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Tracking the Nature of Distortions to Agricultural Price: The Case of China and its Accession to the WTO

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Tracking the Nature of Distortions to Agricultural Price: The Case of China and its Accession to the WTO

Trade liberalization affects rural populations in a number of offsetting ways (OECD, 2001). On the one hand, increases in the demand for a nation's industrial goods through higher exports can increase employment and raise wages of workers from rural areas. New opportunities to export agricultural goods and better access to more affordable inputs make agriculture more competitive to farmers. Rural consumers also gain from access to cheaper food. On the other hand, rising imports of lower priced commodities reduce farm profits and improved access to export markets raises prices to domestic consumers and to producers, for example, livestock producers, that use agricultural goods as inputs to their production processes.

While all of the effects are important, trade officials that have concerns about the profitability of their producers frequently are interested in understanding the impact of trade liberalization on agricultural prices (Martin, 2002). This would be particularly true of nations with many small holders that, while producing a significant fraction of their household's own consumption, also participate actively in commercial markets.[1] In such nations government officials know that agricultural price shifts can have important effects on domestic food production, farm household incomes, national poverty rates and overall rural stability.

Despite the importance of agricultural price effects in the complicated political economy equation that officials must try to solve in coming up with their positions for trade negotiations, for several reasons there is often confusion over how trade liberalization will affect producer prices. First, in some cases, there is confusion about the level of protection (or implicit taxation) that different commodities are receiving. In some countries, for example, one set of studies claims a commodity is being protected; another set shows that the commodity is subject to an implicit tax (or is receiving negative protection).[2] Second, the source of the protection also is sometimes unclear (Garcia, 2003). In an era when trade negotiations have already terrified most

traditional quotas and have already reduced average tariff rates to fairly low levels, the main barriers to the flow of agricultural commodities have become more nontraditional ones, such as domestic taxation policies, export subsidies and Tariff Rate Quotas (instead of traditional tariffs and quotas).

Finally, there often is disagreement about the extent of the effect of trade liberalization on subsets of producers that produce different commodities, belong to different income categories, and live in certain geographical regions. For example, prior to the implementation of the North America Free Trade Agreement there was concern that the reduction in Mexico's tariff on maize imports would adversely affect producers of maize, especially those that lived in poor, remote regions of the nation (see Taylor, 1998 for details of the debate). Some researchers claimed that the lower, liberalization-induced maize prices would bankrupt poor, small farmers throughout the nation and force them into the migrant labor force, many of whom would illegally enter the United States. Others believed that imperfect, fragmented markets isolated poor, small farmers in many regions of the nation from the direct effects of the downward pressure on NAFTA-induced price changes. More than a decade after NAFTA, research shows the importance of the nature of markets in determining the effect of trade liberalization on farm producer prices. According to Taylor (1998), when commodity markets do not operate well and there is poor integration, the effects of trade liberalization on producer prices in isolated areas are greatly attenuated.[3]

In this paper, we create an approach to help researchers and trade officials have a better understanding of how trade liberalization will affect agricultural prices and how the price changes will be experienced in different parts of the nation being studied. First, we describe a new way of collecting data that can be used to create more accurate, disaggregated measures of protection (specifically, Nominal Protection Rates or NPRs). We can use the better measures of protection in two ways. With accurate NPRs, we can analyze the expected effects of liberalization and identify remaining trade barriers by matching up the different sources of protections to the

observed levels of protection. After liberalization, accurate measures of protection can be used to assess the effectiveness of trade liberalization policy implementation. Finally, we use price determination and market integration analyses to study the nature of domestic markets in order to begin to assess the way that price shifts at the borders that arise from trade liberalization measures affect different producers in different parts of the country (either the case when prices decrease due to rising imports or when prices increase due to rising exports). Notwithstanding the new approach that we use to calculate NPRs, the main contribution of our study is the way that we combine a series of analytical exercises that can help analysts and officials more accurately understand how trade liberalization will affect the level of agricultural prices and the distribution of their effects.

To achieve these objectives we carry out a case study of the impact on agricultural prices of China's accession to the WTO. The choice of China is appropriate since officials and academics have been intensely interested in how the nation's WTO promises on agriculture would affect the prices received by farmers (RCRE, 2000; Huang and Chen, 1999). A careful examination of the effect of WTO on agricultural prices also is warranted since there is no agreement in how liberalization will affect farmers (e.g., Carter and Estrin, 2001, that believes there will be a large effect versus Anderson and Peng, 1998, that believes the effects will be relatively minor and generally positive). Finally, since many of China's poor rural households live in remote regions far from the coast and more than any other group tend to rely more on the income that they earn from cropping, they are the ones that likely will be most affected by WTO's liberalizing measures (Chen and Ravallion, 2002). In carrying out our case study, we know that we are focusing only on the effects of WTO on agricultural prices even though the other effects of WTO on the rural population likely will be as important if not more important than cropping (Zhao and Sicular, 2002). We also will not quantify the total welfare effect, instead mainly focusing on the qualitative effects on China's farmers as a way to illustrate how to approach conceptualizing the effects of trade liberalization on agricultural prices.

To meet these objectives, the rest of the paper is organized as follows. First, we review China's trade policy liberalization in the past and its current WTO promises. We divide our discussion of China's trade liberalization measures into more traditional reforms, such as tariffication and tariff reduction, and nontraditional ones, such as taxation policy, export subsidies and TRQ implementation. Next we discuss the way we collected our data that we use to create measures of NPRs and present a new set of protection rates for China. We examine how these distortions should be expected to change as China implements its WTO obligations and gains access (or not) to the promises that were made to it. Finally, we analyze the nature of China's agricultural markets in an effort to understand how trade liberalization effects on prices can affect different types of farm households. The final section discusses the implication of our findings.

Trade Liberalization and Remaining Distortions

In part because of the vulnerability of parts of the rural economy, and in part due to its prominence in China's political economy (and that of its negotiating opponents), agriculture has been at the center of discussion of China's entry into the WTO. However, despite being a central concern for China's policy makers and negotiators from other countries, the likely shifts in China's future trade policy and their impacts on agricultural prices are not well understood. Debates on the future of China's agriculture and the price level in the sector remain unresolved. Some argue that the impact of China's joining WTO on its agriculture will be substantial, adversely affecting hundreds of millions of farmers through sharply lower prices (Carter and Estrin, 2001; Li et al., 1999). Others believe that, although there will be some impact on prices, including substantial ones in some specific areas and for some specific commodities, overall the effect of accession on agricultural prices will be modest (Anderson and Peng, 1998; Huang and Anderson, 2003).

In part the confusion about the ultimate impact of WTO can be traced to a general lack of understanding of the policy changes that may be induced from China's WTO accession (Martin,

2002). Traditionally, analysts have focused on four sets of trade policies, measures that are most frequently used by other countries to protect their agricultural sectors. In examining the previous work (e.g., CARD, Tuan and Cheng, 1999, and OECD, 2001), we find that almost all of the discussion is directed at tariffs, quotas and licensing, state trading and traditional non-tariff barriers (NTBs). In some of these papers it is implicitly assumed that the WTO agreement is focused solely on these policies, that these policies are responsible for most if not all of the protection that China was enjoying prior to accession, and that accession represents China's initial assault on protection at the border. In fact, while at one time these policies were the source of high distortions, after nearly two decades of reform in the external economy, some of the worst distortions caused by traditional policies have already disappeared. In short, the lack of clarity of the debate can be traced to a lack of understanding of the fundamental facts about the level and source of the distortions to China's on the eve of its entry into WTO.

To illustrate this argument, one needs to understand the gradual but fundamental changes that China has experienced during the past two decades. In the late 1970s and early 1980s, the domestic wholesale price of China's four major commodities, converted at the official exchange rate-- all far exceeded the world price (measured at China's border—Table 1). For example, China's rice and soybean prices were 10 to 50 percent above the world market price (row 1). The nation's wheat and maize prices exceeded the world price around 90 percent. However, over the next two decades, the protection rate on rice became negative and that for wheat and maize fell to around 30 percent (row 6). Although the NPR for soybeans fell similarly between the late 1970s and the mid 1990s, the rate rose in the late 1990s before falling to less than 20 percent in 2001 (column 4 and Xie, 2002). During this time period, the intervention by state traders and the use of NTBs also gradually fell (Martin, 2002).

Falling protection and changes in international trade and domestic marketing policies have resulted in dramatically shifting price trends and trade patterns. In other work, Huang and Chen (1999) show the importance of exchange rate management; the depreciation of China's

currency can explain a big part of China's changing protection during the 1980s and 1990s. Huang et al. (2003) also trace the changes in prices that have been caused by the implementation of WTO. Indeed, between 1985 and 2000, the real price of agricultural commodities (measured by the agricultural price index divided by the rural consumer price index) fell by 27 percent (State Price Bureau, 1986-2001). In part driven by the changes in relative prices, disaggregated, crop-specific trade trends also show how exports and imports increasingly are moving in a direction that is more consistent with China's comparative advantage (Table 2). For example, the proportion of grain exports, which was around 20 percent of total agricultural exports in the 1990s, is less than half of what it was in the early 1980s (Huang and Chen, 1999). By the late 1990s horticultural products and animal and aquatic products accounted for about 80 percent of agricultural exports. These trends are even more evident when reorganizing the trade data grouping them on the basis of factor intensity. The net exports of land-intensive bulk commodities, such as grains, oilseeds and sugar crops, have fallen (Table 2, rows 5 to 8); while exports of higher-valued, more labor-intensive products, such as horticultural and animal (including aquaculture) products, have risen (rows 1 to 4).

Non-traditional Sources of Protection

Based on the preceding discussion, two facts become clear. First, price distortions have declined significantly in the past 20 years. Considering this fact, the current episode of policy reform that accompanied (and includes) China's accession to the WTO should be considered an extension of past efforts. Second, much of the falling protection has come from relaxing licensing procedures (for some crops—e.g., moving oil and oil seed imports away from state trading firms), reducing the scope of NTBs, reducing tariffs, and tariffying quotas (Huang and Chen, 1999). It is perhaps for these historic reasons that much research on China's entry into the WTO focuses on these traditional policies (since they were responsible for much of the earlier progress in trade liberalization). Moreover, while we argue below that it is equally or more

important to examine the effect of nontraditional policies in assessing the effect of trade liberalization on agricultural prices, undoubtedly changes in China's tariff regimes, its state trading system and the matrix of non-tariff barriers (NTBs) will play a continuing role in creating or eliminating price distortions in China's agriculture.

However, in part, because many of the gains from traditional trade reforms have already been experienced, it may be that there also are other, less-discussed policies with which China can push forward additional trade liberalization. For example, China has used taxation policy to protect its agriculture, especially in the case of certain commodities, such as soybeans and barley, crops that have been most liberalized (from a tariffication and tariff reduction point of view). In the early 1990s, leaders radically revised China's fiscal system, making the nation's revenue generation more reliant on a value-added tax system (Nyberg and Rozelle, 1999). In theory, a 13 to 17 percent tax is assessed on value added to all goods during their manufacture and sales process from the time the raw material comes out of the ground until it reaches the consumer. Since many other nations do not have value-added taxes, national regulations state (and WTO also allows) that imported goods that are not for immediate re-export also are to be assessed the value added tax. For a variety of political and tax collection reasons, however, in the early stages of the implementation of the tax, tax authorities decided to exempt farmers from the tax when they sold their products into the market. Traders that purchased grain, for example, from a farmer in his home or in a local market do not have to pay the value added tax. When the good is resold in a downstream wholesale market, the value added tax is assessed, but the trader only owes the tax on the amount of the marketing margin, or the difference between the procurement price and sale price. Given marketing margins in China's competitive grain markets are about 5 percent (ranging between 1 to 10 percent—Xie, 2002), the real value-added tax rate on domestic agricultural goods are only 5 percent of those on imported goods (or about 1 percent of the value of the domestic good, compared to 13 percent of the value of the imported good).

When the value-added tax is assessed at the border, but not at the farmgate, such a tax system provides producers with significant rates of protection over the official tariff rates. For example, in recent years many traders have been given the right to import soybeans and the published tariff rate on soybeans is only 3 percent. Theoretically, then, the international price of soybeans (when they arrive at China's borders) should differ from that of China's domestic price by only 3 percent. However, as soybeans cross the border, importers also must pay a 13 percent value-added tax. Domestic soybeans, in contrast, are taxed, on average, at less than 1 percent. As a consequence, the use of a value-added tax at the border gives China's soybean producers more than 10 percent of additional price protection.[4]

China also aggressively used export subsidies in the years leading up to its accession to the WTO to increase exports of some commodities, and in that way, increase protection by raising the price of certain domestic commodities (Table 3, column 1; Rozelle, 2003). Maize and cotton are the two crops that have received the most substantial export subsidies. During interviews in the field during 2001, we found that maize exporters, especially those in Northeast China, received subsidies that *averaged* 34 percent of export price (row 3). For example, one trader said that for each ton of maize that his company exported in 2001, it received back 378 yuan per ton (or 45.7 US dollars per ton) after producing an export bill of sale with the export sales price. With a sale price of 104 dollars per ton, the trading company received a subsidy of 44 percent, a level 10 percentage points above the average. In other words, the total payment they received (export earnings plus subsidy) was 1240 yuan per ton, which was even about 90 yuan higher than they could have earned in the domestic market (1150 yuan). We also discovered that cotton exporters received subsidies when they exported raw cotton of up to 10 percent or more (row 2).

Although no subsidies were provided to meat exporters (it is a more difficult transaction to make fiscally since there are many more meat exporters and most of them are private or commercialized public firms, unlike maize and cotton traders that mostly are associated with

formal, public state trading firms), tax policies also favor exporters of many livestock products. For example, when a meat exporter executes a contract, the company can receive a rebate (Table 4, column 2). Although less than the export subsidy received by maize and cotton exporters, in 2001 pork and beef exporters received a rebate equal to 5.2 percent of the value of their transaction (rows 4 and 5). Poultry exporters received 13 percent rebates (row 6). Since rebates are not provided to domestic wholesalers (and in many cases the value added tax was not assessed), such policies encourage traders to export.

In summary, then, as China enters the WTO, there are still a number of challenges that officials interested in liberalizing China's trade will face. Alternatively, China also has a number of instruments that it was using prior to the accession to WTO (and may continue to use--legally or not) in managing agricultural prices in its domestic economy. In addition to traditional trade policies—tariffs, quotas, state trading and NTBs—this section has shown that China has protected and/or has the potential to protect its agriculture with a number of other policy measures. In particular, our analysis has shown that taxation policy may still be a tool that China could try to use to protect or further open its agricultural sector. China's leaders also have used export subsidies and rebates to create wedges between the domestic and international prices of importable commodities.

New Estimates of China's Nominal Protection Rates in Agriculture

In this section, we estimate a new set of NPRs for key agricultural goods on the eve of China's accession to the WTO. The primary purpose of this section is to illustrate how to calculate estimates of NPRs that avoid some of the common problems that researchers have encountered in the past. Among other things, we try to understand in a more disaggregated way, the level at which China is protecting agricultural commodities or parts of certain markets (that is for a certain variety or commodity type). Such an analysis should help us more accurately assess

what the impacts will be after China implements its WTO obligations (and if we were to calculate them in a period after accession, whether or not China was carrying through on its promises).

To do so, in this section we first explain how we collected our data. Next we look at the disaggregated results. Finally, in order to make the information more useful to policy makers and other researchers, we create a series of more aggregate NPRs. The aggregation of our disaggregated NPRs into a single crop-specific figure allows us to assess how our methods would have changed had we used traditional methods of estimating NPRs. Appendix A summarizes some of the difficulties that practitioners face when trying to measure NPRs for China's agriculture with traditional methods.

Our new NPRs depend mostly on the collection of a new type of data. In particular, we conducted a set of interviews and surveys with the stated goal of precisely identifying the differences in the prices of specific agricultural commodities at a precise point of time and at a particular location between an imported good on one side of the border (outside China) and a domestic good on the other side (inside China). Likewise, we also wanted to identify the same price gap between exportable domestic goods as they leave the country and the same goods from other countries that are being traded in international markets. Conducted in 2001, the enumeration team was in the field more than 3 months, from August to November. The team visited 7 coastal cities--Guangzhou, Shenzhen, Ningbo, Shanghai, Lianyungang, Qinghuangdao and Dalian—and 2 other more inland cities, Beijing and Changchun.[5] In each port, a number of different types of grain traders and users was used to select a sample of domestic traders, importers and exporters, wholesalers, grain and oilseed users, trade regulators, agents, and other grain and fiber officials. In total more than 100 people were interviewed.[6] Only a small fraction (less than 10 percent) of those contacted refused to be interviewed.

During the interviews, a survey instrument was filled out documenting the scope of the interviewee's participation in China's domestic and international food and fiber trade. We were particularly concerned with understanding price gaps between international and domestic maretks

of commodities—e.g., grains, fibers, meats and horticulture goods—in which that the interviewees were trading or using. The survey recorded the characteristics of the commodities (e.g, their qualities; grades; varieties; etc.) that were being traded in the immediate marketing area during the fall of 2001. For imported commodities, interviewees first told the enumerators the current international CIF price of the good (for a ship docked in their home port). Second, the interviewee then told enumerators what the good would sell for if auctioned of in a competitive auction. In other words, we elicited a series of price gaps for a carefully defined set of goods. Since, on average, each interviewee had information about a number of commodities, we had several thousand observations. A similar set of questions was asked about exportable goods, including rice, fruits and vegetables, and meat products. In the case of exported goods that were being subsidized (i.e., either those that actually were—maize or cotton; or those that possibly could be—wheat or various types of rice), we asked the interviewee how much would be lost on a per ton basis if the trader sold a shipment onto the international market *without* any financial assistance from the government.

Dissagregated NPRs for Selected Agricultural Commodities in China

The results of our analysis illustrate the problems with a strategy of NPR estimation that attempts to come up with a single rate of protection for a commodity (i.e., the types of estimates that most analysts do using the typical types of secondary data that are available in most countries). For example, using our data from China, one of the world's largest importers of wheat over the past two decades, it is difficult to provide just one single NPR for wheat in China (Table 4, rows 5 to 13). Traders reported that the price of very high quality wheat from North America was 20 to 50 percent higher in the domestic markets of China's major ports than when it was sitting on a ship in China's port ready to be brought into the country (rows 6 and 7). More precisely, according to our data, if a ton of imported Canadian Number 3 hard white wheat were costlessly brought across the border and auctioned off in China's domestic market in October of

2001, on average the competitive bid price would have been 20.5 percent higher than the international price on a CIF basis. Hence, based on this price gap, one would have to assume that China's protection price is high, and if it were to open its markets completely, China's domestic wheat prices would fall and import volume rise.

The sample traders/users were quick to point out, however, that they did not think that even with open markets, China's overall wheat price would fall anywhere near 50 percent (even if there was no effect on the world price—i.e., they were not considering the impact of China's imports on the world price). According to our interviews, the market for baking-quality wheat, the main use for hard white wheat from North America, is relatively small in China, at most only several million metric tons (MMTs). We were also told that few users in China outside those who demanded flour for making cakes, pastries, and high quality breads would use this type of wheat even if were available at a cheaper price. On the supply side, only a small group of farmers and processors inside China were able to competitively produce and market this type of wheat. If these supply and demand dynamics are accurate, this would mean that even in world that was free of any trade restrictions, imports of hard white wheat would at most come into China up until demand for that particular variety was filled and the domestic price for that variety would fall to international levels. It is true that liberalization would mean that most of the production of that particular variety would shift to outside of China. Because of the limited demand for such wheat varieties, however, at most only a relatively small number of China's domestic farmers that had been producing these varieties at the trade barrier-protected price would have to abandon them. Moreover, in this specific case—one in which there were few domestic suppliers, and one in which there was little or no substitution of the baking-quality wheat for other domestic uses—there should only be a small price impact on other domestic wheat producers. In short, growers of the high-quality wheat would lose; they would either have to keep growing at a lower price or switch to another wheat variety or some other crop. Since the

quantities of such specialized wheat varieties so small and fill such a special niche, however, the overall price impact would be minimal.

While not as extreme as the case for North American baking quality wheat, traders reported that there were arbitrage possibilities in other wheat markets (Table 4, rows 8 to 10). With a remarkable degree of consistency, the CIF price of medium quality wheat imports from Australia, England and the Pacific Northwest of the United States (hard red) was reported to be 10 percent lower than the price that the traders-cum-enumerators believed the same wheat would command in China's domestic market. Used for more common breads, cheaper pastries, industrial uses and high quality noodles, the interviewees believed that this market accounted for around 10 to 15 percent of China's wheat demand. However, unlike the case of the highest quality baking wheat, there was more production in China. In fact, in 2001 domestic producers supplied most of the wheat of this quality into this segment of China's wheat market, enjoying protection either provided by state-trading of the VAT policy (since a 13 percent VAT on imports is more than enough protection to keep these varieties of wheat from being competitive inside China's domestic market).[7]

Finally, although there have been no imports of low (or lower-medium) quality wheat from international markets, it appears as if China's medium quality wheat, by far the biggest part of China's production (estimated to be more than 60 percent) is at most only marginally protected (Table 4, row 12). Our survey found that traders believed if China's medium quality wheat was sold on the international market in late 2001, it would sell at a discount of about 8 percent. Another way to interpret this result is that if international traders can ship this quality of wheat to China, it would command a premium of 8 percent. Being the largest part of China's wheat crop, the price gap of this size would likely mean that there would be imports of this type of wheat in the aftermath of the nation's succession into WTO (in the absence of VAT or other non-tariff barriers). China's lowest quality of wheat (about 10 to 15 percent of its harvest) is at the world's feed wheat price (row 13). China did export some feed wheat into international markets in 2001

(mostly to Asia, according to an interview). Similar differences in the size of the price gap among varieties of a single type of commodity are found for rice (rows 1 to 4), though not for soybeans and maize, which are more homogeneous products (rows 14 and 15).

New NPRs for China and Sources of Protection for China's Agricultural Commodities

Although there are differences among major types of any individual agricultural commodity, by weighting them by either their sown area (for crops) or production (for meats) shares, sets of more traditional, by-crop, aggregate NPRs can be created (Table 5). Wheat, for example, has an NPR of 12 percent (row 1) when the individual NPRs from Table 4 are weighted by their area shares. On average, the price of all varieties of domestically produced wheat that are sold in the domestic markets of China's major port cities are 12 percent above the average CIF price of all types of imported wheat varieties. Rice, on the other hand, is implicitly taxed by 3 percent. The aggregate figures, although helpful (and perhaps needed for analysis that is only disaggregated to the crop level), are less interesting and provide much less insight about which groups of farmers in which areas that are producing which varieties will be hurt or helped if trade liberalization was able to reduce trade-related distortions.

In the case of commodities with less intra-crop quality differences, the aggregate measures have more inherent interest. For example, maize, soybeans and sugar (and cotton to somewhat lesser extent) have less quality differences among varieties than rice and wheat. In part this is due to the fact that maize and soybeans are rarely consumed directly (as is the case of rice and wheat which make staple food grains more sensitive to human tastes and preferences). Instead, maize and soybeans are mostly used as a feed (apparently, animals have less taste preferences) or are processed. As a consequence, in the next part of our analysis in which we try to match the observed protection rate with the source of protection we only examine aggregate NPRs for maize, soybeans, sugar and cotton.[8]

Our findings show not only that significantly positive rates of protection exist for a number of China's major field crops, but also that they vary over the nation and according to the position in which China finds itself (as a net importer or as a net exporter). Maize prices, according to exporters, were more than 30 percent, on average, above world prices. In other words, traders would have lost more than 30 percent of the value of their shipment, if the government did not subsidize the transaction. Protection rates when considering maize as an import differed among regions, however. For example, traders in the northeast told our survey team that if they were not exporting and foreign maize was to come into China, the importer could make, on average, 21 percent. Our interviews in south China, however, found that the price gap between imported maize, CIF, and maize being traded in the domestic market in and around Guangzhou was more than 35 percent. Aggregated across areas on the basis of their maize consumption shares, we estimate that China's maize NPR was 32 percent in 2001 (Table 5, row 2). When done this way, it is interesting to note that the level of protection of maize almost exactly corresponds to the export subsidies that were being paid to exporters of maize during the fall of 2001.

Interviewees also reported that despite the large volume of increase of soybean imports in recent years, there is still a difference between the CIF and domestic price in the port (Table 5, row 3). The average difference between the domestic price and the international price was 15 percent. In one sense, the fact that there is a remaining price gap is remarkable given that China imported almost 15 MMTs of soybeans in 2001, the official tariff is only 3 percent, and the commodity can be traded by any foreign trade company (that is, trading firms do not need to secure a license or quota allocation). On the other hand, the remaining price gap reminds us that there may be other reasons for distortions beyond tariffs and state trading. In fact, the gap between the domestic and international price almost certainly demonstrates the effect of China's policy of assessing a value-added tax on imported soybeans at the border. As we saw the difference in the tax rate of imported versus domestic soybeans is about 12 percent. Since this is

exactly the difference between the imported soybeans after paying the three percent tariff, there is strong evidence that the main distortion to China's soybean price in the fall of 2001 was the value added tax.

Our results also find that cotton and sugar were fairly highly protected in October 2001 (Table 5, rows 4 and 5). In September and October 2001, traders of sugar in south China and Shanghai (the main ports that we interviewed traders or users that handled or used raw sugar) reported that they could have sold a ton of imported sugar (CIF, China) for almost 40 percent more on China's domestic market if it did not have to pay any fees. In assessing the source of the distortion, we note that in the fall of 2001 the official tariff for sugar was 40 percent (MOFTEC, 2002). Hence, the main distortion for sugar in the fall of 2001 was the official tariff rate, and it appears as if the VAT plays little role.

The case of cotton demonstrates one of the shortcomings for NPRs when they are gathered by our new approach. In the fall of 2001, the average gap between international and domestic price of cotton was measured to be 17 percent. Traders and users of imported cotton told us if they could costlessly bring imported cotton across the border in late September and early October 2003, they could earn 17 percent if the immediately auctioned off their shipment. When our team went back to do follow up work at the end of November, however, the domestic price of cotton had fallen from 9500 yuan per ton in October to less than 8000 yuan per ton. With this fall, the NPR went to around zero (in fact, it was slightly negative). However, by the end of the year (late December 2001), the international price of cotton also fell. Although we only followed up with phone calls to a few of the cotton traders and users, according to the abbreviated survey in late December 2001, the NPR became positive again. While the prices of other crops—both inside and outside of China—varied less than those of cotton in 2001, the case of cotton cautions us that NPRs can change rapidly even over a short period of time. As a result, if this method were to be adopted by a statistical bureau as a way to track NPRs for a variety of their

nation's commodities, it is clear that the surveys would have to be repeated on a regular basis at periodical intervals throughout each year.

Assessing the New Methodology

Since one of our objectives was to use a new data source and method for aggregating variety-specific NPRs to generate crop-specific NPRs, in this section we compare the NPRs created by our time- and data-intensive approach with those that would have been calculated using traditional methods. To conduct such an "experiment" we use the same methodology, data sources and assumptions that many others have used for calculating NPRs for China in 2001.[9] Although the two approaches give almost the same answers for some commodities, such as soybeans and maize (though soybeans was still slightly overstated, in part, because of China's domestic prices fell over the year, suggesting that the NPR in late 2001 was lower than it was in early 2001), the answers vary considerably for other commodities. For example, the national average price for wheat in 2001 reported from the MOA's reporting system was 1113 yuan per ton. The average price of imports calculated by dividing total import value by total import quantity was 1393 yuan per ton. In other words, the domestic price of wheat using these sources of data about prices is 21 percent below the CIF price of imports. From this standard methodology, one would come to the conclusion that wheat, rather than being protected (by 12 percent—see Table 4), was actually being taxed by trading policies. Yet, as we have seen the main reason for generating a negative rate of protection is that China is importing almost exclusively high-grade, baking-quality wheat, while its domestic consumers use mostly medium and lower qualities of wheat. Hence, the wrong conclusion is reached when one uses the specialty prices for imports as an international reference price for types of wheat that are much lower quality and are lower priced.

The same problem is found for rice. Because China imports only high quality jasmine rice from Thailand, the international price of rice (3908 yuan per ton—that is calculated by total

import value divided by total import quantity) appears to be more than 150 percent higher than the average domestic price (1464 yuan per ton). In fact, as shown in Table 4, China's average price protection (tax) rate, calculated on a variety by variety basis, is almost zero (–3—see Table 4).

Thus, according to this illustrative example, we can see the necessity of approaching the estimation of NPRs in a more careful way, at least for certain commodities. Using the traditional approaches work fairly well for commodities that are fairly homogenous in their quality characteristics (such as maize and soybeans). We have seen for the case of wheat and rice for China in 2001, however, that comparing average prices inside and outside of the nation can lead to misleading results. Based on this example, one might conjecture that traditional estimates of NPR rates for some products, such as sugar and edible oils, may be fairly reliable. Those for meat products, cotton (if there are many different varieties being produced and/or imported), and horticulture crops, however, could be misleading.

WTO Effects Away from the Border

While important in determining the size of the shock at the border, the entire effect of trade liberalization on agricultural prices (and the distribution of the effect) depends not only on the size of the distortion, but also on the size of the area across which it will be felt. This second factor, in turn, is a function of the nature of China's markets. In fact, there are at least three factors—policy safeguards (that limit market forces from fully equilibrating domestic and international prices); household responses (by which households are able to move into the production of higher profitability commodities and away from those that experience price falls) and high transaction costs (that possibly can serve to buffer the effects of liberalization policies on those who live in rural areas). In this section, we focus on the nature of markets. The policy safeguards are discussed in the conclusions. The effects of household responses are discussed in Taylor (1998); OECD (2001); and Huang et al. (2003).

Ultimately, the distributional impacts of China's accession to the WTO depend on the nature of the nation's markets. If large areas of the country are isolated from coastal markets where imports enter the nation, the effects of WTO may be circumscribed to restricted parts of the country and should not be expected to have highly adverse impacts on the poor who are largely located in inland areas far from major coastal cities. While being isolated from negative external shocks is a benefit, there also is a cost. Those living in poor, isolated areas would not benefit from price rises when there are enhanced opportunities to export. Living in isolated markets also make household more vulnerable to regional price shocks (which may be caused by either regional production or consumption shifts). In contrast, with well-functioning markets, when imports are infused into (and exports flow out of) areas concentrated around a few large coastal cities, the increased trade flows will affect the prices that small, poor households face even when they live thousands of kilometers away. Moreover, if markets link inland areas together with the coastal areas, it is less likely that local shocks to supply or demand in the inland regions will have any large effect on the price that the local producers receive (which in most cases mean that price variability will be less).

To the extent that there are high transaction costs inside China and to the extent that certain domestic markets are isolated from others in the country—especially those inland areas that are isolated from port regions where imports land—it could be that the impacts of WTO policies are not evenly distributed. In previous work done on China's agricultural markets (e.g., Park *et al*., 2002), it was found that, in general, China's markets had become fairly integrated by the mid-1990s. However, this conclusion should be qualified. First, although markets improved greatly during the early 1990s (when compared to the 1980s), the analysis still found that during some years large regions of the country, especially those in poorer areas, were not completely integrated into national markets. Moreover, the study's dataset is dated. The Park study only studies market integration through 1995. Based on the literature (although there is no rigorous national study of market integration in the late 1990s), and based on the marketing policies that

have been pursued by government leaders during the late 1990s (some of which have been pro-market; others anti-), it is unclear whether we should expect that markets have become more or less integrated since the mid-1990s (Nyberg and Rozelle, 1999).

Assessing the Interregional Market Integration in China

To assess how integrated and developed markets in rural China are in the late 1990s and 2000, we first describe the data. Second, we test for integration and conduct direct tests of how well prices in different markets move together across regions. Finally, we examine if prices are integrated between the market town and China's villages.

Data. The data come from a unique set of price data collected by China's State Market Administration Bureau (SMAB). Nearly 50 sample sites from 15 of China's provinces report prices of agricultural commodities every 10 days. This means there are 36 price observations available for each market site for each commodity each year. The prices are the average price of transactions that day in the local rural periodic market. The Ministry of Agriculture assembles the data in Beijing and makes them available to researchers and policy makers.

We examine rice, maize and soybean prices from 1996 to 2000 (except for maize that was only available through 1998). The three crops are produced and consumed in nearly every province in China. Rice price data are available for 31 markets. Because of quality differences among rice varieties in different regions of China, we look at price integration among markets within four regions, South China (South), the Yangtse Valley (YV), the North China Plain (and Northwest China--NCP) and Northeast China (NE). For the provinces included in the sample, rice prices are available for over 90 percent of the time periods. Prices for maize and soybean data are available for 13 and 20 markets, respectively.[10] Product homogeneity in the case of maize and soybeans makes it possible to examine price integration among markets across a

broader geographic range. We compare our results for the late 1990s (1996 to 2000) to results from 1988 to 1995 that were produced with the same data and published in Park et al. (2002).[11]

Integration tests. In this section we use more formal tests of market integration. Cointegration means that although many developments can cause permanent changes in the individual elements of tested series, i.e. grain price in this paper, there is some long-run equilibrium relation tying the individual components together, represented by the linear combination, as in equation (1). In our paper, the Engle-Granger cointegration approach is applied to test China's market integration. The basic intuition behind is that if one can write two price series in the following way :

(1) $$U_t = P_t^i - bP_t^j,$$

If each price series is stationary of order zero, I(0), then this condition implies the existence of a long-run equilibrium. In other words, in the long run, the two series will eventually return to a constant mean. Moreover, a linear combination of these two prices shows that it is efficient to predict one market's price based on the information of another market's price. Equivalently, these two price series are cointegrated and the two markets are integrated.[12] If the price series are not stationary of order zero, we then need to test whether each elements of the price series is stationary of order 1, I(1). This is done by applying a unit root test. Our analysis shows that all price series for the commodities in China's grain markets in the late 1990s are stationary of order one.

Using our stationary price series, the next step uses the OLS regression of one price series on another:

(2) $$P_t^i = \alpha + \lambda t + \beta P_t^j + e_t,$$

where t is the common trend of the two price series and where e_t is the error term. The main reason for running equation (2) is that it provides the residuals, e_t, to use in the augmented Dickey Fuller test:

(3) $$\Delta e_t = \delta e_{t-1} + \sum_{j=2}^{N} \gamma \Delta e_{t-j} + \xi_t$$

If the test statistic on the δ coefficient is less (i.e. more negative) than the relevant critical value from the Dickey Fuller (D-F) table, the null hypothesis maybe rejected and the two series are said to be cointegrated of order (1,1). According to Engles and Granger, this implies that the two markets from which the price series come are integrated. In our analysis, we assume markets are integrated when the absolute value of the test statistics is greater than 3 (which implies significance at the 10% significant level.

Results. The results of the cointegration analysis illustrate that China's markets have continued to develop in the late 1990s, especially when the results are compared to the market integration research in the late 1980s and early 1990s (Table 6). In middle part of the reform era (1988 to 1995), a time when markets were starting to emerge, between 20 to 25 percent of markets showed signs the prices were moving together during the study periods and sub-periods (Park et al., 2002). According to the Park et al. findings, although there were many market pairs in which prices did not move together, between the late 1980s and mid-1990s, there was evidence of rising integration.

Using the results from the early 1990s as a base line, our current analysis shows that during the late 1990s, China's markets continued along their previous path of maturation. In the late 1990s, examining the co-movement of prices among pairs of markets in our sample, we see a significant increase in the fraction of market pairings that are integrated. In fact, some markets in China are remarkably integrated. In the case of maize, for example, in 89 percent of the cases, prices in one market move at the same time as in another (Table 7, column 2). This is up from only 28 percent of the time in the early 1990s. The share of market pairings (for soybeans,

japonica rice and indica rice) that exhibit price integration also increases (rows 2 to 4). The integration of these markets is notable because in many cases, the pairs of market are separated by more than a 1000 kilometers. For example, we find soybean and maize prices in many years to be integrated between markets in Shaanxi and Guangdong provinces and between those in Sichuan province and southern Jiangsu.

Despite the significant progress in terms of integration, our results do also show that there are pairs of markets during different years that are not integrated. For example, in one third of the cases, japonica rice prices moved in one market but did not in another. The case of indica rice trade is even more notable. While one explanation for such a result is that there is some kind of institutional breakdown or infrastructure barrier (e.g., some policy measure or a weak link in the transportation or communication infrastructure) that is fragmenting China's markets for certain commodities, as shown in Park *et al*. (2002), it is also the case that since every province in China has rice production and consumption, if during a certain year in a certain area, supply in that region is just equal to demand and price differentials between regions stay within the band between regional "export" and "import" prices, moderate price movements in another area may not necessarily induce a flow into or out of the region that is in equilibrium. Hence, even with the non-trivial number of cases in the late 1990s in which market prices in pairs of markets do not move together, based on each of the market performance analyses, one must conclude that the impacts of WTO on China's agriculture increasingly will be experienced across wide regions of the nation from coastal to inland areas.

Assessing Village-to-Regional Market Integration

The inter-regional integration of markets, however, is only half of the story. While the analysis in the previous section demonstrates a remarkable degree of integration between markets on the coast and those inland, such an analysis is still not sufficient to be able to state with confidence households in China's villages are integrated into the nation's marketing network. To

complete our integration analysis, we also need to examine the extent to which villages are integrated into regional markets.

Our test of village-regional market integration tests if farmers in China's villages are price takers or if they reside in villages that are isolated to the extent that local prices are determined by local supply and demand. The equation to test for village-regional market integration is:

$$P_i = a0 + a1*A_i + b1*T_i + d1*D + e_i. \quad (3)$$

In briefest terms, if variables that affect local grain availability, A_i, in village *i* significantly affect the village's price, P_i, we will assume villages are isolated and markets do not extend into China's villages; in contrast, if the variables that affect local availability do *not* affect the price, we conclude that villagers are price takers and markets can be thought to be integrated.[13] Availability in each village during the survey year is measured as the sum of production, P_i, and storage, S_i. We would expect that a rise (fall) in availability would negatively (positively) affect the village's price if markets are isolated. In contrast, we would expect changes in local availability to have no affect on the village's price if markets are integrated. Since it is total availability that matters (note that $A_i=P_i+S_i$), it is total availability (or production plus storage at the beginning of the period) that should enter equation (3). In our analysis, we run equation (3) separately for rice, wheat, maize and soybeans.

When examining the impact of local grain availability on the household's grain price in equation (3), other factors, D_i, need to be controlled for in our cross sectional analysis. In equation (3), we assume that D_i includes two components, one spatial—measured as the distance of the village from the county seat (the typical site of the regional market—the further the village is from the county seat, the lower the price); and the other temporal—the timing of the grain sale (if the sales of grain by the households in the village were during the first three months after the harvest, we would expect a lower price). Because village price levels in different provinces also are expected to vary due to each province's location (with respect to the port) and infrastructure

(e.g., the quality of its road and rail network), we also include a provincial dummy. In the case of rice, since quality varies so much from region to region, we include regional quality dummies (one for each of South China; the Yangtse River Valley; and North/Northeast China).

The data for this study were collected in a randomly selected, nearly nationally representative sample of 60 villages in 6 provinces of rural China (henceforth, the China National Rural Survey—CNRS). To accurately reflect varying income distributions within each province, one county was randomly selected from within each income quintile for the province, as measured by the gross value of industrial output. Two villages were randomly selected within each county. The survey teams used village rosters and our own counts to randomly choose twenty households, both those with their residency permits (*hukou*) in the village and those without. A total of 1199 households were surveyed.

The data from the survey allows us to construct a number of variables that potentially could affect the price that the farmer received in the village. The CNRS project team gathered detailed information on both the production and marketing behavior of all of the farmers in the sample and the characteristics of each village and its relationship to the nearest regional market. From each individual respondent in the survey in each village, we know the price and timing of the sale for each commodity. We average the price associated with all of household sales in the village, weighting each sale by its volume in kilograms. With the information on timing, we can construct a set of variables that measures the proportion of village sales that occurs within each of the first three months after the harvest. In a community questionnaire, we know how far the village's center is from the nearest paved road and the distance to the county market both in kilometers. Finally, for each crop that the farmer cultivates, we know if the farmer's crop suffered a shock, recording both the incidence and the percentage by which the yield fell. These are aggregated to the village level. We do not include any variable that controls for the presence of a community buffer stock system, primarily because such an institution is almost never observed in modern China. However, farmers, at least in the past, have been known to hold large

stores of grain. It is possible that in an isolated village if a production shock occurred and the local price began to rise, farmers could draw on their own stocks and the local price could fall and exhibit no net change (thus looking like villages were integrated into the regional market, when in fact they were not). We use beginning year stocks of farm households, aggregated to the village level, to measure the potential that households stocks could play in increasing availability. We can ignore sales among farmers within a village, since such transactions are rare (according to our data, less than 4 percent of sales are among farmers in the same village).

To test our hypothesis, we regress total grain availability, A_i, on grain price, P_i, for each of the four main staple crops, holding the other variables, T_i and D, constant. In our analysis, we measure total grain availability in three ways: as the production shock, P_i, by itself; as the production shock, P_i, and grain storage, S_i; and as the interaction between the grain storage variable and the production shock variable (or a direct proxy of $A_i=P_i+S_i$). Since the third definition (the interaction effect) is the most intuitive (since it captures total grain availability of the village in one variable), we report the results from the regressions that use this version of the variable in Table 7 and the results of the regressions using the alternative variables are reported in the Appendix Tables 1 and 2). If villages are isolated from the regional markets, when there is a positive production shock and high levels of grain storage—that is, when the interaction term is large—the coefficient on the interaction term should be negative and significant. If markets are integrated into China's larger marketing networks, the coefficient should be insignificant.

Our regression analysis clearly shows markets in China are integrated down to the village level (Table 7). The signs of the coefficients (and level of significance in some cases) on variable measuring the distance of a village from the regional marketing center demonstrate that the further a village is from a market, the lower the price the farmer receives, which is the expected result. More importantly for our purposes, the t-ratios of the coefficients of the village supply shock variables are all small, signifying that the output of the local village's crops does not affect the local price. The main implication of this finding is that it is primarily factors outside the

village that are affecting the prices that farmers receive, making them price takers. In other words, farmers in China's villages are linked to China's regional markets.

Conclusions

The substantive objective of our paper was to study the effect of China's accession to WTO on agricultural prices. Although other effects on the rural economy from other subsectors may be equally large or even larger, this study's focus on agricultural prices showed that there will be an impact on most farmers in economy—both those in coastal areas and small, poor farmers in inland areas. Our findings, based on new methods to collect data and create what we believe are more accurate NPRs, show that indeed for some crops WTO will likely lead to a fall in prices and a rise in imports. Maize and cotton prices may be most affected. It is possible that soybean and sugar prices could also fall. However, not all of the effects are negative. There are also commodities in which China has considerable comparative advantage – e.g., rice, meats, and horticulture products—and, hence, WTO could provide benefits to those engaged in these activities to the extent that markets in other countries become more open to China's exports. The prospect of increased imports of feed grains (e.g., maize and soybeans) at lower prices means that livestock producers could become even more competitive.

The extent to which prices fall from rising imports or increase from rising exports in part depends on how China's executes its WTO obligations, especially in terms of executing the parts of the agreements that affect some of the more nontraditional barriers that were shown to be providing protection to China's farmers prior to the nation's accession to the WTO. Although there may be room for footdragging, which could delay that negative effects (e.g., China now is continuing to subsidize maize exports in order to keep domestic maize prices from falling and hurting maize producers—Rozelle, 2003), the agreement itself also contains a number of legitimate provisions that limit the downside effects. For example, although the TRQ section of the agricultural agreement lowers tariffs and provides access for non state traders to participate in

the import of commodities such as cotton, sugar, and edible oil, it also caps the quantity that can be imported at the low tariff rates. Likewise, the magnitude of the benefits for China's producers is going to depend on how well its trading partners honor their commitments and provide China with better access to global markets for products in which China has a comparative advantage.

Our paper also found that unlike the case of Mexico, it appears as if most of China's villages, even those in remote, inland regions, may be well-integrated into the economy. This is good news and bad news for poor farmers. The good news is that they can benefit from falling input prices and rising export opportunities. The bad news is that unlike a large number of maize farmers in Mexico who were not affected by NAFTA's reduction in maize import restriction, if our results are correct (and maize and cotton prices fall) for large parts of China, its farmers will be affected. The problem, although a short run one (that is, until the households adjust), may most affect the poorest households, who are most dependent on agriculture and least able to adjust their cropping structure. As a consequence, our findings should be taken as a warning to government leaders that they need to begin to be concerned about the welfare of these susceptible groups.

Beyond our illustrative case of China and its accession to the WTO, our paper provides a new way of approaching the analysis of the effect of trade liberalization on agricultural prices. In short, we advocate a three step approach. After understanding the policy environment, pinpointing the sources of protection and identifying how the proposed trade liberalization policies will effect the way an economy is linked to international markets, we need to: a.) generate accurate and disaggregated measures of NPRs; b.) understand the sources of the protection; and c.) through a careful study of the nature of markets, understand how price effects, if they will occur, will affect the level of prices and how the effects will be distributed across the nation. To the extent that the poor in remote villages are integrated or isolated, we need to be concerned about how they will be adversely affected by the negative effects of trade liberalization and how they can be encouraged to take advantage of the positive effects. Having accurate

measures of NPRs for specific times and places also can facilitate the assessment of a nation's implementation of parts of its trade liberalization agreements. For example, knowing precise differences between the price of a commodity being traded international and the domestic price of the same commodity could help assess if export subsidies are being provided.

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Appendix A
Challenges and Issues in Measuring Nominal Protection Rates

Although measuring the difference in price between an economy's domestic price and the international price, the wide range of estimates of NPRs that exist for China demonstrate it is not a straightforward process. In fact, there are a number of issues that complicate NPR measurement. First, confusion may stem from the way analysts have asked their question about NPRs. Policy makers and researchers have sought to summarize the impact of various commodities with a single number. Trade modelers need a single number to make their analytical frameworks tractable. People want to know what is *the* price of wheat in China and compare that to *the* world price of wheat. With this information, the NPR of a commodity is simply the difference of these two numbers.

However, more careful observation shows the search for a *single* number may be one of the main reasons different analysts can come to *so many different* conclusions. In fact, there are many prices for wheat in China. Prices vary across time within a year. Prices vary across regions within a time period. When calculating the NPR, does one look at the price of corn in a Guangzhou feedlot or the price of corn sitting in storage in a farmer's homemade silo in Northeast China? Moreover, rice is not rice is not rice. There are many different varieties and types, all of which command different prices at different places at different times during the year. In fact, for some commodities, such as rice, China is exporting one type at the same time it is importing another. The same sets of issues face analysts when they attempt to choose a price series (or more difficult yet, the single price) to represent the international price. Which price should an analyst choose? Should it be FOB or CIF? Should it be the average annual price or a price during one particular period? And, if there are many different types of imported varieties, which type should be chosen?

In part because previous studies have not dealt with these issues (at least explicitly), it is unsurprising that different research efforts have generated different estimates of NPRs. For example, Tuan and Cheng (1999) estimated quite high and variable nominal rates of protection for agricultural commodities. Their estimates for wheat, maize and soybeans in 1997 were 62, 15 and 140 percent respectively. On the other hand, Carter and Estrin (2001) finds generally negative price distortions. Huang (2001) provides sets of estimates that show some products are highly protected and in other cases there are negative rates of protection.

Table 1. Changes in Nominal Rates of Protection Over Time of China's Major Agricultural Commodities, 1978 to 2000.[a]

	Nominal Rates of Protection (percent)			
	Rice	Wheat	Maize	Soy-bean
1978-79	10	89	92	40
1980-84	9	58	46	44
1985-89	-4	52	37	39
1990-94	-7	30	12	26
1995-97	-1	19	20	19
1998-00	-6	26	32	49
1998	-6	22	40	37
1999	-9	30	33	67
2000	-2	26	23	44

[a] Nominal rates of protection (NPRs) measured as difference (in percentage terms) between average border prices and average domestic wholesale (market) prices.

Source: Huang, 2001

Table 2. China's agricultural trade (US$ million) by factor intensity, 1985-97.

Year	Land intensive products		Labor intensive products		Labor/capital intensive products	
	Value (US$ million)	Share (%)	Value (US$ million)	Share (%)	Value (US$ million)	Share (%)
			Agricultural exports			
1985	2119	36.4	2199	37.8	1497	25.7
1990	1689	17.7	4971	52.1	2881	30.2
1995	875	6.0	7095	48.4	6704	45.7
1997	2158	14.1	6538	42.6	6642	43.3
			Agricultural imports			
1985	1072	43.8	680	27.8	695	28.4
1990	4032	71.9	642	11.5	935	16.7
1995	6575	54.5	3278	27.2	2216	18.4
1997	4644	47.3	2179	22.2	2987	30.5

Source: Huang and Chen, 1999.

Table 3. Subsidies and tax rebates for exports of selected agricultural commodities in China, 2001.

Commodity	Export Subsidies (percent)	Rebate of Value-added Tax for Exported Agricultural Commodities (percent)
Rice	<1	0
Cotton	10	0
Maize	34	0
Pork	0	5.2
Beef	0	5.2
Chicken	0	13

Source: Author's survey

Table 4. Disaggreated nominal protection rates for selected grains in China, October 2001.

	Variety or quality	Comparable domestic price		Border prices (US$/ton)		NPR (%)
		Yuan/ton	US$/ton	C.I.F	F.O.B	
	Estimated at official exchange rate[a]					
						-3
Rice	Weighted average					
	Thai jasmine rice	3690	446	380		17
	High quality japonica	2930	354		398	-11
	Medium quality indica	1519	184		185	-0.5
Wheat	Weighted average					12
	US DNS	2350	284	190		49
	Canadian #3	1800	218	181		20
	Australian soft	1625	196	175		12
	US hard red	1550	187	169		11
	UK	1350	163	145		12
	China-high quality	1350	163	145		12
	China-medium quality	1250	151	140		8
	China-low quality	1100	133	133		-0.1
Soybean	Common variety	1950	236	205		15
Maize	Common variety	1150	139		105	32

[a] The estimated official exchange rate is 8.28.

Data source: Authors' survey.

Table 5. Average Nominal Protection Rates for Major Imports and Exports in China, October 2001.

Major imports and exports	Domestic price (yuan per ton)	Nominal Protection Rate (percent)
Imports [a]		
Wheat [b]	1250	12
Soybeans	1950	15
Cotton	9500	17
Sugar	2612	40
Exports [a]		
Rice [b]	1954	-3
Maize [b]	1150	32
Pork [b]	11442	-30
Beef [b]	13743	-10
Poultry [b]	9904	-17
Fresh Fruits	5472	-4

Source: Authors' Survey

[a] Import commodities are compared to international prices—CIF, China; and export commodities are compared to international prices—FOB, China.

[b] Average Nominal Protection Rates are created by summing the NPR rates of individual varieties weighting with the sown area (production) share.

Table 6. Percentage of Market Pairs that Test Positive for Being Integrated based on Dickey Fuller Test in Rural China, 1988 to 2000.

Commodity	1989-1995	1996-2000
	(Percent of Market Pairs)	
Maize	28	89
Soybeans	28	68
Japonica Rice (Yellow River Valley)	25	60
Indica Rice (Yangtse Valley and South China)	25	47

Note: Results for two periods from same data set. For results from 1989 to 1995 for maize and rice, see Park et al. (2002). Rice results are for the whole country in 1989-1995. Results from soybeans for 1989 to 1995 and all results from 1996 to 2000 are by authors.

Table 7. Ordinary Least Squares Regression Explaining Effect of Local Grain Availability on the Price Level of Major Crops in China's Villages in 2000 (Dependent Variable: Village-Level Price).

Explanatory Variable	Rice	Wheat	Maize	Soybean
Local Grain Availability				
Village Level Climate Shocks (Production Shock) [a]	-	-	-	-
Village Level Grain Storage at the Beginning of Year (Grain Storage) [a]	-	-	-	-
Interaction: Production Shock * Grain Storage [a]	-3.15e-06 (1.31)	7.50e-07 (0.37)	-3.91e-07 (0.33)	.000045 (0.15)
Control Variables				
Distance to the nearest county (km)	-.00074 (0.74)	-.0079 (2.1)*	-.0005 (0.55)	-.032 (2.76)*
Variables Representing Proportion of Grain Marketed during Each of First Three Months after Harvest	-	Included	Included	Included
Quality Dummies	Included	-	-	-
Provincial Dummies	Included	Included	Included	Included
Adjusted R-square	0.16	0.38	0.50	0.15
No. of observations	31	30	28	17

Note: T-ratios in parentheses. Coefficients marked with *** and ** and * are statistically significant from zero at the 20 and 10 and 5 percent level.

[a] Independent measures of Production shocks and Grain storage are not included in this version. See Appendix Tables 1 and 2 for versions that includes these variables.

Table Appendix Table 1. Ordinary Least Squares Regression Explaining Effect of Local Grain Availability on the Price Level of Major Crops in China's Villages in 2000 (Dependent Variable: Village-Level Price).

Explanatory Variable	Rice	Wheat	Maize	Soybean
Local Grain Availability				
Village Level Climate Shocks (Production Shock)	-.108 (1.05)	.06 (0.61)	.109 (1.23)	-.11 (0.49)
Village Level Grain Storage at the Beginning of Year (Grain Storage) [a]	-	-	-	-
Interaction: Production Shock* Grain Storage [a]	-	-	-	-
Control Variables				
Distance to the nearest county (km)	-.00069 (0.69)	-.0081 (2.15)*	-.0007 (0.79)	-.031 (2.75)*
Variables Representing Proportion of Grain Marketed during Each of First Three Months after Harvest	-	Included	Included	Included
Quality Dummies	Included	-	-	-
Provincial Dummies	Included	Included	Included	Included
Adjusted R-square	0.14	0.38	0.53	0.16
No. of observations	31	31	28	17

Note: T-ratios in parentheses. Coefficients marked * are statistically significant 5 percent level.

[a] Grain storage variable and Interaction variable not included in this table. See Appendix Table 2 for version that adds Grain storage variable. See Table 7 for version that includes interaction term.

Table Appendix Table 2. Ordinary Least Squares Regression Explaining Effect of Local Grain Availability on the Price Level of Major Crops in China's Villages in 2000 (Dependent Variable: Village-Level Price).

Explanatory Variable	Rice	Wheat	Maize	Soybean
Local Grain Availability				
Village Level Climate Shocks (Production Shock)	-.108 (1.02)	.06 (0.6)	.132 (1.3)	-.206 (0.96)
Village Level Grain Storage at the Beginning of Year (Grain Storage)	-8.21e-08 (0.18)	1.12e-07 (0.14)	-4.04e-07 (0.5)	.00018 (1.66)
Interaction: Production Shock * Grain Storage [a]	-	-	-	-
Control Variables				
Distance to the nearest county (km)	-.00069 (0.66)	-.0082 (2.11)*	-.0005 (0.51)	-.034 (3.19)*
Variables Representing Proportion of Grain Marketed during Each of First Three Months after Harvest	-	Included	Included	Included
Quality Dummies	Included	-	-	-
Provincial Dummies	Included	Included	Included	Included
Adjusted R-square	0.10	0.36	0.51	0.29
No. of observations	31	30	28	17

Note: T-ratios in parentheses. Coefficients * are statistically significant at the 5 percent level.

[a] Interaction variable not included in this table. See Table 7 for version that includes interaction term.

Endnotes

[1] There is also demand for information about the effect of liberalization on prices in more developed countries in which producers exercise considerable political influence. Although we will cast the discussion in the paper in terms of producer prices, similar arguments can be made for a nation with many poor, landless rural residents; in this case, however, officials also are interested in the effect of liberalization on agricultural prices, but their concerns would be on how such effects would affect the cost of the average household's consumption bundle.

[2] In China, for example, researchers disagree. Some argue that the impact of China's joining WTO on its agriculture will be substantial, adversely affecting hundreds of millions of farmers through sharply lower prices (Carter and Estrin, 2001; Li et al., 1999). Others believe that, although there will be some impact on prices, including substantial ones in some specific areas and for some specific commodities, overall the effect of accession on agricultural prices will be modest (Anderson and Peng, 1998; Huang and Anderson, 2003).

[3] In his case study, Taylor (1998) finds that the impact of NAFTA on Mexican farmers in border regions and those in more remote regions that faced high transaction costs for marketing their output and buying inputs varied dramatically. In fact, Taylor finds that NAFTA has had little impact on those in the poorest areas mainly because they have been insulated from the changes by high transaction costs. Before NAFTA since most of the their economic activities were all either within the household or with others in their own village or township, the prices that they were facing and selling for were determined locally and were not affected by what happened far away in the nation's border areas. Moreover, because farm households in poorer areas are operating in economies that are characterized by poor, incomplete or absent markets for many factors, such as land and on-farm labor, even when they do interact with commodity or input markets, if there are changes in these prices, some of the impact of the prices are "absorbed" by changes in the shadow value of the un-marketed household resources, such as its land or labor (see Singh, Squire and Strauss, 1986, for a complete analytical description of the exact mechanism). For example, part of the fall in agricultural prices could affect the shadow value of land, which while "real" is unrealized since the household is not able to (or is not willing to) sell or rent the land in any case. Such impacts, rather than having their full effect fall on family nutrition or consumption, often end up mainly affecting the farmer's valuation of leisure or un-marketed land. That is not to say, trade liberalization policies do not affect welfare in these areas; they do. However, the complicated ways in which farmers in these economies respond to changes in prices and marketing opportunities usually mean the effects are much smaller than they would be on households that live and work in completely commercialized economies.

[4] Some scholars in China have also pointed out that since part of the value of agricultural commodity production uses inputs on which the value added tax has been assessed, the "real" tax rate on agricultural commodities is actually higher. Although certainly this is the case, the maximum that could be added would only be an addition 2 to 4 percentage points (15 percent times the share of the inputs that were taxed—about 10 to 30 percent—depending on the commodity, the technology, and region of production).

[5] Although Beijing and Changchun are inland cities, firms from the two areas are still actively engaged in international and domestic trade (that uses ocean-going vessels). The prices that they quote used the same basis as did the firms from the coast.

[6] Because of the absence of a single central authority that manages grain flows, the enumeration team chose their sample in a number of ways. In each location, we first visited the local grain bureau and obtained access to a list of all grain bureaus, the firms that they were running on a commercial basis, and their subsidiaries. We interviewed an official in the grain marketing division and transportation division. We also chose three firms that were owned directly by the grain bureau and three that were affiliated with the grain bureau. In several cities, the grain bureau had a list of large grain trading and grain using firms (e.g., mills and feed lots). In others, this was obtained from the market administration bureau. Five firms were chosen on the basis that they were private and had yearly sales that exceeded one million yuan. We

interviewed at least 2 flour or rice mills and feed mills in each location. Finally, we visited the wholesale market and randomly chose 5 stalls to interview. The team also visited a number of other entities, such as the grain reserve, the local COFCO agency, and supermarket chains. In some cases, the managers of these entities knew the grain trade business well enough to answer our questions, in other cases they did not.

[7] In China's domestic market, medium quality wheat from international markets was considered to be high quality wheat from China's domestic suppliers. Interestingly, evidence that medium quality wheat on international markets is the same as high quality wheat supplied by China's farmers is found in the answer to the question that we asked our interviewees: if China's higher quality wheat were sold on international markets, how much *loss* would a trader incur. Our survey found that this rate, 10 percent, was almost exactly the same as the premium importers would make from bringing in medium quality grain from the international market.

[8] We should stress, however, our survey was conducted the same way. In most cases, interviewees told us that there was not a lot of quality differences among maize varieties. Moreover, there was only a slight (around 2 to 3 percent) of price difference between imported and domestic soybeans from quality. Hence, we asked our questions both ways: what was the price difference if imported soybeans (CIF, China) were auctioned off in the domestic market with no taxes or tariffs added; and what was the price difference if domestic soybeans (FOB, China) were auctioned off in the international market with no subsidies provided.

[9] These are computed by comparing the domestic wholesale price with the average implicit price of trade, for the importable (exportable) it is total value of import (export) divided by total volume of import (export). It should be noted that it is possible that in the case of some commodities comparisons using these traditional methods and data are not comparable to our estimates since the traditional measures are calculated on an annual basis and those for our estimates are for a single quarter (Fall 2001). In this particular case, since the international and domestic prices of rice, wheat, and maize were fairly constant across the year, there is little bias. But, in fact, the right comparisons should be to compare fall NPRs from both methods or entire year NPRs from both methods.

[10] Since we use data over time, we need to convert prices to a real basis. Nominal prices from our data set are deflated using monthly consumer price indices calculated and reported by the China National Statistical Bureau. Deflation facilitates transaction cost comparisons across time and allows us to disregard transaction cost increases within periods associated with inflation.

[11] To produce the results, we run cointegration tests on the each pair of markets using the data for each year. So, in other words, we use 36 observations (since the price data are available every ten days) and count the number of pairs of markets that are cointegrated in a statistically significant way (see next endnote and text for explanation of testing). For example, for the case of soybeans, for the late 1990s (1996 to 2000), this means that we are examining the extent of integration between 190 (20*19/2) pairs of markets in each of 5 years, which equals a total of 950 pairs of markets. Hence, since we found that prices in 646 markets were integrated (according to the testing procedure), we report that 68 percent of markets are integrated in the late 1990s. Since we only use 36 observations per test, and since cointegration tests typically perform better with longer time series, by splitting our data into annual increments, we are biasing the results against accepting integration. We do this in order to make our analysis comparable to Park et al. (2002) which follows a similar procedure.

[12] Note that we do not need to have the *b* coefficient be unity to conclude cointegration and integrated markets (which is only needed if one wants to apply the much more restrictive criteria of the Law of One Price.

[13] The data for this study were collected in a randomly selected, nearly nationally representative sample of 60 villages in 6 provinces of rural China (henceforth, the China National Rural Survey—CNRS). To accurately reflect varying income distributions within each province, one county was randomly selected from within each income quintile for the province, as measured by the gross value of industrial output. Two villages were randomly selected within each county. The survey teams used village rosters and our

own counts to randomly choose twenty households, both those with their residency permits (*hukou*) in the village and those without. A total of 1199 households were surveyed. The CNRS project team gathered detailed information on both the production and marketing behavior of all of the farmers in the sample and the characteristics of each village and its relationship to the nearest regional market. From each individual respondent in the survey in each village, we know the price and timing of the sale for each commodity. From these data, we construct an average village price for each month in yuan per kilogram. In a community questionnaire, we know how far the village's center is from the nearest paved road and the distance to the county market both in kilometers. Finally, for each crop that the farmer cultivated, we know if the farmer's crop suffered a shock, recording both the incidence and the percentage by which the yield fell. We do not include any variable that controls for the presence of a community buffer stock system, primarily because such an institution is almost never observed in modern China. In addition, sales among farmers within a village are rare (according to our data, less than 5 percent of sales).