CHINA'S ACCESSION TO THE WTO. WHAT IS AT STAKE FOR AGRICULTURAL MARKETS?

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Abstract

We analyze the impact of China's accession to the WTO on agricultural markets using the FAPRI modeling framework. Our analysis includes major crops, livestock sectors, and exogenous changes in consumer income, expanded textile production, and policies. Chinese livestock, grain and oilseed crushing industries experience lower revenues, while cotton production prospers with accession, despite increased cotton imports. Most food prices decrease with accession. Chinese consumers benefit from these lower prices, with vegetable oil, dairy and meat consumption increasing significantly. The increase in world agricultural trade with China benefits Argentina (soy meal and oil); Brazil (soy oil and poultry); Canada (pork); the EU (pork); and the United states (pork, poultry, soy oil).

Key Words: China, World Trade Organization, policy analysis, trade liberalization, accession, agricultural trade, simulation models

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Introduction

We analyze the impact of China's accession to the WTO on agricultural and food markets based on the recent agreements China signed with the United States, Canada, and the EU. We investigate the implications of accession on agricultural markets in China and in the world. Our analysis includes all major crops and the livestock and dairy sectors. We quantify the impact of the policy changes implied by accession in deviation from the 2001 FAPRI baseline (FAPRI, 2001).

China's accession to the WTO has been investigated and debated for a long-time (e.g., Anderson [(1996), (1997)]. In the last two years China's accession has finally appeared to be imminent, and several recent papers have been written analyzing the specifics of accession for agriculture and food markets (Huang and Chen; USDA-ERS; and Schmidhuber). Salient features differentiate our analysis of China's accession to the WTO and its implication for agriculture from previous studies. First, it is the most up-to-date analysis available, that is, based on the most current available data and policy information. We analyze actual policy changes agreed upon by China and major trade partners (bilateral agreements with the United States, EU and Canada). Inclusion of the provisions of the EU and Canadian agreements in our analysis uncovers new and important implications for the oilseed sector. Second, we incorporate an expectation of the growth in Chinese incomes and the expansion of China's textile industry induced by accession to the WTO, two factors which have been omitted by other multi-market studies. Third, our product coverage, in excess of twenty agricultural and food commodities, is the largest of any study to our knowledge, unprecedented in the literature investigating China's integration in world agricultural markets. Our approach generates a multi-market equilibrium that allows world markets and world prices to respond to Chinese policy changes and feed these effects back into Chinese markets.

Consistent with the intuitive consequences of the relative scarcity of its land endowment, our results suggest that China does not have a comparative advantage in feed crops and, hence, in livestock production. We find that the oilseed crushing, grain, and livestock sectors are negatively affected by accession. In the FAPRI baseline, China switches from a net exporter of corn to a net importer in 2005/6. Following accession, China's net exports of corn decline, forcing the switch to a net importer one year earlier, but the growth in corn imports is not sufficient to reach the TRQ level. Likewise, wheat imports increase moderately and rice exports decrease following accession; however, all grains remain below their TRQ-binding levels. A combination of increases in food use and slight declines in production is responsible for the growth in grain imports. The reduction in domestic feed prices initially stimulates Chinese meat and diary production. With full implementation of livestock tariff reductions, livestock product imports increase and bring competitive discipline to the domestic industry. Feed use in China declines in the latter half of the scenario despite the lower feed price because hog and poultry output decreases significantly.

Chinese consumers, especially in urban areas, benefit from accession because most food prices decrease. Per capita consumption of meat (pork and poultry) increases by 0.45kg/year. Urban consumption of dairy products also increases noticeably. Vegetable oil consumption expands with accession, generating a corresponding increase in imports of soy oil. The growth in soy oil imports implied by our results are not nearly as large as the growth predicted by previous studies of accession, primarily because the latter did not include the liberalization of the other vegetable oil sectors (rapeseed and sunflower).

Fueled by an expansion of textile production, both imports and domestic production of cotton in China increase with accession. Cotton is a labor-intensive crop and China is relatively competitive in cotton production (Fang and Beghin). World markets are affected by China's accession to the WTO, but world prices of most commodities increasing only moderately. The biggest effects occur in the cotton market, with prices rising 11 percent in the last year of the simulation period. The increase in world agricultural trade induced by China's accession to the WTO benefits Argentina (soy meal and oil); Brazil (soy oil and poultry); Canada (pork); the EU (pork); and the United states (pork, poultry, soy oil).

In the next section we review important results from the literature on China's trade integration in agricultural and food markets. Next, we present the policy changes implied by

bilateral agreements China signed with the United States, Canada and the EU, which form the basis of our accession scenario. This is followed by a presentation of the major assumptions underlying our modeling approach and a discussion of the major findings coming out of the scenario simulations. To conclude, we reflect on the implications of WTO accession for China and for major trade partners in world markets.

Literature on China's accession to the WTO

Recent investigations that are most relevant to our analysis are Huang and Chen, USDA-ERS, and Schmidhuber. Huang and Chen analyze two reform scenarios in deviation from a baseline. They contemplate full trade liberalization by 2005, and then the same liberalization scenario *cum* productivity gains enhanced by infrastructure investment. The policy reforms are phased in 5 years and the analysis covers 14 commodities. According to Huang and Chen, China is projected to become a major grain importer. Net grain imports in 2005 rise by 60 million metric tons (mmt) following liberalization, of which about 40 mmt are corn imports! These figures represent real import surges.

Under the assumptions of the second scenario, the authors extend their projection horizon to 2020 and find that wheat imports decrease relative to corn and that China eventually becomes nearly self-sufficient in wheat. China becomes a major exporter of pork and poultry, which induces corn to become China's largest grain import. Huang and Chen's livestock results are driven by their expectation that domestic meat prices in China would rise to world levels while feed prices drop, therefore stimulating livestock product supply. Rice, horticulture and livestock producers gain from liberalization, while other agricultural sectors lose. In 2005, China's self-sufficiency in wheat, rice, corn, and soybeans falls from 95.9 percent under the baseline to 88.4 percent under free trade, essentially driven by wheat and corn imports. By 2010, self-sufficiency improves slightly to about 90 percent.

USDA-ERS provides an interesting assessment of China's accession to the WTO based on its 2000 baseline projections. Their study does not provide information about impacts on livestock and cotton, nor does it consider trade liberalization in rapeseed and rapeseed products. The USDA study is bullish on Chinese import growth, estimating that all crop tariff-rate quotas (TRQs) but corn would bind. Our findings do not support this projection. USDA-ERS also

projects a substantial increase in soy oil imports above the TRQ, nearly doubling soy oil import value from $455 million to $803 million in 2009.

In contrast, Schmidhuber provides a pessimistic assessment of China's accession to the WTO. He believes that China's food industry is inefficient beyond the farm gate. Trade liberalization would be a blow to that industry and its export-oriented segments, such as vegetables. Inefficient processing compromises exportable crops because high processing margins and low quality make these products uncompetitive. Schmidhuber concludes that the U.S.-negotiated in-quota import levels will not be binding. For meats, he predicts a 0.8 mmt or 2 percent increase in pork output (above the baseline of 50 mmt in 2005). The modest impact is motivated by the small role of commercial feed in backyard hog production. Poultry imports rise by 150 to 200 thousand metric tons (tmt), roughly a 20 percent increase. Milk and dairy imports also increase, with the growth in dairy consumption just short of 800 tmt in urban areas in 2005. Consumption declines in rural areas due to lower rural incomes following trade liberalization.

We concur with Schmidhuber that China's potential for meat exports is seriously constrained by prevailing phytosanitary conditions. Among others, FMD, Classical Swine Fever, New Castle Disease, and Avian Influenza outbreaks have been recently reported in China. In 1998/1999, the EU banned poultry imports from China. Pesticide residue in meat (particularly poultry) is also a concern.

A number of other studies have appeared recently, but they are very limited in scope. Jiang, Piggott, and Wohlgenant analyze trade liberalization in the soybean sector alone, but abstract from the rapeseed and sunflower sectors and linkages to the livestock sector. Zhao, Whal, and Wang use a three-country (US, China, ROW), multi-commodity model of world grain markets (corn, rice and wheat). This study, like Jiang et al., falls short because it uses older data and limits trade liberalization to selected grains. Koo provides an investigation of the impact of the US-China accession agreement on wheat markets, but his study focuses on wheat and misses important linkages to the livestock sector and competing grain industries.

Several studies assess the impact of China's accession using computable general equilibrium (CGE) models (Ianchovichina, Martin and Fukase; and Li and Zhai). These studies indicate that China's trade and production of textiles and clothing expands rapidly with accession (about 25 percent for production). China has been left out of the quota growth that is occurring under the current WTO Agreement on Textiles and Clothing, but would catch up with WTO accession.

Estimated gains in real income (EV) from accession are between 1.24 to 1.95 percent of real GDP. Li and Zhai also estimate gains in GDP of 1.53 percent. Changes in rural and urban income, expressed in deviation form the baseline in 2005, are –2.05 and 4.56 percent, respectively. We use these figures as references to incorporate the change in urban and rural consumer incomes and textile production that would accompany accession.

Policy changes implied by WTO Accession

There are general policy changes implied by the WTO membership. Domestic taxes, inspection, testing, and other policies must be transparent and must not discriminate against imports. SPS restrictions must be science-based. In addition to the general changes, China made specific concessions to the United States, Canada and the EU in three bilateral agreements. Based on these three agreements, our analysis includes the trade policy changes for major commodities presented in Table 1[1]. Most changes in TRQs, out-of quota tariffs and tariffs of non-TRQ commodities are phased in 5 years.

Grain imports face a 1-percent tariff for within-quota imports, and a 65-percent tariff on out-of-quota imports, down from 76 percent. Following accession, the share of private traders involved in grain trade will increase to 40 percent for corn, 10 percent for wheat, 50 percent for short and medium grain rice, and 10 percent for long grain rice. TRQs will increase from 4.5 mmt to 7.2 mmt for corn; 7.5 mmt to 9.64 mmt

for wheat; and from 2.66 mmt to 5.32 mmt for rice, equally shared between long and short rice. The value added tax on these grains is 13 percent.

Policy changes affecting oilseeds and products vary by commodity, with TRQs for soy and rapeseed oils, but no TRQs on other oils. Tariffs on soybeans and soy meal will be maintained at 3 percent and 5 percent, respectively. Tariffs on soy oil will be reduced from 13 % to 9% for within-quota imports. During implementation, the over-quota duty will fall from 74% the first year to 9% in the fifth year. The TRQ on soy oil will increase from 1.7 mmt to 3.3 million metric tons after 5 years and then will eventually be abolished the following year. The VAT on soy meal will remain at its current level of 13%. The tariff on rapeseeds would decrease from 40 percent to 20 percent. Within-quota rapeseed oil tariff will be reduced from 20% to 9%, and the

TRQ will start at 600 thousand metric tons (tmt) upon accession and will rise to 1.13 mmt in five years before being eliminated in the 6th year. Quotas on sunflower, peanut, and palm oils will be immediately eliminated upon accession and replaced with a 9-percent tariff.

For livestock and poultry, there is a tariff-only regime with no TRQs. China will remove the import restriction "for hotels, restaurants and institutional buyers only," and allow imports for retail markets. China will also allow participation of foreign firms in importation, wholesaling, and retailing, with implementation phased-in over 3 years. Tariffs and value-added taxes combined will decrease from 70 percent to 31 percent for beef; from 40 percent to 31 percent for pork; from 40 percent to 29 percent for poultry; from 44 percent to 40 percent for lamb and mutton; and from 46 percent to 40 percent for eggs. The pre-accession duties are nearly prohibitive. In late 1990s China experimented with a trial program to import meat for retail markets, certifying eleven U.S., Canadian, and Australian plants for export to China. No significant trade resulted due to high duties. Tariffs on dairy products decrease substantially: from 50 percent to 12 percent (all cheese), from 25 percent to 10 percent for milk powder, and from 50 percent to 10 percent for butter.

Finally, the cotton TRQ will start at 743 tmt and increase to 894 tmt in 5 years. The tariff on within-quota cotton imports will be decrease from 3 percent to 1 percent, effective upon accession. The out-of-quota tariff on cotton will decline from 76 percent to 40 percent in five installments. Textiles exports from China will also benefit from the growth of textiles and apparel trade implied by the tariffication of quotas in developed countries and the eventual elimination of the Multiple Fiber Arrangement in 2005.

Major Modeling Assumptions

The FAPRI modeling system is a multi-market world agricultural model. The model is extensive in terms of both its geographic and commodity coverage. Functionally, the modeling system is organized into modules according to major commodity groupings (grains, other crops, oilseeds, livestock, and dairy) with country sub-models. The system captures important linkages between dairy, livestock, grain, and oilseed markets. Feed prices impact dairy and livestock supply decisions, and animal inventories have an impact on milk and meat production. Both dairy and livestock animal numbers are used to determine demands for feed, which ultimately influence feed prices. Oilseed markets are linked to livestock through oilseed meal demand.

Vegetable oils compete in final consumption for consumer's income. Final consumption for most products is disaggregated into rural and urban demands in the China sub-model because consumption patterns in urban and rural China differ significantly. The FAPRI model solves for world prices by equating excess supply and demand in the world market.

The FAPRI model is driven by two major groups of exogenous shifters. First, the model incorporates forecasts of macroeconomic variables, such as gross domestic product (GDP), inflation rates, and exchange rates, and population. It is clear that accession will affect the distribution of income between urban and rural sectors in China. We adopt the consensus view that urban income will increase with accession while rural income will decrease. Consequently, we assume that urban income increases steadily to 4 percent above the baseline by 2006, while rural income falls 2 percent below the baseline during the same period. After 2006, the differences in income are maintained for the remainder of the scenario. Second, important domestic agricultural and trade policy instruments are integrated into the model specification. Apart from the policy changes contained in the accession scenario, agricultural and commercial policies in all countries remain unchanged from the baseline.

Productivity gains in Chinese agriculture have been remarkable (Huang and Chen; Huang and Rozelle; Fan and Pardey). The FAPRI baseline assumes the following productivity gains in Chinese agriculture for the coming decade. Grain yields increase annually by 1.15 percent (corn), 0.83 percent (rice) and 0.96 percent (wheat). Oilseeds yields increase annually by 1.14, 1.27 and 1.24 percent for soybean, rapeseed, and sunflower respectively (average annual growth rate). China's livestock sector has undergone significant structural change over the last two decades. Production of pork, poultry, and eggs has steadily shifted from small backyard units to more market-oriented specialized household and commercial farms. With this change in structure, feed efficiency and the grain content of animal rations have increased.

The FAPRI baseline assumes that structural change and efficiency improvements in China's livestock sector continue in the coming decade. The share of pork and poultry production occurring on traditional backyard farms declines by roughly 20 percent over the projection period to 63.8 and 45.1 percent, respectively, in 2010. Feed efficiency of commercial poultry operations is assumed to increase 1.5 percent annually. Likewise, feed efficiency in specialized pork-producing households is assumed to rise 1 percent annually. In the latter years of the baseline, the productivity of breeding sows increases by 0.37 percent annually and slaughter

weight rises 0.162 percent. These rates of productivity growth are roughly one quarter of the corresponding rates in the U.S. swine industry. Milk yields in China's dairy industry are assumed to increase by 1.43 percent annually on average. We assume these improvements in productivity and feed efficiency are accomplished through the use of improved genetic material, better management practices, and more intensive use of grain and high-protein feeds. Although China's entry to the WTO may accelerate the transformation and productivity growth in the Chinese livestock sector, the productivity gains from trade liberalization are difficult to anticipate, so we do not deviate from the baseline assumptions.

Based on the results of CGE studies, we assume that textile production permanently increases by 25 percent above the baseline level with WTO accession. We use this information to calibrate the cotton demand with an exogenous shift in textile production of 4.56 percent per annum for 5 years. After the fifth year, textile production is assumed to remain 25 percent above the baseline level until 2010.

Finally, we track the evolution of self-sufficiency in grains with accession. We define self-sufficiency with respect to rice, wheat, and corn consumption (Schmidhuber; Johnson; Huang and Chen). Self-sufficiency will remain an essential component of China's food policy as indicated by its National Long Term Economic Plan to 2010 (Huang and Chen).

Results

Most domestic crop prices decline substantially following accession. By 2010, China's domestic price decreases roughly 5 percent for corn, 8 percent for wheat, 6 percent for rice, 7.5 percent for rapeseed. Crop supply is price inelastic, thus limiting the effects of the policy changes on grain and oilseed production.

As shown in Table 2, generally lower prices for grains prompt an expansion of food and feed use. With rural incomes declining, wheat food use falls slightly in rural areas, outweighing the increases in urban what consumption. Rice consumption, a staple food, increases in rural areas as rural income declines but decreases in urban areas for the opposite reason, resulting in a net increase in rice food use by 0.33 percent in the long run. Feed use for all grains declines toward the end of the scenario as pork and poultry producers respond to lower meat prices by reducing production. The decrease in feed use of corn becomes more substantial at the end of the projecting period, and corn imports fall below the baseline level starting 2008/9. Wheat feed use

is slightly higher under accession than in the baseline because feed rations change in response to a decrease in the wheat price relative to the corn price. and despite the lower price. With accession, corn imports approach but do not exceed the TRQ level. Exporters in the United States gain the most from increases in corn imports. Wheat imports increase but remain well below the TRQ level, with the United States, EU, and Canada supplying the bulk of increased wheat imports.

Tables 5-7 show the implications of accession for soybean and products, rapeseed and products and major exporters of both soybean rapeseed products. Increased demand for meat and vegetable oil following accession drives up soybean prices on world markets. Lower soybean oil prices in China and higher soybean prices reduce China's soybean crush demand, lowering soybean imports and raising soybean meal imports. Soy oil imports increase substantially, but not nearly as much as predicted by previous studies of accession, because the latter did not include the liberalization of the other vegetable oils sectors (rapeseed, sunflower, peanut, and palm). Rapeseed imports decline initially due to a decline in crush demand, but imports rise in the latter half of the scenario when the reduction in the rapeseed tariff is complete. Crush demand nearly returns to the baseline level by 2007/08.

As Tables 8 and 9 suggest, production of meat increases in the first half of the scenario because feed grain prices drop immediately upon accession, while the reduction in duties on meat imports are phased in. In the second half of the scenario, the reduction in livestock product duties is sufficient to cause domestic production to drop and consumption to increase, inducing China to import more pork and poultry. This period also coincides with the full permission of foreign entities to engage in trading activities in the domestic market. The greatest beneficiaries from expanded pork imports are the United States, EU, and Canada. Brazil, Thailand, and the United States supply the increased demand for poultry imports in China.

Table 10 displays the impacts of liberalization on dairy markets. Domestic prices of all dairy products decrease substantially: -7.6 percent for fluid milk, -10 percent for whole milk powder and nonfat dry milk, and in excess of 20 percent for cheese and butter. Consumption increases for all products, particularly milk, whole milk powder, and cheese. Imports of whole milk powder surge by 120 percent in 2006, and then eventually remain at a level 66 percent above the baseline level by 2010. Cheese imports follow similar surging patterns as urban incomes rise, settling 51 percent above the baseline in 2010.

Driven by the expansion of the Chinese textile industry, both imports and, to a lesser extent, domestic production of cotton increase with accession. Cotton imports reach and exceed the TRQ by 2005. Imports are 53 percent above the TRQ level by 2010, with the United States, Uzbekistan, and African countries supplying the bulk of the increase. Chinese cotton production also rises by 2 percent above the baseline.

Table 12 shows the effects of China's accession on world market prices. World prices of most commodities rise moderately. The biggest affects occur in cotton markets, where international prices increase 11 percent by 2010. The price of rapeseed and rapeseed meal also increase markedly.

Conclusions

We analyzed the impact of accession of China to the WTO on Chinese and world agricultural markets. We found that Chinese food consumers would gain enormously from the WTO accession. Domestic food prices decrease across the board. Most notably, per capita poultry consumption increases by 3.98 percent by 2010. Vegetable oil and the nascent dairy consumption also increase substantially, benefiting from the competitive discipline imposed on the domestic crushing and dairy industry. Changes in aggregate grain utilization are limited because it is more rational for China to import meat rather than feed (Anderson et al. (1996), Hayes and Clemens).

Our livestock sector results are fundamentally different from Huang and Chen, who predicted a strong expansion of the livestock sector driven by Chinese meat exports. Therefore the demand for feed would expand, driving Chinese feed imports to record levels. Our prediction of large Chinese meat imports is consistent with (Wang et al.). More importantly, we concur with Schmidhuber that China's potential for meat exports is seriously constrained by prevailing phytosanitary conditions. Among others, FMD, Classical Swine Fever, New Castle Disease, and Avian Influenza outbreaks have been recently reported in China. In 1998/1999, the EU banned poultry imports from China, and pesticide residue in meat is also a concern.

In aggregate, Chinese producers lose, as is evident from the lower production levels and lower domestic prices for most crops. The exceptions are cotton and soybeans. Cotton production increases substantially, driven by the textile-output surge brought by accession to the WTO. Our results resonate the findings of Huang and Chen on rural farm income in China;

namely, it is bound to decrease with the WTO accession. A major qualifier to this conclusion is that our analysis does not include horticultural products, which would probably benefit from accession, provided minimum SPS standards are met. China's has a comparative advantage in these products (Fang and Beghin; Huang and Chen; Tuan and Cheng; and Tuan et al.).

Our results do not reveal a sharp decrease in food self-sufficiency in china and do not indicate a major increase in world food scarcity. Hence our findings contradict the pessimistic conjectures of Brown, and do not support the bullish predictions of USDA-ERS on China's grain Imports. Hence, we share the non-alarmist view of Anderson (1998) on self-sufficiency in grains, and it appears that China should be able to preserve its food security policy objective and simultaneously comply with WTO rules on agricultural and trade policy. The impacts of accession on world markets prices are positive but moderate, except for the sharp increase in cotton price.

Endnotes

1.Tariff reductions for barley, sorghum, mutton, eggs, nonfat dry milk, butter, sunflower seeds, sunflower seed products, and other oilseed and oilseed products were also included in the analysis.

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Table A16. Impacts on world livestock production and trade

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production									
Beef				(Thousand Metric Tons)					
Baseline 2001	43,358	44,013	44,905	45,747	46,468	47,235	47,777	48,119	48,388
Change	3.12	-2.90	6.40	13.28	26.09	32.10	38.83	40.69	46.16
% Change	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
Pork									
Baseline 2001	76,832	77,789	78,690	79,633	80,718	81,673	82,663	83,777	84,935
Change	9.89	17.04	22.24	55.08	122.72	210.88	273.30	252.59	165.97
% Change	0.0%	0.0%	0.0%	0.1%	0.2%	0.3%	0.3%	0.3%	0.2%
Broiler									
Baseline 2001	43,426	44,380	45,422	46,382	47,464	48,593	49,734	50,892	52,132
Change	7.41	-5.09	7.26	11.06	32.41	68.52	100.01	116.36	137.06
% Change	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.2%	0.3%
Trade									
Beef									
Baseline 2001	3,237	3,432	3,589	3,705	3,859	3,977	4,037	4,015	4,006
Change	-2.33	-3.09	-6.32	-6.28	-4.98	-0.34	2.87	3.98	9.03
% Change	-0.1%	-0.1%	-0.2%	-0.2%	-0.1%	0.0%	0.1%	0.1%	0.2%
Pork									
Baseline 2001	2,567	2,710	2,701	2,720	2,816	2,821	2,831	2,941	3,124
Change	-8.49	-29.08	-57.56	9.46	158.75	358.39	560.78	635.03	715.29
% Change	-0.3%	-1.1%	-2.1%	0.3%	5.6%	12.7%	19.8%	21.6%	22.9%
Broiler									
Baseline 2001	4,203	4,296	4,388	4,461	4,515	4,600	4,688	4,780	4,882
Change	-1.69	-18.51	-16.12	-23.83	9.65	88.11	165.39	244.27	314.71
% Change	0.0%	-0.4%	-0.4%	-0.5%	0.2%	1.9%	3.5%	5.1%	6.4%