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HOW CHINA'S WTO ACCESSION AFFECTS RURAL ECONOMY IN THE LESS-DEVELOPED REGIONS: A MULTI-REGION, GENERAL EQUILIBRIUM NALYSIS

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Abstract

This study constructs a regional CGE model of China to analyze the differential regional impacts of China's WTO accession on agricultural production, trade, and farmers' income. The results show that China's WTO accession will generally improve the total welfare but will widen existing gaps among regions and sectors. It is expected that the agricultural sector will suffer if only agricultural trade is liberalized, as cheap imports of agricultural products, particularly grains, will increase and domestic agricultural production and farmers' agricultural income will decline. Full trade liberalization, i.e., lifting trade barriers in both agriculture and non-agriculture will benefit farmers and agriculture at the national level. However, the increase in rural income is still smaller than the increase in urban income, which implies that the rural-urban income gap may be further widened. Furthermore, among the regions, the less-developed rural areas will benefit little or even suffer because their major production activities and income sources are still from agriculture, especially from traditional agricultural activities such as grain production.

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Introduction

After 15 years of continuous efforts, China was finally admitted to the World Trade Organization (WTO) in December 2001. For the past 15 years, China has witnessed considerable progress in economic liberalization and reforms even without being a WTO member. This process is in harmony with the general trend of globalization elsewhere, which, through the flows of trade, financial capital, technology and information across national boundaries, has led to and will continue to lead to a restructuring of the world economy.

As a result of the economic reform and opening-up since 1979, China has achieved a remarkable rate of economic growth. The nation's GDP has grown at nine to ten percent per annum, outperforming most of the countries in the world. The reform was initiated in the agriculture sector, and has led to a rapid transformation in rural China. Grain output increased from 305 million tons in 1978 to 508 million tons in 1999, with an annual growth rate of 2.5 percent per annum. Such growth is much faster than the population growth rate of one percent per annum. The value added of agriculture rose at an even higher annual rate of 4.8 percent, due to increased diversification of agricultural production. Rapid growth in agriculture has led to an even more impressive reduction in rural poverty. At the beginning of the reforms, about one- third of the rural population (or 260 million people) lived under the poverty line, without access to adequate food supplies or income to maintain a healthy and productive life. In 1999, the number of rural poor declined to less than 34 million, accounting for less than four percent of rural population (MOA 2000). Many development indicators including agricultural products possessed per capita as well as average calorie and nutrition in-take have reached or even surpassed the world average. Various studies have shown a strong positive relationship between openness and economic growth based on data in the past several decades, and this relationship is particularly strong for low-income countries. Thus, it is almost certain that the WTO accession will accelerate China's economic growth by more integration into the world economy and by taking advantage of globalization.

However, the gains from the past reforms are not equally distributed among regions. The less-developed areas such as the Northwest and Southwest have gained very little. Regional inequality has become increasingly large over the last two decades (Kanbur and Zhang, 1999). With China's entry into the WTO, the less developed regions may suffer even more, as their economies are still predominantly agricultural. It is expected that agricultural prices will drop, leading to a decline in farmers' income. With poor infrastructure and a shortage in human capital in the less developed regions, it will be hard for farmers to switch from grain production to other high value-added crops or to non-farm activities. All of this may lend to increasing the concentration of rural poor in these regions if proper government policies are not implemented.

In this context, the objective of this study is to quantify the effect of WTO accession on China's economy at the regional level, particularly on the rural economy of the less-developed regions. The method of the study is to develop a multi-sector, multi-region CGE model and the model is utilized to analyze the impact of the possible trade policy changes after China joins the WTO. Previous CGE studies on China's WTO accession mainly focus on the possible impacts at the national level (DRC, 1998; USITC, 1999; Wang, 1999; Martin et al., 1999; Walmsley et al., 2000; Lejour, 2000; Fan and Zheng, 2000. Also see a comprehensive survey of CGE assessments of trade liberalization in China done by Gilbert and Wahl, 2000). While the aggregate effect at the national level is positive, it does not imply that all regions in China would benefit equally and some regions may be hurt given the existing gap among the regions in economic development and openness. Thus, a national-level assessment is obviously not enough to understand the impact of the WTO accession on China's economy, especially on agriculture and the well-being of the rural population. For policy makers, it is imperative to identify the region-specific adverse effects and implement appropriate policies to cope with them. The paper is organized as follows: We first give a basic description about the differences in economic development and openness among the regions within China. Then we employ a CGE model with disaggregated regional production to simulate the effects of the WTO accession on the agricultural and rural economy at the regional level,

particularly in the less-developed regions. Policy implications from the study and future research directions conclude the paper.

Regional disparities in the rural economy

We divide China into seven regions according to geographic location, agricultural production structure, and the level of economic development at the provincial level. The classification of the regions is listed in Table 1. Difference in economic development among the seven regions can be gauged by per capita GDP and agricultural share in regional GDP, as well as per capita income in the rural area (Table 2). Measured by both per capita GDP and rural income, the Northwest and Southwest are the two least-developed regions in China. In 2000, per capita GDP in the Southwest and Northwest is around 5,000 yuan, about half the income level in the East and South. The rural income gap between these two regions and the other five is particularly large. Per capita rural income in the Northwest and Southwest is 1,518 and 1,662 yuan, respectively, only 40 percent of the income level in the East. Shares of agriculture in these two regions (20 and 23 percent) are much higher than those in the other regions (11-15 percent), indicating farming is still a major source of rural income.

The difference in the share of the rural labor force employed by the rural non-farm sector is seen to contribute significantly to the regional gap in rural income (Rozelle, 1994). Many factors, including economic, social, cultural, geographical, and others, have restricted labor mobility in the less developed regions and such restrictions have been found to be a major contributing factor to the widening regional disparity (Kanbur and Zhang, 1999). For the nation as a whole, about 29 percent of the rural labor force in 1997 was engaged in nonagricultural activities, such as rural industry, construction and services, and the non-farm sector provided rural residents more than one-third of income. However, in Northwest and Southwest, the two less-developed regions, the percentage of the rural labor force employed in non-farm activities is below 20 percent, compared to 40 percent in the more developed areas such as the East.

With an overwhelmingly large share of the rural labor force employed in agricultural activity, labor productivity is low in the less developed regions. For example, labor productivity in the Southwest was half of the national average level in 1997. Poor natural resource endowments and infrastructure limit the potential yield of agricultural land, while the high illiteracy rate and the lack of investment and personnel in science and technology research restrain the adoption of new technology and the improvement of agricultural productivity. Moreover, the difficulty in accessing both national and international markets constrains the choice of cropping mix and the development of high value agricultural products in these regions. A study by Fan et al. (2001a) shows that the growth rates of agricultural land and labor productivities in the Northwest and Southwest have been far below the national average in the last two decades. With the rise in the gap of agricultural productivity and rural income between the less developed regions and the rest of the nation, the poverty incidence has been increasingly concentrated in the less developed regions. It is estimated that more than 60 percent of the rural poor population lives in the two less-developed regions (Fan et al. 2001b) despite containing only 20 percent of national population.

The difference in the degree of openness across regions might contribute to the income gap across regions as well (Kanbur and Zhang, 2001). After China adopted its "opening-to-the-outside-world" policy in 1978, the degree of the openness of China's economy, measured both by trade and foreign capital flows, increased dramatically. For example, the trade to GDP ratio quadrupled, from 8.5 percent in 1978 to 36.5 percent in 1999 (Wei and Wu, 2001). However, due to geographical and economic reasons, the degree of openness differs sharply among the provinces and regions. In Table 3, we use the trade-GDP ratio and per capita foreign direct investment figures to measure the gap in openness across provinces and regions in China. As Table 3 shows, the three-year (1997-99) average of the trade-GDP ratio was as high as 97 and 40 percent for the South and East, respectively, but as low as 7-9 percent for the Southwest, Central and Northwest. Similarly, the per capita foreign investment (in 1999) in the South and East was 1,860 and 1,452 U.S. dollars, but was only 90 and 121 U.S. dollars for the Northwest and Southwest, respectively.

The model and data

For the purpose of our analysis, we developed a China regional CGE model to evaluate the possible impact of China's WTO accession on the rural economy. Various sources of data are used in the study. A national level social accounting matrix (SAM) for China in 1997 is used as the base, with the crop sector being further disaggregated based on the GTAP (Global Trade Analysis Project, 2001) version 5 database (details on the sectoral aggregation are in the Appendix). The regional agricultural production data are compiled from *China's Statistical Yearbooks* or *China's Agricultural Yearbooks* and a three-year average (1996-98) for both input and output is used in the study. Due to data constraints, the regional categorization only covers crop production (9 sectors in the model), while other agricultural production (6 sectors), nonagricultural production (13 sectors), as well as all other economic activities such as trade and consumption are still kept at the national level. The parameters in the production function by region and crop are obtained from Fan and Zhang (2001), while other parameters are calibrated from the national level data included in the SAM.

Similar to most other CGE models that are neo-classical in spirit, the China-regional CGE model assumes that the representative producer for each production sector (in the case of crop production for each sector within each region) maximizes profits by making production decisions (chooses levels of inputs and outputs), and the consumers (aggregated into rural and urban) maximize their utility function by making consumption decisions subject to income constraints. While labor and capital are categorized as rural and urban, land is only employed in agriculture and returns to land go to the rural households.

Taking into account the rapid growth in rural non-farm activities, rural labor and capital are assumed to be involved in both agriculture and non-agriculture (while urban labor and capital are employed in non-agriculture sectors only). Shares of non-agricultural labor and capital in the total rural labor and capital supplies are calculated

according to the share of the gross value of rural industrial products in the gross value of national industrial products. As the rural industry is more labor intensive at the sector level, we allow the share of the rural contribution to be high in the labor-intensive sectors, such as in the textile, apparel, and construction sectors, while the share of the urban contribution is high in the capital-intensive sectors such as other industry, urban utility, and financial services.

In the model, all agents (producers and consumers) respond to prices; for example, when the relative prices change due to removing or reducing import tariffs, producers adjust their production level while consumers adjust their demand for commodities. In the international market, the country is assumed to be "small" in the sense that it takes world prices as given. Following a commonly used assumption in CGE models, there exists imperfect substitution between foreign goods and domestically produced goods, and hence, the domestic price for a commodity, e.g., wheat, is not necessary equal to (even though highly affected by) the world price for the same commodity. Detailed discussion of the "standard" structure of the CGE model can be found in Löfgren et al. (2001)

Also like other static CGE models, the China regional model has a medium-run focus. We report the results of comparative static experiments in which we first "shock" the model by changing or eliminating tariff and tariff equivalent rates and then compute the changed equilibrium solution. We do not explicitly consider how long it might take the economy to reach the new equilibrium, or what other adjustments (such as an increase in labor employment, more capital investment, technology transfer, productivity shifts, etc.) might occur as well. The model's time horizon has to be viewed as "long enough" for full adjustment of currently employed factors (including labor, land and capital) to occur, given the shock. While useful to understand the pushes and pulls the economy will face after introducing a shock, this approach has obvious shortcomings. In particular, it does not consider the costs of adjustment, such as transitional unemployment, that might occur while moving to the final equilibrium. Moreover, with its static features, the model does not consider many dynamic factors, such as the linkage

between opening-up and economic growth, which are statistically proven to be strong and important in explaining China's economic growth and rural development. In future work, we will account for the dynamic factors related to China's WTO accession.

The China regional CGE model is used to evaluate both the national and regional effects of China's WTO accession. A great deal is still not known about the terms of China's accession, and the U.S.-China agreement is the only agreement currently available to the public. Based on this agreement, upon joining the WTO, China agreed to reduce its average tariff rate on agricultural imports from 22 percent to 17.5 percent, as well as many of its current non-tariff barriers to trade, including quotas, import licenses and the use of state trading companies (see tables A1-A2 in Appendix for the commitment of tariff and non-tariff barrier reductions for selected agricultural commodities). In the model, we simulate China's WTO accession by three different scenarios: (1) reducing the level of the agricultural tariff rate and the tariff equivalent rate (which is used to capture the non-tariff barriers in the imports of grains, vegetable oil, and meat products) by 50 percent, (2) eliminating agricultural tariffs and non-tariff barriers, and (3) a combination of (2) with eliminating tariff protections in the non-agriculture sectors. Given the focus of the study on agriculture and the difficulty in obtaining non-tariff barriers data for non-agricultural sectors, the model does not take into account the reduction and elimination of any non-tariff barriers in the non-agricultural sectors, such as in the automobile industry and services, which are crucial components of China's commitments and would also generate a large effect on the Chinese economy. Furthermore, the study does not take into account the potential conflicts between China's domestic policies and institutional arrangements and WTO requirements. While the harmonization between China's domestic policies and institutions with China's commitments to WTO is a necessary condition to make the following effects happen (Colby et al., 2001), we have to ignore such important linkages in the current study due to the difficulties in quantitatively identifying these domestic policies and institutions.

Aggregate effect of China's WTO accession

At the national level, we focus on evaluating the effect of China's WTO accession on macroeconomic indicators as well as on agricultural trade, including imports and exports. As expected and similar to many other studies, China's WTO accession, by reducing or eliminating import tariffs, would benefit the economy at the aggregate level. The gain comes from a more efficient allocation of current factor endowments, which allows GDP and the level of consumers' aggregate consumption to rise. While fully liberalizing agricultural trade only (scenario 2) raises GDP by 0.23 percent, liberalizing both agricultural and non-agricultural trade (scenario 3) allows the gain in GDP to almost triple to 0.8 percent. The result is comparable with those from the other studies [e.g., China's GDP rises by one percent in USITC (1999) and 1.4 – 2 percent in Lejour (2000), in which the long-run cumulative effect of tariff reduction is taken into account]. With more imports of foreign goods at lower prices, the domestic price level declines. However, the decline mainly happens in agricultural prices when agricultural trade is liberalized. Once both agricultural and nonagricultural trade are fully liberalized, the decline in agricultural prices becomes much smaller and is comparable with the change in nonagricultural prices and the consumer price index, as well as the depreciation of the real exchange rate (Table 4). This comes from the higher demand for agricultural products due to higher income level after full liberalization.

If only agricultural trade is liberalized, rural income declines in both nominal and real terms due to the decline in agricultural income, including returns to labor employed in agriculture as well as to land and agricultural capital. In contrast, urban income rises in the same scenario. If both agricultural and non-agricultural trade are liberalized, agricultural and rural incomes increase both in real and nominal terms, even though the increase is still smaller than the gain in urban income (Table 4). These results warn us that the income gap between rural and urban areas may be further widened after China joins WTO, though liberalizing the non-agricultural sectors would help rural income rise.

Hence, partially analyzing the WTO effect by just looking at agricultural liberalization may overestimate the potential negative effect on the rural sector.

As usual, trade liberalization always stimulates trade, both in exports and imports. When the trade surplus is fixed at the base level, agricultural trade liberalization raises total trade modestly, as total imports and exports increase by six and four percent, respectively, at the border prices. These increases are mainly due to more agricultural trade. However, full trade liberalization allows total imports and exports to increase by 35 and 23 percent, respectively (Table 4).

Most of the increase agricultural imports comes from grains (except for rice), cotton, vegetable oils and meat products, while the gains in agricultural exports are concentrated in rice, vegetables, fruits, and other crops, an aggregated category that represents a variety of cash crops. Total grain imports more than double after restrictions on imports are lifted in the simulation. The increase in grain imports is driven by the surge in the wheat and corn imports. However, even though grain imports rise sharply, the ratio of imports to total domestic consumption is still below five percent with free trade in agriculture and non-agriculture, rising from two percent in the base. Among the four major grain crops, the ratio of imports to total domestic consumption rises to 6.5 – 7.3 percent for wheat (from less than one percent in the base), around ten percent for corn (from 4.6 percent in the base), 0.8 percent for rice, and 27 – 28 percent for soybean (from 15 percent in the base, see Table 5).

It has to be emphasized that the import-consumption ratios obtained from the model simulations still do not reach the expected limits set by the government. In our model, the mobility of land and capital among crops is realistically restricted at the regional level, while in many other studies agricultural resources are reallocated among different crops at the national level. In addition, by controlling labor mobility from agriculture to non-agriculture and the change in cropping mix in the Northwest and Southwest, we also take into account the reasonable constraints on labor migration, natural resources, and market conditions in these less-developed regions. Moreover, the

ratios are the result of full trade liberalization as simulated in the model (scenarios 2-3), which is obviously a long-term goal and far beyond the requirements of the WTO until the year 2004 (after China joins the WTO) (tables A1-A2). In the first scenario in which China only reduces agricultural tariff and tariff equivalent rates by 50 percent, i.e., from an average rate of 29 percent to 16 percent, the ratio of imports to domestic consumption for total grains is 2.6 percent and wheat imports only account for 1.6 percent of domestic consumption (Table 5).

With regional aggregation in agricultural production and reasonable constraints on the mobility of labor and other factors, agricultural production at the national level does not change too much, except for soybeans and cotton, in which output declines 11 – 22 percent and two – six percent, respectively, as the imported foreign goods replace domestic production. Even though imports of wheat and corn increase to a large extent due to the trade liberalization, output of wheat and corn only falls by 0.6 – 3.4 percent and 1.6 – 4 percent, respectively. On the other hand, the production of exportable commodities rises slightly due to an increase in exports (Table 6).

Differential effects of China's WTO accession at the regional level

At the regional level, we focus on the possible effect of China's WTO accession on rural income. Given the fact that non-farm income accounted for more than one-third of rural income at the national average level, but accounted for only 10 percent of rural income in the less-developed regions, in the model we assume that agricultural labor in the Northwest and Southwest cannot freely move into non-agricultural activities. Moreover, given the constraints of natural resources and market access conditions in these two regions, the choice of cropping mix and export opportunity are also restricted in these regions. Specifically, we assume that the exportable commodities are mainly produced by the other five regions while agricultural production in the two less-developed regions is only for the domestic markets. Moreover, production of rice, vegetables, and fruits is fixed in the Northwest at the levels observed in the base year's data.

Regional analysis reveals large differential impacts on agricultural production. For example, at the national level, wheat is expected to decline around three percent in the second and third simulations. But at the regional level, if only agricultural trade is liberalized, wheat production falls much more in the regions of Central, South, and Southwest than at the national level. If both agricultural and non-agricultural trade are fully liberalized, the East region becomes the fourth region where wheat production declines substantially. In the North, a major wheat production region, accounting for almost 60 percent of national wheat output, wheat production falls by only 2.1 and 2.6 percent, respectively, in the two corresponding scenarios. About ten percent of national wheat was produced by the Northwest region. Given the limit in the choice of cropping mix, wheat production actually slightly rises in this region in both scenarios (Table 7).

Given the difference in cropping mix, and especially the difference in the share of non-farm income in total rural income, the WTO accession has even larger regional differential effects on rural income. Four regions will benefit from the full liberalization (Table 8, scenario 3), while the less-developed regions will suffer; total rural income declines by 2.2 and 0.4 percent, respectively, in the Northwest and Southwest. The Northeast, the major soybean production region in China, will also suffer slightly due to a rapid decline in soybean production caused by the competition from imported soybeans and soybean oil. If only agricultural trade is liberalized, income falls in all of the regions due to the decline in agricultural income. In this scenario, the less-developed regions suffer disproportionately more than the other regions, as the rural income falls by 9.7 and 8.4 percent, respectively, in the Northwest and Southwest, compared to a 3.7 percent drop at the national level.

In the more advanced regions, such as in the East and South, non-farm income accounted for as high as 70–80 percent of total rural income (Fan et al. 2001b), while in the less-developed regions, the share was often less than 20 percent. Table 4 shows that the returns in the nonagricultural activities rise more than those in agriculture, which benefits the advanced regions as their non-farm income ratio is high. Moreover, as the

wage rate of non-farm labor increases more rapidly than the agricultural wage rate after the liberalization, more labor moves from the agriculture to non-agriculture sectors, which further benefits the developed regions, considering the fact that there are more non-farm employment opportunities. However, for the less-developed regions, as agriculture is still the main income source, rural households will gain very little from engaging in non-farm activities. With the decline in agricultural prices and the majority of the rural labor force still in agriculture, rural income declines in these regions. Table 9 exhibits the changes in the rural income by sources, while Table 10 displays the additional migration of rural labor from agricultural to nonagricultural activities due to the trade liberalization. If only agriculture is liberalized, about seven percent of rural labor in the other five regions would move from agriculture into non-agriculture, while fully liberalizing both agriculture and non-agriculture reduces labor migration to only two – four percent in these regions (Table 10). As a result of the decline in agricultural employment, rural income from agriculture declines by eight – ten percent among all regions if just agriculture is liberalized. If both agriculture and non-agriculture are liberalized, rural income from agriculture declines only slightly (Table 9). However, rural income from non-agriculture rises in the both scenarios, except for the less developed regions in which migration opportunities are limited. Among the five regions, non-farm income rises the most in the Central region instead of in the East and South, the two most advanced regions in China. This is because in the base, non-farm employment accounted for 40 and 31 percent of the total rural labor force in the East and South, respectively, but only 27 percent in the Central region. With the trade liberalization, the speed of labor migration and hence the increase in non-farm income in the Central region can be more rapid than in the East and South, even though the share of non-farm income in total rural income is still higher in the East and South than in the Central region.

The decline in rural income in the less-developed regions further affects poor people in these regions. The poverty ratio is already high in the less-developed regions. Moreover, in these regions the poverty ratio is strongly associated with the change in rural income (Fan et al. 2001b). Therefore, the careful design of government policies and the use of its limited resources to avoid the adverse effects of the WTO accession on the

less-developed areas deserve great attention both from China's policymakers, and researchers and international development agencies.

Policy implications: How WTO accession can stimulate growth in the less-developed regions

This study constructs a China regional CGE model to analyze the differential regional impacts of China's accession on agricultural production, trade, and farmers' income. We divide China into seven regions (for agricultural production), and 28 sectors, including 15 disaggregated agricultural sectors for grain, cash crop, livestock, and processed agricultural activities. We utilize the model to simulate China's WTO accession effects by reducing or removing tariff (and tariff equivalent) protections in the model. The results show that China's WTO accession will generally improve the total welfare with an additional increase of 0.8 percent in GDP, but will widen existing gaps among regions and sectors. It is expected that the agricultural sector will suffer if only agricultural trade is liberalized, as cheap imports of agricultural products, particularly grains, will increase and domestic agricultural production and farmers' agricultural income will decline. Full trade liberalization, i.e., lifting trade barriers in both agriculture and non-agriculture, will benefit farmers and agriculture at the national level. However, the increase in rural income is still smaller than the increase in urban income, which implies that the rural-urban income gap may be further widened. Furthermore, among the regions, the less-developed rural areas will benefit little or even be hurt because their major production activities and income sources are still from agriculture, especially from traditional agricultural activities such as grain production.

The difficulties in migrating to the non-farm sector (such as rural township and village enterprises, and cities) and in switching from grain to high value-added cash crop production are the two key factors that make the less-developed regions lag behind. The simulation results of our study show that these two constraints are the major reasons why the less developed regions may get hurt by the WTO accession. The study shows that the WTO accession may allow non-farm income to rise more rapidly than income from agriculture, especially from grain production. This would stimulate the advanced regions

to further increase non-farm employment and to shift from low-return grain production to high-return cash crops. While facing lower prices for grain crops due to the increase in import competition, farmers in the less-developed regions may have to return to traditional subsistence farming.

Therefore, there is an urgent need for policymakers to re-evaluate the current policies in order to minimize or avoid the adverse effects of WTO accession on the less-developed areas. The government has been implementing a *Western areas development strategy*, but Chinese agriculture, farmers, and rural areas in the less developed areas (the so-called Shan Nong problem) should receive a much higher priority in the development strategy. Since the majority of farmer income in the less developed regions still comes from agriculture, continued agricultural growth is the most effective way to increase farmers' income and to reduce rural poverty. Various studies have shown that growth in agriculture in these regions has the largest impact on poverty reduction through the so-called trickle-down process. In the near future, the increase in non-farm employment should also receive high priority once the effects of agricultural growth on poverty reduction are exhausted.

Apart from poor natural resources such as lack of water resources and poor soil fertility, the major reason why these less-favored areas still have a high concentration of rural poor is the past neglect of the government in public investment. As a result, the development of infrastructure, technology, and education is far behind the other regions. For example, in the Northwest and Southwest, the literacy rate of the rural population over 15 years old is often less than 50 percent, compared to 80 percent at the national level. In terms of agricultural R&D, although the number of agricultural researchers per 10,000 farmers is large in less-developed regions (e.g., in the Southwest and Northwest), spending per agricultural scientist is much lower than the national average (only half), indicating lack of operation funds for the research. Given that government spending in rural areas is unlikely to increase after China joins the WTO, it is necessary to target more government resources to the less-developed regions in order to maximize the

overall poverty reduction impact. More investments in these regions might lead to high economic returns as well, pointing out the possibility of a win-win development strategy.

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Table 1. Regions in the study

Region (Number of provinces included)	Province
Northeast (3)	1. Liaoning 2. Jilin 3. Heilongjiang
North (6)	4. Beijing 5. Tianjin 6. Hebei 7. Shanxi 8. Shandong 9. Shaanxi 10. Henan
Northwest (6)	11. Inner Mongolia 12. Gansu 13. Qinghai 14. Ningxia 15. Xinjiang 16. Tibet
Central (5)	17. Anhui 18. Jiangxi 19. Hubei 20. Hunan
East (3)	21. Shanghai 22. Jiangsu 23. Zhejiang
Southwest (3)	24. Sichuan 25. Chongqing 26. Guizhou 27. Yunnan
South (4)	28. Guangdong 29. Guangxi 30. Hainan 31. Fujian

Table 2. Major Economic Indicators in Seven Regions, 2000

Region	Population (10,000)	Per Capita GDP (Yuan)	AgGDP/GDP (%)	Rural Per Capita Income (Yuan)
Northeast	10,454	9,328	13	2,175
North	35,560	7,747	15	2,592
Northwest	5,409	5,317	20	1,518
Central	16,358	6,092	19	2,200
East	18,942	11,716	11	3,845
Southwest	19,027	4,496	23	1,662
South	15,545	10,280	15	2,733

Source: Fan et al. 2001b

Table 3. Measures of openness by province and region

Province/region	Trade-GDP ratio 3-year (97-99) average (%)	Per capita foreign investment 1999 (US$)
Beijing	68.9	3,129
Tianjin	72.5	3,067
Hebei	8.3	220
Shanxi	12.4	147
Inner Mongolia	7.4	96
Liaoning	31.0	1,033
Jilin	12.8	273
Heilongjiang	10.4	239
Shanghai	74.6	6,156
Jiangsu	30.6	1,011
Zhejiang	29.5	614
Anhui	7.9	145
Fujian	46.8	1,490
Jiangxi	6.3	115
Shandong	23.2	429
Henan	4.4	127
Hubei	7.1	274
Hunan	5.5	110
Guangdong[1]	136.7	2,968
Guangxi	9.5	231
Sichuan[2]	6.9	149
Guizhou	6.6	54
Yunnan	7.7	104
Tibet	12.1	100
Shaanxi	11.7	213
Gansu	5.3	72
Qinghai	6.5	172
Ningxia	11.9	151
Xinjiang	12.3	72
North	22.3	430
Northwest	8.7	92
Northeast	20.5	559
East	40.1	1,452
Central	6.7	163
South	96.6	1,860
Southwest	7.1	121
Nation	33.8	615

1. Including Ha inan

2. Including Chongqing

Source: *China Statistical Yearbook*

Table 4. Macroeconomic effects in the model

% change from the base year

	EXP-1	EXP-2	EXP-3
GDP	0.12	0.23	0.79
Total consumption	0.22	0.39	1.59
Consumer price index	-0.66	-1.70	-0.48
Real exchange rate	0.30	0.79	5.65
Level of agricultural prices	-1.67	-4.20	-0.35
Level of nonagricultural prices	0.17	0.42	-0.72
Value of total imports	2.24	6.10	34.67
Value of total exports	1.51	4.11	23.36
Rural income, nominal	-1.45	-3.66	1.55
Rural income, real[(1)]	-0.79	-1.99	2.04
Income from agriculture, nominal	-1.65	-4.33	1.36
Income from agriculture, real[(1)]	-1.00	-2.68	1.85
Urban income, nominal	0.54	1.39	3.63
Urban income, real[(1)]	1.21	3.14	4.14

(1) Normalized by CPI

EXP-1: 50 percent reduction in agricultural tariff rates

EXP-2: Eliminating agricultural tariffs

EXP-3: Eliminating all tariffs

Source: Model results

Table 5. Effects on the imports and exports for selected agricultural products

	Base	Exp -1	Exp -2	Exp -3
Imports, % change from the base				
Wheat		177.1	1007.4	1144.2
Corn		48.5	120.7	132.8
Soybeans		27.8	59.8	71.2
All grains		45.7	143.4	160.2
Imports/consumption, %				
Wheat	0.60	1.64	6.54	7.33
Corn	4.56	6.74	9.98	10.37
Soybeans	14.86	20.05	26.62	28.09
All grains	1.79	2.60	4.33	4.57
Exports, % change from the base				
Rice		5.05	13.46	19.11
Vegetables		4.89	13.68	21.50
Fruits		11.80	32.78	24.14
Other crops		11.07	31.08	23.86
Exports/production, %				
Rice	1.60	1.67	1.80	1.86
Vegetables	4.23	4.43	4.81	5.14
Fruits	4.88	5.46	6.48	6.06
Other crops	13.34	14.59	16.68	15.83

EXP-1: 50 percent reduction in agricultural tariff rates

EXP-2: Eliminating agricultural tariffs

EXP-3: Eliminating all tariffs

Source: Model results

Table 6. Change in agricultural output in the model

	EXP-1	EXP-2	EXP-3
Wheat	-0.57	-3.25	-3.38
Rice	0.28	0.65	2.08
Corn	-1.63	-3.98	-2.91
Soybeans	-10.71	-21.95	-22.08
Other oilseeds	-2.62	-5.22	-4.63
Cotton	-3.16	-6.41	-2.14
Vegetables	0.30	0.65	2.47
Fruits	0.93	2.43	3.07
Other crops	1.55	4.82	4.40
Livestock products	-0.73	-2.56	0.29

EXP-1: 50 percent reduction in agricultural tariff rates

EXP-2: Eliminating agricultural tariffs

EXP-3: Eliminating all tariffs

Source: Model results

Table 7. Change in crop production at the regional level, % change from the base

EXP-2	North	Northwest	Northeast	Central	East	South	Southwest	Nation
Wheat	-2.09	0.30	-3.54	-10.10	-3.16	-4.17	-8.77	-3.25
Rice	1.08	0.00	0.00	3.60	-4.74	-4.82	5.85	0.65
Corn and other cereals	-7.32	-0.19	2.30	-15.35	-11.75	-13.94	-25.95	-3.98
Vegetables	1.57	0.00	-3.26	-4.72	4.21	1.71	7.79	0.65
Fruits	4.66	0.00	2.16	-1.10	3.75	-0.52	-3.90	2.43
Soybeans	-23.11	-23.91	-16.82	-29.22	-34.40	-36.47	-38.29	-21.95
Other oilseeds	-0.51	1.01	-3.23	-8.64	-7.39	-9.28	-8.99	-5.22
Cotton	-7.52	-0.87	-7.98	-9.81	-7.71	-3.33	-3.84	-6.41
Other crops	4.30	13.50	8.62	0.63	5.77	7.34	4.94	4.82
EXP-3								
Wheat	-2.61	0.45	-0.70	-6.73	-6.73	-13.45	-8.25	-3.38
Rice	4.79	0.00	0.00	2.14	2.27	0.42	4.97	2.08
Corn and other cereals	-5.27	-1.66	1.26	-10.10	-8.43	-12.79	-13.38	-2.91
Vegetables	5.14	0.00	-0.34	-2.22	5.55	1.47	3.44	2.47
Fruits	5.11	0.00	9.18	1.02	1.46	-1.58	-3.22	3.07
Soybeans	-25.59	-26.23	-16.52	-28.04	-27.47	-29.49	-37.50	-22.08
Other oilseeds	-1.96	6.81	2.99	-5.80	-7.70	-10.15	-7.04	-4.63
Cotton	-2.49	2.54	-1.17	-4.83	-4.66	-4.80	-1.97	-2.14
Other crops	8.30	22.35	18.56	4.41	5.11	2.79	6.15	4.40

EXP-2: Eliminating agricultural tariffs

EXP-3: Eliminating all tariffs

Source: Model results

Table 8. Change in rural income by region[1]

% change from the base

	EXP-1	EXP-2	EXP-3
North	-1.62	-4.13	1.35
Northwest	**-3.77**	**-9.71**	**-2.21**
Northeast	-2.47	-6.09	-0.11
Central	-1.78	-4.50	1.29
East	-0.37	-0.92	2.89
South	-0.49	-1.19	2.93
Southwest	**-3.31**	**-8.43**	**-0.37**
Nation	**-1.45**	**-3.67**	**1.55**

1. Income from livestock production is not included

EXP-1: 50 percent reduction in agricultural tariff rates

EXP-2: Eliminating agricultural tariffs

EXP-3: Eliminating all tariffs

Source: Model results

Table 9. Change in rural income by source and by region

% change from the base

	EXP-1	EXP-2	EXP-3
Agriculture			
North	-3.70	-9.43	-0.87
Northwest	-3.77	-9.71	-2.21
Northeast	-3.94	-9.79	-2.07
Central	-3.37	-8.54	-0.64
East	-3.71	-9.40	-0.30
South	-3.51	-8.79	0.45
Southwest	-3.31	-8.43	-0.37
Nonagriculture			
North	1.15	2.93	4.32
Northwest			
Northeast	1.30	3.36	4.89
Central	1.95	4.99	5.82
East	0.67	1.72	3.88
South	0.71	1.83	3.91
Southwest			

Source: Model results

Table 10. Decline in agricultural labor by region

% change from the base

	EXP-2	EXP-3
North	-7.04	-2.28
Northwest		
Northeast	-7.70	-4.02
Central	-7.42	-3.95
East	-7.82	-2.14
South	-6.82	-1.82
Southwest		

Source: Model results

Appendix

Sector aggregation of the model

Agricultural and processed food sectors in the model:

Wheat
Rice
Other cereals
Vegetables
Fruits
Soybeans
Other oilseeds
Cotton
Other crops
Livestock and products
Meat, processing eggs and dairy products
Grain mill products
Vegetable oil and forage
Other agricultural products
Other food product

Manufacturing sectors in the model:

Fertilizer and pesticides
Agricultural machinery
Cotton textile
Other textile
Wearing and apparel
Leather product
Other industry

Service sectors in the model:

Electricity and other utility
Construction
Transport services
Sales services
Finance services
Social services

Table A1. Selected tariff cuts:

Item	Base (%)	2004 (%)
Beef	45	12
Pork	20	12
Poultry	20	10
Citrus	40	12
Grapes	40	13
Apples	30	10
Almonds	30	10
Wine	65	20
Cheese	50	12
Ice cream	45	19

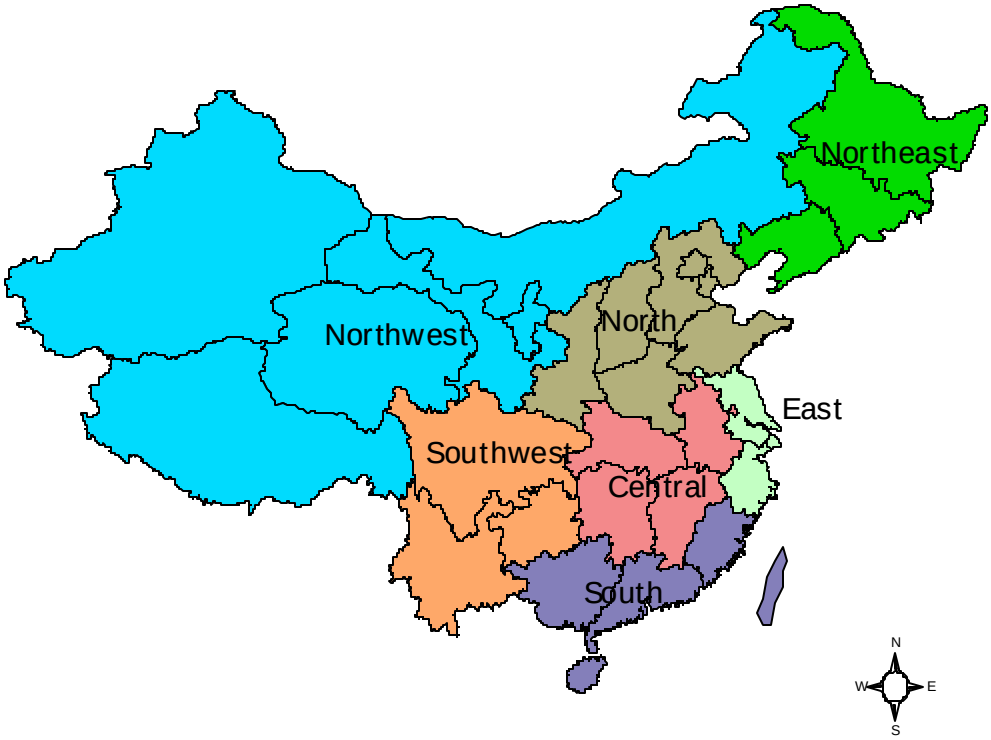
Source: U.S.-China bilateral agreement.

Table A2. China's TRQ system quotas, tariff rates, and private trade share

	Quota amount		In-quota tariff	Over-quota Tariff		Private share	
	2000 (mil tons)	2004 (mil tons)	tariff (%)	2000 (%)	2004** (%)	2000 (%)	2004** (%)
Wheat	7.30	9.64	1	77	65	10	10
Indica rice	1.33	2.66	1	77	65	10	10
Japonica rice	1.33	2.66	1	77	65	50	50
Corn	4.50	7.20	1	77	65	25	40
Cotton	0.74	0.89	4	69	40	67	67
Soy oil /1	1.72	3.26	9	74	9	50	100

** 2004 is the final year of implementation for every commodity *except* soy oil (see footnote 1 below).
/1 The final year of implementation for soy oil is 2005 (the TRQ quota reaches 3.26 million tons); for 2006 the TRQ is eliminated, converting to 100 percent private trade with a tariff rate of 9 percent.
Source: U.S.-China bilateral agreement.

Appendix 2: Chinese map with seven regions



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