Problems associated with cities largely derive from the lack of good planning of infrastructure, inappropriate property rights to land, and inappropriate taxes and subsidies. China should therefore persist with infrastructure development to promote inland cities as an offset to the geographical disadvantages of the inland regions. Otherwise, it will face continued pressures for migration to the coastal cities. Removal of the remaining restrictions on rural-urban migration and the discrimination against rural migrants should accompany the promotion of the development of urban centres.

It is shown that rural households in the coastal region will do best from the trade reforms as they have the most opportunity for earning income in off-farm employment (Jiang 2003). These opportunities arise because the non-agricultural industries in the eastern region benefit most from the trade reforms. This is partly the result of the bulk of private sector development having taken place in this region. The government should reduce its support of SOEs in the inland regions, which crowd out private enterprises. However, the private sector also needs government to provide infrastructure to overcome the geographical disadvantages of the inland regions.

The modeling has also shown that China's monetary policy regime of the fixed *yuan* and capital controls has increased the rural-urban income gap by raising real wages and reducing employment growth in the non-agricultural sectors (Chang and Tyers 2003). The results show that moving away from this monetary policy regime could lead to a much more rapid relocation of labour out of agriculture and thereby promote a reduction in the rural-urban income gap.

A monetary policy regime change could also reduce the adverse impacts of the WTO trade reforms on the agricultural sector. Modeling with capital controls in place and the fixed exchange rate results in almost the entire agricultural sector being adversely affected by the tariff reductions. Even partial relaxation of the monetary policy regime may reduce this adverse impact. For example, when capital controls are in place but the exchange rate is floated, the "other crops" livestock and fisheries sectors expand.

However, the government is right to undertake any change in its monetary policy regime gradually and cautiously, as shown by the Asian financial crisis. Adoption of a floating exchange rate would be premature, considering the underdeveloped state of China's financial sector, its only partially reformed banking sector, and its still-vulnerable state-owned enterprises. The priority at this stage should be to accelerate the reforms in each of these areas.

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