Chapter 5:

Integrating China's Agricultural Economy into the Global Market: Measuring Distortions in China's Agricultural Sector

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Introduction

Although there has long been an interest in the agricultural economy, it is quite surprising to many that the agricultural sector of China actually has a record that is impressive in many dimensions. Growth rates of gross domestic product, agricultural gross value added and food per capita increased substantially between the early-1980s and the mid-2000s. Indeed, agriculture's performance over the past two to three decades was more impressive than any other country in South and Southeast Asia. Markets have boomed. The structure of agriculture has fundamentally shifted. Despite having the largest population in the world and high income growth (which has had a wrenching change on the nation's consumption bundle), since the early-1980s China has been a net exporter of food in all but one year.

While the performance of the agricultural economy is well documented, there is less understanding about the environment within which this growth occurred. In particular, there have not been many studies of the external economy's environment that created some of the incentives for producers. In the past, there has been work on the nature of the distortions to China's agricultural economy, for example, Huang, Rozelle and Chang (2004), OECD (2005), Orden et al. (2007). Unfortunately, these previous studies have only been partial. For example, Huang et al. (2004) only looked at distortions in a single year; Orden et al. (2007) examined only six years between 1995 and 2001. The OECD (2005) examined only a small set of commodities and made a number of simplifying assumptions about some of the most important commodities, such as pork meat and poultry. In part perhaps because of the partial nature of these studies, they have come to a number of different conclusions.

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The purpose of this chapter is to examine the extent of China's agriculture integration into the world market through estimations of indicators of direct and indirect interventions by China's government in agriculture from 1981 to 2005. The main part of our analysis examines the differences in prices between international prices and domestic wholesale prices at the border, i.e., Nominal Rates of Assistance. We also consider distortions in the domestic economy by examining the differences between farm-gate and border prices.

The wide scope of the goals and objectives, like other studies, also necessitate certain limitations. First, the absence of data precludes us from examining the entire agricultural sector. Instead, we examine commodities that account for nearly two-thirds of the gross value output in all of the study years. Second, although we are able to judge from the price trends and an understanding of domestic marketing and pricing, and trade policy reforms, the source of the shifts in the distortions of the agricultural economy, we cannot identify the exact source of changes. Also, although we use a revised exchange rate series in coming up with what we believe are the correct values at which we convert international values into the domestic currency, in a way that is useful in making any comparison with prices in China's domestic economy, we do not analyze the effect of these assumptions. This is done elsewhere (Martin, Huang and Rozelle, 2006).

The chapter is organized as the follows. In the next section, we discuss our quantitative approach and sources of data. The results of the distortion analysis are presented in the third section. The final section concludes.

Methodology and Data Sources

In this chapter, we have utilized the approach specified in Anderson, Martin, Sandri and Valenzuela (2006). The approach is broadly based on comparisons between domestic and international prices. During the reform era these price comparisons provide indicators of the incentives for production, consumption and trade, and of the income transfers associated with interventions.

Our approach essentially creates two measures of distortions for each major commodity in the agricultural economy. The first measure in our analysis is the Nominal Rate of Assistance (NRA). NRAs are used to compare the prices of commodities in the domestic economy (at the port) with the international prices of commodities at the border (that is, cif at the port for importable goods; fob at the port for exportable ones). Quality adjustments to the border prices

have been made before we estimated NRAs. Conceptually, with NRAs we are trying to measure the extent of distortions due to tariffs, exchange rate distortions, and other non-tariff barriers—at the border.

Because of barriers within the domestic economy, the extent of protection (or dis-protection) that is afforded by trade policies may not be the same as the real rate of protection to farmers. Since we have independent observations on the prices obtained by farmers in local markets we are able to estimate the nominal rate of assistance at the farm level taking into account *both* border distortions *and* domestic distortions affecting farmer returns (NRA_f's). NRA_f's are calculated after allowing for quality adjustment, tax or subsidies, transport, storage and handling costs in moving commodities from the farm to the wholesale level. Differences between NRAs and NRA_f's arise from subsidy or transfer payments that cause the prices received by farmers to differ from what they would receive under competitive internal market conditions.

While NRAs (and NRA_f's) only measure differences in output prices, there may also be distortions on the input side. To capture these, it is possible to provide measures taking into account direct subsidies and differences between the international prices of inputs and the prices that farmers pay for these inputs. While these forms of protection (or taxation) are important in many countries, and particularly in OECD countries, we find that they are generally relatively small and so we focus on the NRA and NRA_f measures when examining distortions to producers.

Exchange rate distortions present particular measurement problems and require detailed analysis if price-comparison-based measures are not to be misleading. The assumption and methods that were used to generate our exchange rate series are in described in Appendix Table A1. For documentation of our complete domestic and international price series, see Martin et al. (2006).

In compiling our data we necessarily had to make choices on the coverage of the commodities included in the study. Overall we have included 11 commodities: rice, wheat, maize, soybeans, cotton, pork, milk, poultry, fruit (using apples as a representative product), vegetables (using tomatoes as a representative product) and sugar (both sugar-beet and sugarcane). Over the study period, these commodities accounted for between 75% (in the late-1980s) and 60% (during the early-2000s) of the total value of agricultural output in China.

Because decisions on production and consumption in China's domestic market were only gradually being allowed to respond to domestic prices, and because we do not have access to reliable data on the secondary market exchange rates prior to 1978, we focus on data for the period beginning in 1980.

The data used in our study come from a number of sources, depending on the time period of analysis and the commodity. Commodity balance data (production, utilization trade and others) are from Center for Chinese Agricultural Policy's (CCAP) CAPSiM database, which are mainly from the Ministry of Agriculture (production), National Bureau of Statistics of China (NSBC) (consumption and others) and Ministry of Commerce (trade). Domestic prices are from several different ministries. Specifically, farm-gate output prices come from the cost of production surveys conducted by National Development and Reform Commission (NDRC). Wholesale and retail prices of most products are from the Center for Price Monitoring, NDRC, the Ministry of Agriculture (China Agricultural Development Report), and the Department of Rural Survey under the NSBC. When wholesale and retail prices for some commodities in some years are not available, price margins from farm-gate to wholesale and retail are estimated. Much of the data on margins, transportation costs and other transaction costs are from an extensive set of surveys by Huang and Rozelle during the 1990s and the early-2000s, surveys which also served to establish which commodity price series provided appropriate bases for price comparisons. Some of this was previously reported in Rozelle et al. (2000) and Huang et al. (2004), which provided information on substantial quality differences between some imported and domestic commodities and resulting biases in price comparisons as a measure of protection. For more recent years, survey teams from the CCAP interviewed traders in 10 cities around China in 2006. The complete data series are in the appendices of Huang et al. (2007).

The international price data (fob and cif) for all commodities except milk are the unit values of exports or imports with adjustments for quality. These data are from the Ministry of Commerce and China's Customs Administration. For the border price of milk, because no import prices for milk are available, we use the farm gate price of milk in New Zealand adjusted by international transportation and insurance rates to create a series for the international price of milk (cif) that we refer to as the "reference price."

Results

The Role of Domestic Price and Marketing Policy: Before examining the role of distortions at the border, it is useful to examine the relationship between the available domestic price-series for farm and retail prices for the major grain crops (Table 1). The importance (and role) of China's domestic price and marketing policy for rice and wheat (the three largest crops in China) can be seen by comparing the state-set urban retail price and the state-set rural farm-gate procurement price with the rural retail price (a free market price) before 1993 when the urban grain rationing system was formally abolished. Until 1993, urban retail grain prices were generally substantially below the price on the free market in rural areas, despite the costs associated with transferring grain to urban areas. This was a consequence of a procurement price system designed to provide urban residents with relatively inexpensive food. Only urban residents could buy grain at these low prices and only with ration coupons that were available in limited quantities.

Table 1: Rural Retail Price, Urban Retail Price and Farm-Gate Sales Price of Rice and Wheat in China, 1980-2005

	1980-1993	1994-2001	2002-2005
Rice (in milled rice equivalent)			
Farm-gate price	1375	1889	1939
Rural retail price	2069	2145	2112
Urban retail price	989	2144	2112
Wheat			
Farm-gate price	1126	1305	1268
Rural retail price	1700	1433	1325
Urban retail price	920	1433	1325

Sources: Computed by the authors based on various sources
Note: the prices are yuan/ton in real 2005 yuan. Using the years of 1993 and 2001 as time division points because the former is the year of ending grain ration policy in urban area and the later is the year before China joined WTO

In addition, the marketing and procurement system may have been the source of additional distortions. The relatively low selling price of grain at the farm-gate by farmers shows that China's food system in the 1980s was set up to transfer income from rural to urban areas (Table 1, column 1). The amount that farmers received for mandatory deliveries was far below the free market price. However, there is some question about the effects on incentives for production and consumption given the infra-marginal nature of many of these transfers (Sicular, 1988). This is because after the mid-1980s, farmers were able to sell additional amounts at higher market prices once they had met their obligation to deliver a fixed quota quantity at the low purchasing

price. If a farmer sold more grain than was required by his/her delivery quota, and the above quota price was determined by market forces, there may have been less of a distortion. Ultimately, however, even such policies are not fully decoupled from incentives, with seemingly infra-marginal transfers away from rural households, for instance, giving their members an incentive to move out of agriculture. These linkages have been shown by Wang, Rozelle and Huang (1999). Therefore, the distortions created by domestic marketing and procurement systems may have distorted incentives relative to international prices.

From 1994, however, changes to China's domestic marketing and procurement system appear to have eliminated this additional layer of regulation for producers of rice and wheat (Table 1, columns 2 and 3). In the early-1990s the urban price began to rise above the farm-gate price; urban and rural retail prices also moved much closer together (Huang et al., 2007). This reflects the phasing out of the implicit taxation of farmers through the grain procurement system. The gap between urban and rural retail prices essentially disappeared after 1994 (Table 1). And the gap between the rural retail price and the farm price declined, possibly suggesting an improvement in marketing efficiency (Park et al., 2002). With the disappearance of the distortions from the marketing and procurement system, the remaining distortions after the mid-1990s reflect only trade policies and not trade and domestic policies.

Nominal Rates of Assistance for China's Main Agricultural Commodities: All NRAs and NRA_f's are computed at adjusted exchange rates (the estimated equilibrium exchange rates, Appendix Table A1) since we believe this measure is the right one to use to calculate the true rate of protection. In Martin et al. (2006) we report how the measures of distortions vary when using official and adjusted exchange rates.

(i) Distortions to the grain economy before mid-1990s**:** The distortions to the rice economy of China in the 1980s and early 1990s are characterized by two important features (Table 2, row 1). First, the NRA of rice, an exportable commodity, is negative between 1980 and 1993. Averaging -23%, the negative NRAs show that China was highly competitive in international rice markets during these years. Trade policy, however, kept exporters from shipping large quantities of rice onto world markets and kept the free market price of rice in China's port cities below the world price. Clearly this demonstrates China's commitment to keeping domestic prices low. Even if there had been no other distortions in the rice economy, producers would have faced prices below world market prices.

The second feature demonstrates how domestic marketing and procurement placed a greater tax on farmers and insulated the domestic price of rice from the world market price even if trade policy had been liberalized (Table 2, rows 1 and 4). Because of China's marketing policy that lasted through the mid-1990s, the state's artificially low procurement price kept the price received by farmers systematically below the free market price of rice as seen by the NRA_f's. Because of this the tax on rice farmers averaged -42%. Rice producers were among the most heavily taxed farmers in China—given the large share of the crop's sown area and large negative rates of dis-protection. Importantly, our analysis shows how the state used trade and procurement policy to tax its rice farmers.

Table 2: Nominal Rates of Assistance (NRA) and Nominal Rates of Assistance for Farmers (NRA_f) in Cereal Sector in China, 1980-2005

	1980-1993	1994-2001	2002-2005
NRA			
Rice	-23	-4	-6
Wheat	47	25	0
Maize	-1	7	16
NRA_f			
Rice	-42	-8	-9
Wheat	10	24	1
Maize	-28	6	11

Source: Authors' estimates

Unlike rice, the NRA measures show that trade policy offered high rates of protection for wheat farmers in China between 1980 and the mid-1990s (Table 2, rows 2 and 5). During the period 1980-1993 the free market price of wheat in China's port cities was 47% higher than the international price of wheat (cif, China's port cities). Unlike rice, which China produced competitively during the 1980s, wheat producers—who have been shown to produce at a higher cost than many other producers in other countries (Huang and Ma, 2000)—received strong protection from trade policy. This policy on its own, unlike that for rice would not be consistent with providing inexpensive food for consumers. It would, however, be consistent with a policy of food self-sufficiency since it would encourage greater production by keeping out imports and keeping domestic prices high.

Domestic marketing policies, however, were working in the opposite direction of trade policies. The trends of the NRA_f's show how the forced deliveries of wheat quotas insulated farmers from the high rates of protection (Table 2, row 5). Although there was still positive

protection for wheat farmers in most years between 1980 and 1994 the rates were lower (averaging about 10%). These figures—along with those for rice—show that at least for China's staple food crops, leaders were not trying to use prices to encourage food security.

The story of maize is a mix of those for rice and wheat (Table 2, rows 3 and 6). In considering row 3, trade policy was providing very little protection for maize over the period 1980-1993, with an average of -1% for this period. Like the case of both rice and wheat, procurement policy depressed the price of maize to China's farmers. Measured at farm-gate level, maize farmers were taxed by 28% between 1980 and 1993.

(ii) Distortions to the grain economy after mid-1990s: After 1994, our distortions analysis shows that China's international trade and domestic marketing policies have changed strikingly (Table 2, columns 2 and 3). It is apparent from the way the differences in the estimates of NRAs and NRA_f's narrow that China's reformers were able to eliminate the procurement policies that had been taxing rice, wheat and maize farmers (either by reducing the tax imposed by trade policy as in the case of rice or reducing the protection as in the case of wheat). In other work, Huang et al. (2006) show that the elimination of the procurement quota contributed significantly to a reduction in the implicit tax burden shouldered by farmers.

The liberalization of domestic markets in the mid-1990s was accompanied by a liberalization of trade policy, at least in the case of China's major food grains such as rice and wheat. After the mid-1990s the taxation and subsidization of rice and wheat were clearly being phased out as the NRAs for rice steadily rose (became less negative) and the NRAs for wheat fell. Likely in part in preparation for its accession to the WTO, China's leaders liberalized trade for its main food grains to such an extent that between 1995 and 2001 most of the protection for the crops was eliminated. Since 2001, the NRAs for both rice and wheat have been almost zero.

Interestingly, the case of maize is a bit different than that for other crops (Table 2, row 3). While NRAs moved towards zero in the case of maize, in a number of years after 2000, the NRA for maize has been positive (not shown by the average figures in Table 2). This indicates that at least in some years national leaders have been protecting maize producers. In part, as discussed in Rozelle and Huang (2004), this may in part be due to the rise of the lobby from Jinin province that has been successful in gaining protection for the producers of its most important crop.

(iii) Edible oils and cotton: The biggest difference between the analysis of distortions of grain crops and for cash crops (at least for soybeans and cotton) is that domestic marketing

policy has historically played less of a role. Although in some counties in China there was a procurement delivery quota for soybean producers, it was not as widespread as that for grain (in many counties soybeans were not procured by the state procurement system). In addition, the implicit tax on soybeans in places in which soybean quotas were collected was lower than that for the staple grain crops, there is little difference between the graphs for NRAs and NRA_f's (Huang et al., 2007). The same is true for cotton—except in the case of cotton through the mid-1990s free market procurement of cotton by private traders was not allowed. When reform finally came to the cotton industry in the mid-1990s, leaders did not move to a two-tier pricing system, but instead allowed for both private trade and commercialized government cotton procurement stations. As a result, the measures of distortion for the NRAs and NRA_fs of cotton are nearly the same (Huang et al., 2007). In fact, the same is true for all of the rest of the commodities (livestock; horticulture and milk and sugar). As a result, the discussion in the rest of this section—for all three periods—focuses on trade policy.

The trends in the NRAs after 1995 show the strong commitment to trade liberalization for soybeans (Table 3, row 1). Beginning in the late 1990s and continuing through to 2005 the protection for soybeans fell from around 25 to about 10%. This falling protection, in fact, should not be a surprise given the integration of China into world soybean markets and the monotonic rise in imports (which exceeded 25 million tons in 2005). The story of soybeans—and the fall in protection and almost full liberalization—stands in sharp contrast to that of maize which enjoyed increasing protection.

Table 3: Nominal Rates of Assistance for Farmers (NRA_f) for Soybean, Cotton and Sugar-Crops in China, 1980-2005

	1980-1993	1994-2001	2002-2005
Soybean	na	24	12
Cotton	-31	-6	-1
Sugar-crops	33	28	23

Source: Authors' estimates
Note: The figures for sugar-crops are sugar output weighted average of sugarcane and sugar-beet

The distortion analysis for cotton, in some sense, produces results similar to those for rice (Table 2, row 2). The combination of trade and monopoly procurement policies kept domestic cotton prices lower than world market prices in the 1980s and early-1990s. Clearly it appears that China's planners were taxing cotton farmers to supply its emerging textile industries with

relatively inexpensive raw materials. It is no wonder with such high implicit taxes on cotton that the lack interest by many suppliers (and serious insect problems) led to stagnant and even falling area in many regions (NBSC, 2004).

After 1994, however, with the liberalization of domestic markets (mostly) and increased trade liberalization (somewhat) there has clearly been a shift in the level of distortions faced by cotton producers (Table 2, row 2). Although there were years in which there was fluctuation, since the mid-1990s the NRA_f has been gradually falling to nearly zero. In recent years, despite the fact that national leaders could impose tariff rate quotas (TRQs) on cotton after a certain amount is imported, in fact, trade officials essentially have left the level of imports in most years to be determined by the market.

(iv)Livestock and horticultural commodities: With the exception of milk, the patterns of distortions to China's livestock and horticultural sectors are quite similar (Table 4). In 1980-1993 there was heavy implicit taxation on pork and vegetables. In part, as noted by Huang et al. (2004), this situation was created by China's grain-first policy. Although China can competitively produce livestock and horticultural commodities, producers were neither encouraged to produce or export these commodities on a large scale. Part of this was due to China's own barriers, such as the quotas on exports into Hong Kong. Another part of the price gap shown in these figures reflects trade barriers facing China in export markets. While there quite possibly were grounds for some of the barriers (for example, foot and mouth disease is widespread in China), even if a claim was blatantly false it could not be adjudicated effectively since China was not part of WTO. As a consequence, China's livestock and horticultural producers produced commodities far below the world market price and were neither inclined nor able to increase exports into global markets.

Since the mid-1990s the gap between domestic and world prices of livestock producers has fallen, but the trends are not clear for horticultural sector. Emerging markets and relaxation of grain-first policies (often called agricultural structural adjustment policies inside China) allowed producers to greatly expand livestock and horticultural production in large part to meet the rising demand inside China (Rosen, Huang and Rozelle, 2004). At the same time China's accession to the WTO and the appearance of an export-oriented segment of the livestock and horticultural industries has increased the interest in and feasibility of participating in international markets. In response, the price gap measures have been falling. It should be

noted, however, that the NRA_fs are all still negative. If anything, China's presence in global food markets has given rise to more stringent rules and regulations on the import of livestock and horticultural commodities from China.

Table 4: Nominal Rates of Assistance for Farmers (NRA_f) in Livestock and Horticulture Sectors in China, 1980-2005

	1980-1993	1994-2001	2002-2005
Milk	73	17	24
Poultry	-11	-28	-19
Pork	-57	-19	-8
Vegetable	-50	-22	-23
Fruit	-19	-29	-28

Source: Authors' estimates

(v) Milk and sugar: The story for milk and sugar is in some sense the opposite of that for livestock and horticultural commodities. During the 1980s and early-1990s, the NRA_fs for milk and sugar were positive and large (Table 3, row 3 and Table 4, row 1). Those for milk averaged 70% in 1980-1993. Those for sugar were above 33% in the same period. After the mid-1990s, protection has been lowered, and NRA_fs for milk and sugar were falling (to around 20-25% for the period 2002-2005).

Conclusions and Implications

The main finding of this chapter is that the nature of policy intervention in China's agriculture has changed dramatically over the past 25 years, transforming the agricultural sector from one characterized by high distortions to one that is relatively liberal and more integrated into the world market. In the 1980s and early-1990s (or the early reform period) there were distortions in both external and domestic policies that isolated domestic producers and consumers from international markets. Importantly during the early reform period domestic marketing and pricing policies actually served to make the prices that domestic producers and consumers faced almost independent from the effects of trade policy. Because of this, even in the case of a exportable commodity, e.g., rice, a commodity that enjoyed little protection at the border from tariffs (meaning that the international price of rice and the free market price of rice were nearly identical), domestic pricing and marketing policies did not allow producers to reap the profits from international-level prices and instead forced farmers to sell much of their surplus to the state at an artificially low price. Hence, domestic policies levied a tax on farmers even though there was little protection at the border. Similar dynamics characterized importable

commodities such as wheat and soybeans where, despite fairly high rates of protection from trade policies, producers were receiving much less protection than they would have had there been a free domestic market for the importable, while consumers were being implicitly taxed.

In contrast, since the early-1990s (the late reform period), liberalization of domestic markets has reduced the distortions from domestic policies (as the market gradually has replaced the state as the primary mechanism for allocating resources and has became the basis of farmer production and marketing decisions). At the same time, especially in the case of importable commodities, trade policy has become more liberalized, with distortions from border measures falling substantially. As a result, we find that in recent years (that is, after China joined WTO at the end of 2001) China's agriculture is much less distorted in two ways. First, the differences between international and domestic market prices have narrowed considerably for many commodities due to trade policy liberalization. Second, the elimination of domestic policy distortions mean that when trade liberalization allows for the increased import or export of agricultural commodities, prices in China's domestic market change and farmers are directly affected by them.

Despite the finding that considerable liberalization has occurred due to policy reforms in both domestic and external policies, there are still distortions to agriculture in the mid-2000s, 25 years after the beginning of reforms. In some cases, these remaining distortions arise from tariffs on importable commodities and non-tariff trade barriers of other countries on China's exportable commodities. While low by international comparisons, China is still providing a degree of protection for a number of importable commodities, e.g., maize, sugar and milk.

With this analysis, we have shown that China's agriculture economy has become one of the least distorted in the world. Clearly, the combination of domestic marketing reforms and international trade liberalization has greatly freed up the decision making environment for producers. In such an environment phenomena such as rapid structural change from grain to more labor intensive commodities and the rise of a horticulture and livestock-based export economy become more understandable. When farmers face less distortion they tend to move into those commodities in which they have a comparative advantage.

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Appendix Table A1: Raw Numbers for Exchange Rate Analysis, China, 1980-2005

Year	Official rate[a]	Secondary market rate[b]	Retention rate[c]	Discount to secondary market rate	Estimated equilibrium exchange rate[d]
1980	1.50	1.95	0.20	1.95	1.95
1981	1.71	2.05	0.20	2.05	2.80
1982	1.89	2.27	0.20	2.27	2.80
1983	1.98	2.39	0.20	2.39	2.80
1984	2.33	2.69	0.20	2.69	2.80
1985	2.94	3.05	0.25	3.05	2.95
1986	3.45	4.03	0.25	4.03	3.81
1987	3.72	4.40	0.44	4.40	5.29
1988	3.72	6.50	0.44	6.50	5.79
1989	3.77	6.60	0.44	6.60	4.94
1990	4.78	6.60	0.44	6.60	5.44
1991	5.32	6.60	0.80	6.60	5.84
1992	5.52	6.92	0.80	6.92	7.12
1993	5.76	8.28	0.80	8.28	8.41
1994	8.62	8.70	0.80	8.70	8.69
1995	8.35	n. a.	n. a.	n. a.	8.35
1996	8.31	n. a.	n. a.	n. a.	8.31
1997	8.29	n. a.	n. a.	n. a.	8.29
1998	8.28	n. a.	n. a.	n. a.	8.28
1999	8.28	n. a.	n. a.	n. a.	8.28
2000	8.28	n. a.	n. a.	n. a.	8.28
2001	8.28	n. a.	n. a.	n. a.	8.28
2002	8.28	n. a.	n. a.	n. a.	8.28
2003	8.28	n. a.	n. a.	n. a.	8.28
2004	8.28	n. a.	n. a.	n. a.	8.28
2005	8.19	n. a.	n. a.	n. a.	8.19

Notes: [a] NBSC; [b] Huang and David (1995); [c] The proportion of foreign currency actually sold by all exporters at the parallel market rate; [d] see Anderson et al. (2006) on the exchange rate methodology and Huang et al. (2007)