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China's WTO Commitments in Agriculture:
Does the Impact Depend on OECD Agricultural Policies?[*]

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Abstract

This study provides a preliminary assessment of the potential effects of implementing China's WTO agricultural commitments. Particular attention is given to the integration of the actual commitments into the global GTAP database and to the explicit modeling of the newly introduced Tariff Rate Quotas for major crops. The results show that China's import of agricultural commodities will increase (in particular the imports of grains), and that in general there will be a slight contraction of output and a modest expansion of export in agriculture. The impact on the Chinese welfare is limited as the positive efficiency gains are negated by a terms of trade loss. Although the results found seem to generate an unfavorable picture for the Chinese agricultural sectors in the short run, this is by no means as alarming as feared by some observers.

To explore the perspectives of Chinese agriculture in the continued multilateral agricultural negotiations, we further conduct a few counterfactual scenarios. The simulations clearly illustrate that many of the negative effects on China caused by the implementation of the WTO deal can be limited if the more protectionist rich countries take action to reform their agriculture policies. The scenarios on reforming domestic supports and market access in three rich economies show that, although they produce differential impacts, both of them affect the results non-negligibly. Therefore, continued agriculture liberalization requires paralleled efforts in both these two areas in the OECD countries.

Introduction

China's accession to the World Trade Organization has led to numerous studies and speculations on the potential effects on China and the world economy. In particular, the commitments in agriculture have been debated intensively both within China and around the world. This is partly due to the size of China's population—the question of "who is going to feed China", and partly due to the fact that agriculture in China remains relatively inefficient and is largely based on very small scaled and labor intensive farms. Further, a very large part of the Chinese population is either full time or part time employed in the rural areas of China. The continued declining of China's agriculture, relatively to its booming industry and service sectors, only attaches more importance to this issue.

To what extent will the implementation of China's commitments affect the Chinese agriculture production and trade? Does it affect China's self-sufficient policy in a negative way? Is this a significant offer to the rest of world? What is the impact on the world market? Will China become a major importer of agricultural commodities? These are the questions that have been studied and debated intensively by numerous studies. Another set of questions goes beyond China's accession and considers the possible consequences of further agriculture trade negotiations after China's entry. What is the world's response to China's joining of the WTO? If China's offer is significant, what can the world do to help China in integrating into the world trading systems? Part of answer lies in reforming the protectionist agricultural policies in the rich OECD economies. Will the removal of the protectionism measures in the OECD economies help China in coping with the possible negative impact in agriculture? Studies along this line are relatively few. But these questions will certainly surface when one looks beyond China's WTO entry.

In this study, we try to provide some insights in answering both sets of questions, using a global general equilibrium model that contains sufficient details in agricultural sectors and that allows the examination of China and OECD countries' policies. Our efforts are partly motivated by the recent release of the actual commitments by the Chinese government. We believe that using the actual offer will give a more accurate assessment, compared to earlier studies based on counterfactual experiments. We have also made considerable efforts in conducting a more realistic starting point where the implementation of the WTO offer will take place. These efforts are also embodied in constructing the scenarios for examining the interaction between OECD and China. A review of the literature below will provide some justifications and motivations for conducting this study.

Literature Review

Among the existing studies, there seems to be some agreements that China's agriculture as a whole will suffer in the short run as cheaper foreign goods gain greater access to the Chinese market, while the impact on the world market will be moderate. However, predictions on different sectors are divergent among these studies. One possible reason is that many of the previous quantitative studies conduct counter-factual liberalization scenarios based on hypothetical unilateral liberalization by China, as opposed to the actual commitments. Studies on full trade liberalizations (covering all the sectors) by China are abundant. Some recent examples are Lejour, Zhai and Li, Fan and Zheng. Most of these studies consider agriculture as a whole and none of them take into account the actual commitments made in the accession agreement. Thus, neither do they provide the sectoral results nor do they give the realistic impact from the actual commitments.

Examples of the studies focused on agriculture are Fuller *et al.*, Huang *et al.* (1998) and Diao *et al.*. Fuller *et al.* assesses the sectoral impact of China's WTO entry using a partial equilibrium model and shows that domestic food price in China decreases while per capita consumption goes up, reflecting rising import and limited export expansion. According to their study, there is no sharp decrease in food self-sufficiency for China and the impact on world market prices are positive but moderate. Huang *et al.* also uses a partial equilibrium model to evaluate the impact of full trade liberalization by China and their results show that China will be a net importer of grain but a major exporter of pork and poultry meats. China's ability to expand export of meat products is criticized by Schmidhuber on the ground of unfavorable sanitary conditions. Diao *et al*. constructs a regional CGE model and shows that China's agriculture sector will suffer if only agriculture trade is liberalized. Except for the Fuller *et al.* study[1], none of the above studies are based on the actual commitments made by China. This calls for analyses based on the actual commitments.

Not only many of these studies did not have the chance to consider the actual tariff cut, but also they applied questionable initial protection levels for China (upon which the cuts are based) and simplistic treatment of more complex policy measures. For example, the bilateral tariff rates for wheat are in the range of 70 percent to over 100 percent in the Global Trade Analysis Project database (GTAP for short, see Dimaranan and McDougall), while these are 14 percent in Fuller *et al*. According to the WTO document on China's accession (see WTO), the bound tariff rate for wheat in 2000 is 74 percent. Another example is the Tariff Rate Quota (TRQs) regimes that China will implement for corn, rice, wheat and cotton. These TRQ regimes are often not represented and modeled in the previous studies. According to the data from the WTO and FAO (see Table 1), the quotas for wheat and rice are set at very high levels, relatively to the actual imports, while the quota for corn is almost binding. Implementing these TRQs may cause very different results among theses crops, due to the initial quantities of imports.

Clearly the assessment of the impact of implementing the WTO commitments can be improved and be more precise, if a more accurate representation of the current Chinese agricultural protection measures and the WTO commitment is applied. In this study, we try to formulate our analysis more concretely.

The typical approach followed by many of the quantitative studies on China's entry assumes no policy changes for the rest of the world when China liberalizes its policy. While this is the right way to gauge the impact on China itself and the world, it is nonetheless not sufficient to measure the impact of China's WTO entry, relative to the possible effects of continued multilateral trade negotiations in agriculture. Furthermore, this approach ignores any possible feedback of the multilateral agricultural liberalization on implementing China's WTO commitment. An illustration by Frandsen *et al.* shows that even a partial removal of EU's domestic support has a significant impact on world output and world market prices and decisively changes the "environment" of the world agriculture market. The Producer Support Estimates (PSE Tables, see OECD) quantifies these distortionary measures in OECD countries. Realizing theses limitations, we try to push the impact assessment one step further, by conducting several counter-factual liberalization scenarios in which major OECD countries also liberalize their import barriers and domestic support measures. Impact on the world market and China from these scenarios is compared with a base case (without policy changes in China) to show the relative impact brought about by China's WTO entry. It also

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[1] Actually, even this study only considered some of the bilateral agreements with China, not the final commitments declared by the Chinese government and the WTO.

illustrates the perspective of China's agriculture sectors in the post-entry era when agriculture negotiations continue. This is the second motivation of this study.

To summarize, in this study we analyze the impact of implementing China's WTO commitment on China's agriculture sectors and on the world market. We also explore how these effects can be changed if major OECD economies, namely the USA, the EU and Japan, remove their protections in agriculture. The analysis is expected to show that the impact of these economies' agricultural policy reforms on the world market is far greater than that caused by implementing the commitments made by China; and that the elimination of these distortions caused by them will provide a fairer "environment" for China to implement its WTO commitments. Thus, to continue multilateral agricultural trade liberalization and to promote economic development for developing countries, there is much to do in reforming both developing and developed countries' agricultural policies.

Methodology, Data and Policy Scenarios

To achieve our objectives, we conduct various policy scenarios to simulate the impact of implementing China's agricultural commitment as well as the impact of the policy changes in three major OECD countries (the USA, the EU and Japan). Initially we construct a base case to project the world economy from 1997 to 2005. This base case provides a benchmark against which these policy scenarios are analyzed. The CGE model of the Global Trade Analysis Project (see Hertel) and database (Dimaranan and McDougall) are employed. To incorporate the important TRQ regimes, the model is modified according to Elbehri and Pearson's work on TRQ modeling. Also, additional data are employed and incorporated into the GTAP database, which includes the macroeconomic projections used to update the GTAP database in 1997 to 2000 and 2005, China's WTO commitments, trade volume data from the FAO for the TRQ commodities, etc.

The section begins with a description of China's WTO commitments followed by a brief introduction of the commodities and regions covered in this study. Then we present the construction of the base case and the alternative scenarios analyzed in this paper.

China's WTO commitments in agriculture

The WTO database on China's WTO commitments (see WTO) specifies both the initial and the final bound rates, and the implementation period of tariff reductions. These are defined at HS 8-digit levels. Agriculture and industry TRQs are also contained in the database—for agriculture TRQ commodities (wheat, corn, rice, soybean, sugar, wool and cotton), information on the initial and final quotas, the implementation period, the staging of the quantity and the share between State Trading Enterprises (STE) and private traders, is included. We aggregate these tariff rates from the 8-digit level to the GTAP sectoral classifications[2]. Where trade quantities are available, we also include the TRQ regimes for the TRQ products. These are summarized in Table 1.

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[2] Our aggregation starts with the tariff lines at 8-digit level. Due to the lack of trade data at 8-digit level, we apply the simple average of the tariff data in many of the cases. However, we have tried to discern the most important tariff lines within an aggregated group according to our best knowledge of the trade situation. This exercise of judgment implies that for many of the key crops, the aggregated tariff rates reflect those for the most important lines. The aggregation involves two steps—in the first step, we aggregate the tariff lines into GTAP aggregation, while in the second step we aggregate GTAP tariff lines into the 25 aggregated commodities in this study. In the second step, however, we conduct weighted average using the trade data from GTAP. Please note that the adjustment to the Chinese tariff rates in the

For non-TRQ crops, the tariff rates will mostly fall to around 10 percent for crops. For example, tariff rates for plant-based fibers and vegetable oils will go down from 11.3 and 20.5 to 8.9 and 10.8 percent, respectively. For animal products, the final bound rates will be somewhat higher but the cuts are also significant, e.g. from 21.7 to 15.8 for beef and lambs. For TRQ commodities, although out-of-quota tariff rates will remain substantial, quotas are nonetheless set to very high level. The out-of-quota tariff rate for wheat will decrease from 74 to 65 percent. However, the in-quota tariff rate is only 1 percent. Furthermore, quotas are expanding at a considerable rate, e.g. quota for wheat is set to expand by over 20 percent at the end of the implementation period. Moreover, compared to the total imports in 2000 (from FAO), quotas for wheat and rice are much higher than imports in 2000, suggesting possibly low quota-fill rates at the end of the implementation and virtually free access to the Chinese market. Failure to model these TRQ regimes (especially for wheat, corn and rice) will lead to erroneous results since the gaps between the in-quota rates and the out-of-quota rates are huge[3].

Overall, the concession made by China is impressive, as many of the agriculture sectors will have considerably lower bound tariff rates. The TRQ systems also provide some market access opportunities for China's trading partners. If indeed they serve only as an interim step towards total tariffication, it would lead to more market access in the future. This seems to indicate China's determination in integrating its agriculture into the world trading system. It is no doubt a very positive first step towards the next phase of agriculture liberalization.

Sector and regional aggregations

Since this study is focused on China, including the impact of major OECD countries policy on China, we use a smaller regional aggregation of the GTAP database, which consists of 7 regions, namely China, Australia and New Zealand, Canada, USA, EU, the rest of East Asia and South East Asia, and the rest of the world. The sectoral aggregation consists of 20 agriculture and food products, as well as 5 aggregated other sectors (natural resources, manufacturing, textiles, services and forestry and fishes). To facilitate reading the results, descriptions of these sectors are included in Appendix Table 1.

Policy Scenarios

The implementation of China's WTO commitment will be completed by 2005. To evaluate the impact of these commitments, we first conduct a base case that reflects our projection on the world economy in 2005. This base case incorporates the World Bank's projection on real GDP, population, skilled and unskilled labor growth and productivity changes during the period of 2000 to 2005. No policy changes are conducted in this benchmark. Since we use the GTAP version 5 data base, which has 1997 as its base year, the first step towards such a base case is to update the 1997 data base to 2000, by targeting the real GDP growth while taking into account of population growth, changes in skilled and unskilled labor force and productivity changes in that period. The second step is to update relevant policy instruments, namely the tariff rates for China in 2000 and the latest domestic support data as published in the OECD PSE tables. The latter is important as its correct

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GTAP database occurs in the aggregated GTAP database used in this study. This way, we avoid the problem of changing the original database.
[3] We have modeled TRQs for wheat, rice and corn in our model and we plan to do the same for sugar, cotton and vegetable oils.

representation plays a key role in our counterfactual scenarios. The final step in building the base case calls for a projection procedure toward the world economy in 2005, using macroeconomic projections. These three steps are summarized in Box 1.

The base case provides a platform against which various policy scenarios can be compared. The first of these scenarios is the implementation of China's WTO commitment in agriculture, while all the other policies as reflected in the base case data (in 2005) are maintained and unchanged. This scenario is largely similar to the previous studies on China's WTO accession. However, using the real commitment data, together with the important TRQ regimes for rice, wheat and corn, our experiments give a more accurate and realistic assessment.

Box 1. Experiment Scenarios

Base case: projection from 2000 to 2005 with no policy changes.

Step1. Project the GTAP 5 database from its base year of 1997 to 2000, targeting real GDP growth and taking into account of population growth, changes in skilled and unskilled labor forces, and productivity changes;

Step 2. Adjust the database from Step1. This includes incorporating China's initial bound tariff in 2000; building the TRQ structure into the model and database, using WTO data and FAO statistics; and updating the domestic support data to 2000, drawn from the OECD PSE tables version 2000, for major OECD countries (EU, USA and Japan);

Step3. Project from 2000 (the database from Step 2) to 2005, targeting the World Bank's projections on real GDP and taking into account of population growth, changes in skilled and unskilled labor forces, and productivity changes.

Policy scenarios against the base case:

Scenario 1.   China implements its WTO commitment in agriculture, including tariff cuts and the expansion of quotas for TRQ commodities

Scenario 2.   Scenario 1 plus EU, USA and Japan removing their tariff, export subsidy, and domestic support (output subsidy and payments on the use of land and capital in agriculture).

Decomposition Scenarios:

Scenario 3.   Scenario 1 plus tariff removal in EU, USA and Japan.

Scenario 4.   Scenario 1 plus the removal of export subsidy and domestic support (output subsidy and subsidy on the use of land and capital in agriculture) in USA, EU and Japan.

Scenario 2 analyzes the impact of both the implementation of China's WTO commitments and the hypothetical changes in the policy in three main OECD countries (USA, EU and Japan)—namely, a

complete removal of border protection, export subsidies and domestic support (output subsidies and payments based on land and capital employed in agriculture). Combined with Scenario 1, this alternative scenario is used to illustrate how the impact of implementing China's WTO deal changes when the "environment" is different. It also serves the purpose of showing the perspective of further multilateral agriculture negotiation after China's entry. A third and fourth scenarios complete the exercises by considering the differential effects of liberalizing OECD countries' domestic support and border protections on implementing China's WTO commitments.

Scenario 1: Implementing China's WTO commitments in agriculture

Agriculture trade and production

Implementing its WTO commitment causes importing prices in China to decline for most of the agricultural and food products (see Table 2), most notably for wheat (-41.5 percent), rice (-41.8), corn (-13.1), and milk (-12.7), and also substantial for beef and lamb (-4.8) and sugar (-8.4). The decreases in import price for vegetable and fruits, plant-based fiber and other crops are moderate (under 5 percent). This decline causes an increase in imports, albeit at different rates for different commodities. For example, wheat and rice imports increase by over 150 percent, milk imports go up by 21 percent and corn imports go up by almost 17 percent. There is also a small decline in oilseeds imports, which can be explained by the very small tariff cut (from 8.5 to 8 percent).

The increased imports for non-TRQ commodities are obvious, given the tariff cuts on them (Table 1), while the changes for the TRQ commodities warrant some explanations. For example, the cut from 74 percent to 65 per cent for rice, wheat and corn results in different impact on the market prices of imports and total quantities of imports. The decrease of more than 40 percent for wheat and rice indicates a much larger impact than that from a simple tariff cut from 74 to 65 percent. From Table 1, one can see that in year 2000, the actual import-quota ratio is very low for wheat and rice but very high for corn, suggesting that the quota for wheat and rice may not be binding while that for corn may be reached after implementing the WTO commitments. This is indeed the situation from our calculation. The quota fill rates are about 60 percent for wheat and 15 percent for rice (implying effective tariff rates at 1 percent), but the quota becomes binding for corn and the effective tariff rate is about 51 percent[4]. On the export side, our results (lower half of Table 2) show positive increases in export of all the agricultural sectors, due to lower domestic and exporting prices, which are pushed down by the cheaper imported goods. The notable increases are exports of other animal products, pig and poultry meats, and oil seeds. However, the changes are smaller than predicted by Huang *et al.* (1998).

What does this imply for the domestic agriculture production in China? Table 3 (second row) reports the percentage changes in these sectors. Wheat is the most affected commodity as its output contracts by more than 12 percent, which is influenced by the huge increase in the import side. However, rice output is not affected much as the decline in rice output is just under 1 percent. This can be explained by the fact that only a small portion of rice is traded. Even a doubling of rice imports only contributes to a slight decrease in domestic rice production in China. The decline in corn output is also minor, less than 1 percent. Apparently the protection provided by the TRQ regime works in favor of Chinese farmers. Apart from the TRQ commodities, the other noteworthy changes can be found in vegetable oil, milk and sugar, in the range of 2 to 5 percent. The other

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[4] Please note that the 17 percent increase in corn imports is smaller than the percent changes in the quota from 2000 to 2005. This is because this percentage change is based on the base case, which projects higher corn imports than in 2000.

changes come from vegetable and fruits, pig and poultry meats, and other animal products, all of which experience smaller positive changes in output.

Self-sufficiency in agriculture

Does China's entry into the WTO harm China's self-sufficiency agriculture policy? This is the concern expressed by some people. Although our results show an adverse impact on most of the agriculture sectors in terms of the increased imports and the slight contraction of output, they by no means indicate a substantial overall danger to the viability to the Chinese agriculture sectors, except for selected commodities, notably wheat. A comparison of self-sufficiency rates under alternative scenarios are compiled in Table 4. Compared to the base case, only the self-sufficiency rate for wheat declines notably. In several other cases (e.g. other crops and oils seeds), this rate even improves slightly.

Welfare effects and the impact on the world market

Agriculture tariff reduction and the introduction of the TRQ regime result in allocation efficiency gains. This is a result of the removal of the excess burden associated the tariffs. On the other hand, cheaper imported goods dampen the domestic market price and thus lower the exporting prices. Together with slightly higher world market price for imports (due to increased import demand by China), this tends to create negative terms of trade effects, thereby negating some of the gains from more efficient use of resources. Overall, the welfare impact on China from implementing its WTO commitments in agriculture is very limited.

The impact on the world agricultural market appears to be limited too. As shown in Table 5, the only notable changes come from wheat. The world import/export price index for wheat increases by just over 0.3 percent, while this index for other agriculture commodities increases by even smaller percentages. Total world trade increases by more than 7 percent for rice, more than 4 percent for wheat and about 1 percent for vegetable oils and fats. For most other commodities, growth in world trade appears to be very small. The major beneficiaries of China's expanded import demand are Australia, New Zealand and the USA, as the output of wheat, corn, vegetable oil and rice in these countries expands (Table 6).

In general, China's implementation of its WTO commitments in agriculture will benefit the rest of the world as China's imports for a number of commodities expand, which boosts the domestic production in a number of regions. As a result of improved terms of trade and more efficient resource allocation, all the regions included in this study will enjoy moderate welfare gains (not shown here).

Scenario 2: Impact of reforming policies in OECD countries

In the second scenario, we conduct an experiment to illustrate how the impact of China's WTO commitments in agriculture can be changed when border protection as well as output subsidies and payments based on land and capital in three OECD countries are removed. Removing these three regions' market access restrictions will improve the market opportunities for Chinese products. Recall that China's export in the first scenario only shows very modest increases. The removal of output subsidies and land and capital based payments in the OECD regions is also expected to generate significant impact on the world agricultural markets. While the removal of output subsidies

will lower excess output and raise world market price, elimination of the payments to land and capital (both being coupled with production) will in general increase the marginal cost of production (paid by farmers) and reduce the competitiveness. At the same time it will cause a reallocation of capital and land among agriculture sectors. All of these point to a lower agriculture production in these regions and higher world market prices. Thus, we expect to see improved export opportunity for China and possibly less imports into China.

We first look at changes in China's agriculture trade. As shown in the seventh column of Table 2, the decreases in market prices of imports are less than in the first scenario for all the agricultural commodities. In some cases, market prices for imports even increase. For example, market price for wheat, corn and rice imports decrease by about 36, 10 and 40 percent, respectively, in comparison to about 41, 13 and 42 percent in the first scenario. For oil seeds, market price for imports even increases by 10 percent. Taking out the impact of the reduced tariff rates, this reflects higher world market prices and a somewhat lower Chinese imports, as compared to scenario 1. This is certainly the case for wheat, oil seeds, milk, rice and sugar (as shown in the third column of Table 2). Despite higher market price for import, however, we do observe increased imports for several other commodities, e.g. vegetable and fruits, plant-based fiber, and many of the meat products. This is due to the activities on the export side, where higher world market prices boost China's agriculture export and hence domestic prices (see lower half of Table 2). Take vegetable and fruits as an example. The world export price faced by China increases by over 2 percent, and the Chinese export of vegetables and fruits increases by almost 40 percent. However, its output only expands by 0.5 percent (Table 3), which makes imports more desirable (8.1 percent increase), despite the moderate decrease of 1.3 percent in the market price of imports of the commodities.

The expansion of agriculture output in China is most visible for plant-based fiber, milk, sugar, corn and oil seeds (Table 3). The production of meats and other animal products also increases notably. The decline in rice and wheat output is also smaller (at 9.4 percent and 0.6 percent, respectively). This general expansion in agriculture output leads to improved self-sufficiency rates for most of the agriculture commodities (Table 4), in comparison to the results from Scenario 1, where policy changes are only conducted for China.

In summary, our hypothetical experiment shows that indeed if the implementation of China's WTO commitment in agriculture was operated in a world of greater market access opportunities and fewer domestic supports in the three key OECD countries, the problems faced by China's agriculture sectors would be less challenging.

Scenarios 3 and 4: Market access reform vs. domestic support reforms

We now turn to the discussion of our last two scenarios, which compare the impact of liberalization of OECD market access (Scenario 3) and domestic supports (scenario 4) on China's WTO implementation. Recall that in Scenario 2, the combined forces of these two factors drive the results. Thus, Scenarios 3 and 4 provide a decomposition of the effects from these two forces.

Market access reform reduces the barrier for exports into the three biggest economies and leads to higher price for exports from China. As can be seen in the lower half of Table 2, export prices for most of the exports from China go up and exports indeed increase. Moving up to the upper half of the same table, we can see that market prices for imports into China decrease, but to a lesser degree as compared to Scenario 1. This is because world market prices are generally being pushed up by

import demand in the USA, Japan and the EU. The changes (decreases) in imports in this scenario exceed the changes in Scenario 1 for all the agricultural commodities. This seemingly contradicts the smaller decrease in market prices for imports. Again, this is because the greater access to the markets of Japan, the EU and the USA pushes up China's exporting and domestic prices and thus imports become more desirable—even when domestic output in China goes up. In fact, most of the output expansion as seen in Scenario 2 can be attributed to the improved market access in this scenario—the changes in output (listed in Table 3) show this point. For some commodities, output results from this scenario even exceed those in Scenario 2, as the reform of domestic support in Scenario 2 negates some of the expansion effects (as reported here). An example is plant-based fiber—its output in China goes up by 6.1 percent, which is over the 4.7 percent in Scenario 2, while in Scenario 4, it decreases by 1.7 percent. Apparently, these two types of policy changes affect China's agriculture in different ways. We now turn to the discussion of the reforms of OECD domestic support.

Compared to the market access liberalization scenario, the elimination of domestic support, especially the reduction of payments to land and capital, leads to a re-allocation of these resources among agriculture sectors in the three regions (especially the USA and the EU), and hence differential output effects. In general, China does not import as much as in Scenario 3, while exports from China are also smaller than in Scenario 3, except for corn, oil seeds and sugar. The pattern of the changes of output is similar: outputs for most of the commodities are smaller than in Scenario 3. The reason is that the limited contraction of output in the three OECD economies (compared to market access reform in Scenario 3) leaves fewer exporting opportunities for China. An example is the movement of land from wheat production to plant-based fiber and other crops in the USA. As land based payments to wheat have a much higher ratio in the total production values than in the latter, according to the OECD PSE tables, a complete removal of the payments in these sectors causes increased use of land in plant-based fiber and other crops. Maintaining the border protections in this scenario causes output for other crops and plant-based fiber to even increase in the USA. As a consequence, China's domestic output of plant-based fiber is pushed down by 1.7 percent.

In summary, both the improved market access and the reduction in the domestic support in the three OECD regions change the effects of implementing China's WTO commitments—the former affects the results in providing more market access opportunities and leads to universally more exports from China and greater domestic output, thereby negating much of the negative impact that is brought about by implementing the commitment alone, while the latter changes the resource allocation among agriculture sectors in the three OECD countries and generates differential output effects and to a lesser degree price effects. These also place a non-negligible impact on China, especially the positive output and export perspectives in the sectors of corn, oil seeds and sugar.

Conclusions and discussions

In this study, we provide a preliminary assessment on the potential effects of implementing China's WTO commitment on agriculture on China and the world market. Efforts have been devoted to constructing data and scenarios to reflect the actual commitments made by China as well as to explicitly modeling the newly introduced TRQ regimes for major crops. Our results of implementing the commitments against the base case (with no WTO commitments) illustrate that China's agriculture sectors might suffer a minor overall losses in terms of a lower level of

agricultural production, a limited export outlook, and increased imports, particularly in grain. This is due to China's unilaterally liberalization of part of its distortionary agricultural policy. The overall welfare results seem to be limited as the positive efficiency gains are negated by a terms of trade loss in agriculture. On the other hand, most other regions outside China gain from an improved terms of trade. Although our results seem to indicate a less favorable situation for most of the Chinese agricultural sectors, this is by no means as alarming as feared by some of the observers.

The remaining counterfactual scenarios explore the perspectives of Chinese agriculture in the continued multilateral agricultural negotiations. This is illustrated by removing market access barriers and domestic supports in three key OECD regions. Our results confirm the general impression that many of the expected negative effects in China brought about by the implementation of the Chinese WTO commitments will be alleviated or even reversed if the rich countries take action to liberalize their agriculture policy. The last two scenarios compare the effects of liberalizing the domestic supports and market access barriers in the EU, Japan and the US and the simulations show that although they produce differential impacts, both of them affect the results non-negligibly. Therefore, continued agriculture liberalization requires paralleled efforts in these two areas.

Although we have put considerable efforts in compiling data on the initial state of the Chinese agricultural protection and the WTO commitments, as well as on the recent estimates of OECD domestic support, we acknowledge that continued efforts towards a more accurate representation of all these measures is needed. This indeed reflects in the divergent views expressed in the various existing studies since very likely they are based on data sets of different qualities. It remains an area of improvement for this study too.

Another important issue is that like most of the GTAP applications and many other CGE studies, neoclassical theory is applied in our study. However, the supply side response in China may be blurred by various imperfect market mechanisms (see e.g. the points mentioned by an essay of Huang *et al.*, 2000). Thus the results presented here can only be viewed as preliminary and indicative since we do not offer any insights on the potential effects of all these factors.

Lastly, we need to bear in mind that this study focuses on detailed analysis of agriculture sectors. It does not take into account of the many concessions and commitments made by China in the manufacturing and service sectors. Liberalizations in these areas will no doubt benefit the Chinese economy and the world, as reported by many other studies on the overall impact of China's WTO accession. Also, as a comparative static study, many of the dynamic effects are not captured in this study. If taking all these factors into consideration and expanding the scope to non-agriculture commitments, the overall picture will be much more positive.

Table 1. China's WTO commitments: bound tariff rates and TRQs

	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	ctl	oap	cmt	omt	vol	mil	pcr	sgr	ofd	b_t	tex
T_0	74	74	74	17.6	8.5	10	11.3	11.5	4.5	12.3	21.7	19.9	20.5	28.6	42	51.3	21.8	42	19.1
T_1	65	65	65	13.8	8	10	8.9	8.9	4.5	11.4	15.8	17.2	10.8	12.2	37.5	38.4	16.7	25.6	11.2
T_{in}		1	1*				1						9		1	20**			
Q_0		7.88	5.18				0.78						4.96		3.32	1.68			
Q_1		9.64	7.20				0.89						8.00		5.32	1.95			
Q_t		2.03	4.94												0.24				

Source: WTO documents and FAO statistics.

Note: T_0, T_1, T_{in}, Q_0, Q_1 and Q_t refer to, respectively, out-of-quota *ad valorem* tariff rate in 2000 and 2004, in-quota tariff rate, beginning quota, ending quota, and the actual imports in year 2000. Quotas are in million metric tons.

*: for some lines under corn, this is 9%.

**: in-quota tariff rates for sugar will be reduced to 15% by 2004.

Table 2. Changes in imports/export quantities and prices under alternative scenarios, percent from base case

	Total imports into China				Market price of composite imports in China			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 1	Scenario 2	Scenario 3	Scenario 4
wht	152.2	131.9	155	133.1	-41.5	-36	-39.7	-38.6
gro	16.7	16.7	16.7	16.7	-13.1	-10	-10.2	-13
v_f	4.9	8.1	8	5	-3.1	-1.3	-1.1	-3.3
osd	-2.7	-10.3	-0.6	-12.7	-0.3	10.8	1.1	9.6
pfb	1.6	7	7.7	0.9	-2.1	-0.5	-0.1	-2.4
ocr	1.5	1.5	2.8	0.3	-2.1	-0.7	-0.4	-2.6
oap	-0.4	5.7	7	-1.4	-0.7	0.1	-0.4	-0.3
cmt	7	8	13.5	2.7	-4.8	-0.8	-3.3	-2.8
omt	3.2	7.3	9.9	0.7	-2.2	-1.2	-2.3	-1.1
vol	9.6	10.8	11.2	9.2	-8	-5.9	-7.5	-6.4
mil	21.2	10.4	29	5.2	-12.7	-3.2	-12.5	-4.3
pcr	164.7	162.6	165.2	162.5	-41.8	-40.1	-40.4	-41.5
sgr	7.4	7.2	8.4	6.4	-8.4	-5.5	-6.9	-7.4

	Total exports from China				China's export price index			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 1	Scenario 2	Scenario 3	Scenario 4
wht	23	232.9	148.3	71	-4.3	-1	-1.5	-3.9
gro	2.2	39.3	6.3	33.1	-0.7	2.3	2	-0.4
v_f	2.4	39.8	28.3	9.5	-0.5	2.2	2.2	-0.6
osd	3.5	38.1	5.6	35.5	-0.7	2.7	2	0
pfb	3.2	6.5	-0.7	10	-0.6	2.1	2.2	-0.7
ocr	2.5	9.9	5.4	6	-0.6	2.3	2.2	-0.5
oap	5.6	7.9	4.9	8.3	-0.9	2	1.8	-0.8
cmt	1.8	48.8	10.3	29.7	-0.4	1.6	1.6	-0.4
omt	3.1	24.4	13.8	11.8	-0.7	1.8	1.7	-0.7
vol	1.6	0.1	-0.8	2.7	-0.4	2.9	1.3	1.2
mil	1.9	133.4	101.4	24	-0.4	1.2	1.2	-0.4
pcr	2.8	29.7	20.7	9.8	-0.6	1.3	1.3	-0.7
sgr	2.5	34.4	9.2	25.3	-0.6	2.1	1.7	-0.3

Source: Simulation results.
Note: The description of the sectors can be found in Appendix Table 1.

Table 3. Changes in agriculture output in China under alternative scenarios, percent from base case

	wht	gro	v_f	osd	pfb	ocr	oap	cmt	omt	vol	mil	pcr	sgr
Scenario 1	-12.5	-0.6	0.1	-0.6	-0.6	-0.1	0.3	-1.3	0.2	-3.5	-5.2	-0.9	-2.6
Scenario 2	-9.4	1.5	0.5	2.6	4.7	0.9	0.4	6.1	1.6	-3.7	6.1	-0.6	4.9
Scenario 3	-11.2	0.2	0.6	-0.5	6.1	0.6	0.5	5.7	1	-3.6	1.3	-0.6	-0.9
Scenario 4	-11.1	0.6	0	2.7	-1.7	0	0.2	-1.2	0.7	-3.5	-1.3	-1	2.5

Source: Simulation results.

Table 4. Self-Sufficiency rates for selected commodities in China under alternative scenarios

	wht	gro	v_f	osd	pfb	ocr	oap	cmt	omt	vol	Mil	pcr	sgr
1997	0.936	1.016	1.007	0.84	0.832	1.28	1.009	0.895	1.011	0.729	0.816	1	0.774
Base case	0.93	0.981	0.997	0.81	0.838	1.045	0.991	0.885	0.977	0.741	0.818	0.999	0.772
Scenario 1	0.882	0.981	0.997	0.813	0.837	1.052	0.992	0.882	0.978	0.732	0.8	0.994	0.774
Scenario 2	0.891	0.996	0.999	0.823	0.839	1.073	0.991	0.894	0.989	0.731	0.849	0.996	0.829

Source: GTAP database and Simulation results.

Table 5. Impact on world market under Scenario 1, percent change from base case

	wht	gro	v_f	osd	Pfb	ocr	oap	cmt	omt	vol	mil	pcr	sgr
P_{wm}	0.342	0.05	0.041	0.109	0.069	0.053	0.024	0.051	-0.001	0.029	0.025	0.108	0.022
P_{wx}	0.362	0.058	0.046	0.12	0.073	0.056	0.025	0.055	-0.001	0.032	0.027	0.117	0.023
Q_{wm}	4.052	0.546	0.133	-0.288	0.299	0.028	0.092	0.091	0.148	1.183	0.181	7.05	0.178
Q_{wo}	-0.622	-0.03	0.022	-0.031	-0.09	-0.006	0.087	-0.014	0.001	-0.046	-0.008	-0.027	-0.005

Source: Simulation results.
Note: P_{wm}, P_{wx}, Q_{wm}, Q_{wo} denote, respectively, percentage changes in world import price, world export price, world import quantity and world output quantity.

Table 6. Changes in agricultural output in selected regions under Scenario 1, percent from base case

	wht	gro	v_f	osd	pfb	ocr	oap	cmt	omt	vol	mil	pcr	sgr
China	-12.5	-0.6	0.1	-0.6	-0.6	-0.1	0.3	-1.3	0.2	-3.5	-5.2	-0.9	-2.6
AUS*	3.23	2.8	-0.13	-0.26	-0.07	0.15	-0.29	0	-0.04	0	0	0.21	0.09
USA	1.09	-0.01	0	-0.03	0.06	-0.08	0.03	0.01	0.03	0.38	0.01	0.1	-0.01
Canada	9.21	0.37	-0.48	-0.89	2.19	-1.82	-0.67	-0.25	-0.33	0.07	-0.08	-0.66	-0.2
EU	0.27	0.07	0.02	0.13	-0.02	0.03	0	0.01	0	0.11	0.04	0.12	0.03

Source: Simulation results.
*: Australia and New Zealand

Appendix Table 1. Sectors covered in the simulations

Sectors	Description	Sectors	Description
pdr	Paddy rice	natr	Coal and other natural resources
wht	Wheat	cmt	Meat (cattle,sheep,goats,horse)
gro	Cereal grains nec, including corn	omt	Meat products (pig, poultry, etc)
v_f	Vegetables, fruit, nuts	vol	Vegetable oils and fats
osd	Oil seeds	mil	Dairy products
c_b	Sugar cane, sugar beet	pcr	Processed rice
pfb	Plant-based fibers	sgr	Sugar
ocr	Crops nec	ofd	Food products nec
ctl	Cattle, sheep,goats,horses	b_t	Beverages and tobacco products
oap	Animal products nec	tex	Textiles
rmk	Raw milk	mnf	Manufactures
wol	Wool, silk-worm cocoons	sev	Services

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