Trade and Investment Liberalization and China's Rural Economy: Impacts and Policy Responses after China's Accession to the WTO

Section III

Scott Rozelle
Department of Agricultural and Resource Economics
University of California, Davis

Jikun Huang
Center for Chinese Agricultural Policy
Institute of Geographical Sciences and Natural Resource Research
Chinese Academy of Science

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III. China's Accession to WTO and Agriculture

The overall goal of this section is to understand how WTO will affect the
agriculture sector in China. To accomplish this goal we have two specific objectives.
First, we seek to provide measures of the distortions in China's agricultural sector at a
time immediately prior to the nation's accession to WTO. Second, we seek to assess how
well integrated China's markets are in order to understand which areas of the country and
which segments of the farming population will likely be isolated from or affected by the
changes that WTO will bring. Ultimately, with a knowledge of the size and magnitude of
the impacts, researchers will be better able to being working on understanding how the
policies that WTO will impose on China will change the gap between the domestic and
international price and affect imports and exports, domestic production and production,
income and poverty.

We begin the study with the basic premise that to assess the impact of WTO on
agriculture, we need to basically answer two sets of questions, and do so in a fairly
detailed way. First, we need to understand the magnitude of the current distortions to
agriculture. In essence, this means that we need to come up with estimates of the
nominal rates of protection (NPRs) of the agricultural sector's major commodities, or the
gap between the price at which commodities can be landed at China's borders and the
price in the domestic markets. Such an exercise also includes estimating the rate at which
some domestically produced goods are implicitly taxed because traders are not allowed to
export the economy. In other words, we also need to measure the size of negative NPRs.

Second, once the size of the "shock" at the border is estimated, to understand the
crop-specific and regional impacts of WTO's accession (as well as impacts on certain
groups of rural residents, such as the poor), we need to understand how well price shocks
are transmitted throughout the economy. If large areas of the country are isolated from
coastal markets where imports land, then 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 urban centers. While
being isolated from negative shocks is a plus, there is also a cost. Those living in poor,
isolated areas also would not benefit from the price rises and opportunities to export.
However, if markets exist that link together distant regions with the coast and price
changes in one part of the economy quickly ripple through the economy, even though
imports are infused into (and exports flow out of) areas concentrated around a few large
coastal cities, they could have ramifications for poor households thousands of kilometers
away. Moreover, as will be discussed in greater detail later in the section, the nature of
China's markets also will affect *either* how large the price shocks will be (if imports are
limited by TRQs—that is, for a given quantity of imports, the more integrated China's
markets are, the less the price effect will be at the border because the impact will be
spread over a large area and many producers) *or* how large the imported quantities will

be (given the magnitude of the reduction of the price distortion if there are no quantitative restrictions on the quantities to be imported).

To meet these objectives, the rest of this section is organized as follows. First, we will seek to provide a context for our analysis of the current distortions that affect China's agriculture. Second, after briefly discussing our data and way of collecting information for calculating the gap in prices between international and domestic markets, we present measures of NPRs for a set of commodities for China. The next section then discusses 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. The fourth section of the paper then analyzes the transmission of prices through the economy. The final section discusses the implication of our findings.

1. Gradual Opening and Remaining Distortions

Although agriculture has been at the center of China's negotiations over its entry into the World Trade Organization (WTO), the likely shifts in China's future agricultural policy and its impacts are not well understood. Debates on future China's food security are growing. Some argue that the impacts of China's joining WTO on its agriculture will be substantial (Carter and Estrin, 2001; Li et al., 1999). Others believe that although there will be some impacts, in some specific sectors even severe, overall the effects of accession on agriculture will be modest (Anderson and Peng, 1998; Martin, 2002). In this section, we argue that two fundamental and mostly implicit assumptions have characterized previous studies of the effect of China's entry into WTO, both of which may account for the wide range of views on the issue.
Methodological Shortcomings with Previous Estimates of Distortions

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?

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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 NPR. 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.

Historical Context and Effect of Policies on Distortions

The confusion about the ultimate impact of WTO also can be traced to a general lack of understanding of the policy changes that may be induced from China's WTO accession (Martin, 2002) and an understanding that in fact the current changes are really in some sense an extension of past trends. 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). 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, as is shown in this section, while at one time these policies were the source of high distortions, after nearly two decades of reform in the external economy, the some of the worst of the distortions caused by these policies have already disappeared. To show this we first briefly review China's past policy regimes and show the effect that they have had on protection.

Price and market reforms were key components of China's policy shifts from a socialist to a market-oriented economy. The reforms associated with China's policy reforms, however, began slowly and have proceeded gradually. Market liberalization began with non-strategic commodities such as vegetables, fruit, fish, livestock, and oil and sugar crops. Little effort was made on the major crops. And, although the aims of the early reforms were to raise farm level prices and gradually deregulate the market, most of the significant early reforms were done by administrative measures (deBrauw et al., 2001). However, as the rights to private trading were expanded in the early 1980s, and officials allowed traders the right to buy and sell the surplus output of almost all categories of agricultural products, the foundations of the state marketing system began to be undermined.

Since the mid-1980s, market reforms have continued, albeit in a stop and start way (Sicular, 1995). For example, after record growth in agricultural production in 1984

and 1985, a second stage of price and market reforms was announced in 1985 aimed at radically limiting the scope of government price and market interventions and further enlarging the role of market allocation. Because of the sharp drop in the growth of agricultural production and food price inflation in the late 1980s, however, implementation of the new policy stalled. Mandatory procurement of grains, oil crops, and cotton continued. After agricultural production and prices stabilized in 1990-92, another attempt was made in early 1993 to abolish the grain compulsory quota system and the sale at low prices to consumers. The state distribution and procurement systems were substantially liberalized, but the policy was reversed when food price inflation reappeared in 1994: government grain procurement once again became compulsory. As well, a provincial governors' grain responsibility system was introduced in 1994-95, aimed at encouraging greater grain self-sufficiency at the provincial level. Further retrenchments followed; in 1998 the central government initiated a controversial policy change prohibiting individuals and private companies from procuring grain from farmers (who were supposed to deal solely with the commercial arm of grain bureaus and the grain reserve system--although traders were allowed to operate in wholesale and retail markets). Officials tried to set grain procurement prices at a level more than 20% higher than that set by the market (Huang, 1998; Lu 1999). Not surprisingly, stocks started to accumulate and procurement and market prices began to trend down towards levels that were seen on international markets.

Despite these periodic cycles in the reform process, markets have gradually emerged in rural China. The proportion of retail commodities sold at market prices has kept rising. According to Lardy (2001), the share for agriculture was just 6% in 1978 but had risen to 40% by 1985, 79% by 1995 and 83% by 1999. Moreover, the state's intervention was unable to halt the flow of grain across provincial boundaries. Park et al. (2002) find that agricultural prices for all major commodities, including rice, wheat, and especially for maize and soybeans have moved together during much of the early 1990s. Prices behave as if they are being created by traders who are arbitraging price difference across time and space. And, when coupled with the strong gains in productivity that many of China's crops have experienced since the early 1980s (Jin et al., 2002, the real price of domestic agricultural economies, although fluctuating, have trended downward (Huang, et al., 1999).

China's policies governing the nation's external economy also have played a highly influential role in shaping the growth and structure of agriculture production and trade for many decades and has itself contributed to lower levels of protection. During the entire Socialist Period (1950 to 1978), the overvaluation of China's domestic currency destroyed incentives to export effectively isolating China from international exporting opportunities (Lardy, 1995). An overvalued exchange rates creates a situation in which domestic prices are excessively high from the view point of the foreign trader who is interested in purchasing goods from or selling goods to China. After the reforms began, however, between 1978 and 1994, officials allowed the real exchange rate to depreciate by 400 percent. Shifts in the valuation of the currency alone greatly reduced the inherent protection that agriculture was receiving.

At the same time, China also began to liberalize its international trading system. Lower tariffs and rising imports and exports of agricultural products began to affect domestic terms of trade. In the initial years, most of the fall in protection can from a reduction in the commodities that were controlled by single desk state traders (Huang and Chen, 1999). In the case of many products, competition among non-state foreign trade corporations began to stimulate imports and exports (Martin, 2002). And, although many major agricultural commodities were not included in the move to decentralize trade, policy shifts in the early 1980s also changed the trading behavior of state traders. More imports entered the nation in the 1980s and 1990s, though there continued to be many year to year fluctuations for some commodities. After the fall of restrictions on imports and exports of many of China's agricultural commodities, a new effort was began in the early 1990s, to reduce the level of formal protection. In fact, from 1992 to 1998, the simple average agricultural import tariff fell from 42.2% in 1992 to 23.6% in 1998 (MOFTEC, 2001).

So although WTO indeed must be thought of as a time in which China is entering a new phase in its external and domestic economy management, earlier achievements and policy shifts actually mean that China's level of protection at the border for its agricultural commodities had already been evolving for more than 20 years. For example, Figure 1 clearly shows the monotonic fall in NPR through out the reform era. Protection for all crops has fallen uniformly since 1978. Huang (2001) shows that that the protection for wheat has fallen from more than 90 percent in the early 1980s to around 20 percent in the late 1990s. Similar falls have occurred for rice, corn and soybeans.

Changes in trade and domestic marketing policies have resulted in dramatically shifting trade patterns. Disaggregated, crop-specific trade trends show how exports and imports increasingly are moving in a direction that is more consistent with China's comparative advantage (Table 1). Specifically, the net exports of land-intensive bulk commodities, such as grains, oilseeds and sugar crops, have fallen; while exports of higher-valued, more labor-intensive products, such as horticultural and animal (including aquaculture) products, have risen. The proportion of grain exports, which was around 20% of total agricultural exports in the 1990s, is less than half of what it was in the early 1980s. By the late 1990s horticultural products and animal and aquatic products accounted for about 80% of agricultural exports (Huang and Chen, 1999). These trends are even more evident when reorganizing the trade data grouping them on the basis of factor intensity (Figure 2).

Other Sources of Trade Liberalization or Protection

Based on the preceding discussion, two facts become clear. First, distortions have declined significantly in the past 20 years. Considering this fact, the current episode of policy reform that accompanied China's accession to the WTO should be considered an extension of past efforts. Second, much of the falling protection has come from the relaxation of real tariff rates at the border, changing quotas and relaxing licensing procedures for some crops, decentralizing authority for some crops, and reducing the

scope of NTBs (Huang and Chen, 1999). It is perhaps for these reasons that much research on China's entry into the WTO focuses on the policies that were responsible for much of the earlier progress. And studying these policy tools, in fact, might be merited. Undoubtedly, changes in China's tariff regimes, state trading system and matrix of NTBs will play a continuing role in creating or eliminating 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 policy sources by which China can affect further trade liberalization (or which could allow China to protect its market more, if it uses the measures) as it enters the WTO. Even if traditional policies are still important, it could be that the gains from these other policy reforms may be as important as those that can come from traditional trade reform.

For example, foreign exchange rate policy has the potential for being an important instrument in China's trade policy in the coming years, just as it has in the past. Whereas real exchange rate movements during the 1980s and early 1990s changed terms of trade and encouraged China to export more agricultural commodities and import fewer, during the late 1990s the situation has reversed. After going to a single exchange system in 1994, leaders basically tied its currency (RMB) to the US dollar, at a rate around 8.3 to 1. However, while its own currency exchange rates have stayed the same in nominal terms, in real trade weighted terms, the value of the RMB has risen significantly (Figure 3). Using a conservative estimate of the real index for trade prices, China's real exchange rate rose at least 20 percent in the late 1990s. In competitiveness terms, this means that the real prices of its agricultural commodities have risen and distortions have increased for some commodities. The movement of other Asian currencies versus China's demonstrates that much of the change occurred as a consequence of the Asian financial crisis when most of its East and Southeast Asian neighbors devalued their currencies (Figure 4).

Although exchange rate policy changes are a blunt instrument in that they would affect the trade of all commodities, not just those of agriculture, one can readily see that China does have a power policy tool at its disposal in the post-WTO world. Specifically, even after WTO, if declining protection were to overly affect certain sectors of the economy in an adverse way, policy makers always have the option to devalue its currency. Such a policy shift, at least in the short run (because it is possible that other countries would respond), would increase protection of its imports (it is more expensive to import) and decrease the implicit tax that is being imposed on exportable goods.

China also has used it taxation policy to protect its agriculture, especially in certain sectors, such as soybeans, that have been most liberalized. In the early 1990s, leaders radically revised China's fiscal system, making it much more reliant for revenue generation on a value-added tax system (Nyberg and Rozelle, 1999). The theory of the tax was that it would be assessed 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. National regulations state that imported goods that are not for immediate re-export also are to be assessed the value added tax. Although there are varying rates, the typical value added tax ranges from 13 to 17 percent.

For a variety of political and tax collection reasons, 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 would not have to pay the value added tax. When the good was resold in a downstream wholesale, the value added tax was then assessed, but the trader only owed the tax on the amount of the marketing margin, or the difference between the procurement price and sale price. Recent field work found that in China's competitive marketing regime, the marketing margins are between 1 to 10 percent. Taking an average of 5 percent, the real tax rate on domestic agricultural goods are only 5 percent of that of imported goods.

Such a tax system can provide some of China's farmers with significant protection (Table 2). For example, in the case of soybeans, there is only a 3 percent tariff on imports. In recent years, however, many traders have been given the right to import soybeans. Theoretically, then, the international price of soybeans (when they arrive at China's borders) should differ by only 3 percent. However, as they enter the country, soybean importers also must pay a 13 percent tax to meet their value added tax obligation (row 3, column 2). Domestic soybeans, in contrast, are taxed, on average, at less than 1 percent (row 3, column 1). Through this means, then, China's soybean producers have an added 12 percent of price protection.

China also has used export subsidies in recent years to increase exports of some commodities, and in that way, increase protection by raising the price of domestic commodities (Table 3, column 1). 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 43 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 it produced an export bill of sale with the export sales price. With a sales price of 104 dollars per ton, the trading company received a subsidy of 44 percent. 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 fairly large subsidies when they exported raw cotton, up to 10 percent or more (row 2). Finally, in several isolated cases, rice exporters reported that they received small subsidies (though no more than 5 percent for any single trade) from municipal and prefectural governments, a subsidy that we only documented in south China (although it should be noted that we did not have a chance to interview many rice traders in north China—i.e., ones that might be exporting japonica varieties into the northeast Asia market). Of rice traders we did talk to, most received no subsidy for their exports, meaning the average subsidy almost certainly was less than 1 percent (row 1).

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 favor exporters. Based on the trade ministry's estimate of the average value added tax paid on the products exported by meat traders, when a meat exporter executes a contract, the company can receive a rebate equal to the estimated value of the value-added tax (Table 4, column 2). For example, pork and beef exporters receive a rebate equal to 5.2 percent of the value of their transaction (rows 4 and 5). Poultry exporters receive 13 percent rebates (row 6). Since rebates are not provided to domestic wholesalers, such policies give the trading system an incentive to export, since the demand will be higher as the ultimate user outside of China actually sees a relatively lower price than the domestic user.

In summary, then, as China enters the WTO, there are still a number of challenges that those officials interested in liberalizing China's trade will face. Alternatively, China also has a number of instruments that it has been using and may continue to use (legally or not) in managing its domestic economy. In addition, to traditional trade policies, tariffs, quotas and licensing, state trading and NTBs, we have shown that China has protected and/or has the potential of protecting its agriculture with a number of other policy measures. In particular, our analysis has shown that foreign exchange policy may still be a tool that China could use to protect or further open its agricultural sector. It also has used taxation policy, export subsidies and rebates to create wedges between the domestic and international prices of importable commodities and to decrease the domestic price relative to the world price of exportable goods.

2. New Estimates of China's Nominal Protection Rates

In this section, we estimate a new set of NPRs on the eve of China's accession to the WTO. These estimates will attempt to overcome some of the previous problems of researchers. In particular, we try to understand in a more disaggregated way, the part of certain markets (in terms of varieties or commodity type) that China is protecting. Such an analysis, should help us more accurately assess what the impacts will be after China implements it WTO obligations. To do so, 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.

Data for NPR calculations

To overcome previous shortcomings of NPR studies, we conducted a set of interviews and surveys with the stated goal of precisely identifying the differences in prices at a precise point of time and a particular location between an imported good on one side of the border (outside China) and a domestic good of identical quality on the other side (inside China). Likewise, we also wanted to identify the same price gap between exportable domestic goods as it leaves the country and the same goods from other countries that are being traded in international markets. Such information provides

the raw data that we need for estimating NPRs on a highly disaggregated basis. While such information is of interest in its own right, it also can use it to construct more aggregate NPRs (for the entire crop) by making certain assumptions about the structure of the distribution of quality of the commodity in the domestic economy.

Conducted in 2001, the enumeration team was in the field more than 3 months, from August to November. The team visited 7 port cities--Guangzhou, Shenzhen, Ningbo, Shanghai, Lianyungang, Qinghuangdao and Dalian—and 2 other more inland cities, Beijing and Changchun (Map 1). In each port, a number of sampling frames were 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. 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 the transactions that the interviewees were involved with or knew about that concerned imported or exported grains, fiber, meat and other goods. The survey recorded the characteristics of the commodities that were involved in trade in the immediate marketing area during the fall of 2001. Enumerators then asked the interviewee a series of questions about commodities about which the traders were most familiar. For imported commodities, interviewees first told the enumerators the international CIF price of the good. 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 hundred observations. A similar set of questions was asked about exportable goods, including maize, rice, cotton, and meat products, etc.

Dissagregated NPRs for Selected Agricultural Commodities in China

The results of our analysis clearly illustrate the problems with a strategy of NPR estimation that attempts to come up with a single rate of protection for a commodity. For example, it is difficult to provide one single NPR of wheat in China, one of world's largest importer of wheat (Figure 5, Panel A). 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. More precisely, the average trader told us that if a ton of Canadian Number 3 hard white wheat were brought in and auctioned off in October of 2001, 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, wheat prices would plummet and import volume soar.

However, traders were quick to point out that they did not think that even with open markets, China's wheat price would not 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 actually 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, and that only a small group of farmers and processors inside China could supply this type of wheat. If this is in fact the case, this would mean that even in world that was free of any trade restrictions, imports would come into China up until demand was fulfilled and the domestic price for that variety fell to international levels. Alternatively, it could be that all production of that particular variety shifted to outside of China if all of China's domestic farmers who were producing these varieties abandoned them because they could not make a profit at such low prices. In such an extreme case with few domestic supplies and with little or no substitution of the baking-quality wheat for other domestic uses, there would only be a small price impact on most domestic producers. Growers of the high-quality wheat would lose; they would have to keep growing at a lower price, switch to another wheat variety, or change cropping patterns. Since the quantities of such grain are so small, however, the overall 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 markets (Figure 5, Panel A). In 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 they believed the same wheat would command in China's domestic market. Used for more common bread, 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. In China's domestic market, however, this wheat was considered to be high quality Chinese wheat. 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 high quality of 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.

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 only marginally protected (Figure 5, Panel A). 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, then, it is likely that

there will be imports of wheat after WTO because of the persistent price gap. The effect, however, appears to be less than 10 percent. China's lowest quality of wheat (about 10 to 15 percent of its harvest) is at the world's feed wheat price. Interestingly, China did actually export some feed wheat into international markets in 2001 (mostly for Southeast Asia, according to one interview).

Similar differences in the size of the price gap among varieties of a single grain are found for rice (Figure 5, Panels B). Although China has been a net exporter of rice in the past few years without significant amounts of subsidies, it has also imported some varieties. This pattern of trade is consistent with the findings of our interviews with rice traders. Although China imports about 400,000 MMTs of high quality Jasmine Rice from Thailand, the gap between the price when it lands at the port (higher) and the price when it is sold in the domestic markets (lower) is 17 percent. In contrast, although China was able to access part of the Northeast Asia japonica (short grain) rice market, either demand constraints (likely in 2001) or export restrictions (less likely in 2001) kept China from exporting japonica in quantities large enough to equilibriate the price inside and outside of China.. After exporting several million metric tons of lower quality of indica rice in 2001, the domestic price is almost the same as the international price.

China's international trade in chicken parts shows the same pattern as that of rice (Figure 5, Panel C). China is protecting its market for chicken feet substantially, by nearly 100 percent. At the same time, the domestic price of legs and breasts are about 12 percent lower than world market prices. According to industry interviewees, the restrictions that have kept certain foreign chicken parts, such as feet, out of China is actually protecting the entire market, since it is believed that China's consumers will readily substitute a lot (though certainly not all) of their chicken consumption (in the form of legs, breasts, etc.) with cheaper imported chicken parts, such as feet. Interviews with US pork traders say the exact same situation exists in China's external market for pork and pork parts. The price of lean pork is considerably below the world market price, while the world market price for pork parts (e.g., stomach or pigs feet) is considerably below that of China's domestic price.

Although there are differences among major types of any individual agricultural commodity, by weighting them by their sown area (for crops) and production (for meats) shares, a set of by crop aggregate NPRs can be created (Table 4). Wheat, for example, has an NPR of 12 percent (row 1) when the individual NPRs from Figure 5, Panel A, are weighted by their area shares. On average, the price of all varieties of domestically produced wheat that is sold in the domestic markets of China's major port (and inland) 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 reduces the distortions.

However, to the extent that certain commodities have less intra-crop quality differences, the aggregate measures have more inherent interest. For example, maize and soybeans (and cotton and sugar) have far 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 are rice and wheat, which make them more sensitive to human tastes and preferences). Instead, maize and soybeans are mostly used as a feed (and animals have less taste preferences) or are processed. As a consequence, in our analysis we only examine aggregate crop NPRs for maize, soybeans, cotton, and sugar.[1]

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, they would have lost more than 30 percent of the value of their shipment, had the government not paid them a subsidy. Protection rates when considering maize as an import differed. 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 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 30 to 40 percent. Aggregated across areas on the basis of their meat consumption shares, we estimate that China's maize NPR was 32 percent in 2001 (Table 4, row 2).

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 4, 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 is freely traded without securing 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, a point to which we will return shortly.

Our results also find the cotton and sugar were fairly highly protected in October 2001 (Table 4, rows 4 and 5). The case of cotton, however, is an example of how fast the NPR can change across time. The NPR was measured to be 17 percent in October 2001. 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 less than zero. However, later in the year, the international price of cotton also dipped, a fact that would lead to a higher NPR. Being less variable in 2001 in both China's and international markets, the NPR of sugar remained about 40 percent throughout the year.

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[1] 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.

Since one of our objectives was to use a new data source and method for aggregating NPRs data to generate crop specific NPRs, it would be interesting to analyze what would have happened had we not used this time- and data-intensive survey methodology. To conduct such an "experiment" we use the same methodology, data sources and assumptions that were used to calculate the NPRs in Figure 1 to calculate an NPR for China in 2001.[2] Although the two approaches give almost the same answers for some commodities, such as soybeans and maize (though soybeans was still overstated, in part because of difference in prices over the entire year—China's domestic prices fell sharply 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 very high grade, baking quality wheat, while its domestic consumers use mostly medium and lower quality of wheat. 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 48 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 almost zero (–3).

According to this illustrative example, we can see the necessity of approaching the estimation of NPRs in a more careful way for some 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, and horticulture crops, however, could be misleading.

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[2] 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).

3. WTO Effects at the Border

The magnitude of the effect of the WTO agreement on China's farmers depends on several factors. First, the magnitude will depend on the size of the true NPR as discussed in the previous section, which is a function of the distortions in the economy. The second factor is the size and nature of China's market. To compute a set of estimates of post-WTO supply, demand, trade and price effects, a complete assessment must include an analysis of both supply and demand behavior of producers and consumers of each commodity inside China as well as an analysis of the supply and demand behavior of the rest of the world.[3] Such analysis, however, is beyond the scope of this paper. In other work done by the authors, when we use the CAPSIM framework to project the impact of completely liberalizing prices, we find the rice farmers and livestock producers benefit greatly; wheat, maize, and soybean producers suffer large falls in prices and income cuts (Huang and Chen, 1999). Given the sizeable gaps that our analysis has measured between domestic and international price for some crops, it would be plausible that if the nation were to undergo complete trade liberalization, the economy would experience wrenching changes. There would potentially be big winners; likewise, there would likely be big losers. These results are briefly described in appendix A of this section.

However, China's accession to WTO is not big bang trade liberalization. In reality, as we have tried to argue above, China's entry into the WTO represents another gradual step in the opening of the external economy. In fact, there are at least three factors—policy safeguards, household responses and high transaction costs (or isolate markets) that possibly can serve to buffer the effects of liberalization policies on those who live in rural areas in China.

Policy Safeguards

As described in the previous section (section II), even when China's producers will face the most liberalized conditions imposed on them by the WTO agreement (the peak year is currently specified as 2004) under which China will enter the WTO, there are provisions that will allow the nation to protect its rural sector—both under the letter of the agreement and by actions that it should be expected to take. Under the current accession agreement, China's TRQ levels are set at modest enough levels that the quotas may not even bind. It is possible, for example, that after WTO, when TRQs are offered to private traders at such narrow price gaps between the international and domestic market (10 percent or less for the type of wheat the China's consumers demand the most), importers only find that the highest quality of wheat is worth bringing in and the market for such grain may not be enough to fill the TRQ.

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[3] Without considering the political-economy factors that affect how fast and how complete the distortions are removed, traditional supply, demand and trade analysis, such as with the use of a CGE or partial equilibrium modeling framework, is needed to project the changes in output, consumption, prices and income.

Moreover, even after China does everything to meet its obligations, the TRQs are low enough and the above quota tariff rates are set at high enough rates that if the TRQs filled and leaders believed its rural sector was being seriously hurt, it has means at its disposal to minimize any damage, either real or perceived. For example, after bringing in imports up to its TRQ level (e.g., 9.636 million tons for wheat), China's leaders can legally assess a tariff of 65 percent on any additional imports. At such high tariff levels, China's wheat producers almost certainly would be shielded from any other competition from international producers for many years since according to almost any set of predictions, there are almost no conceivable scenarios under which China's domestic price would rise by more than 50 percent of the world price for a long period of time—especially if China continues to commit itself to carry through with its ambitious set of "green-light" investments in water control, rural roads, and agricultural research and extension. The same would be true for almost all other commodities. Of course, there would be pressure to continue to liberalize in the next round of world TIL negotiations, but, if the effects were damaging enough (or were perceived to be damaging enough), China's leaders would almost certainly not agree to any further concessions, at least not without large enough gains in other parts of the agreement that they thought they would adequately be able to take other measures (e.g., delinked producer payments) with which they could offset the negative impact.

There are also a number of practical more gray-area actions that can be used. If leaders truly perceived large parts of the rural sector were being hurt seriously, China should be expected to begin to search for and find interpretations of existing rules that will provide them with a measure of protection.[4] International agreements are never specified in comprehensive enough terms that a determined government can not find ways to limit the impact of many of the WTO provisions. One of the best examples of this has been the way in which Korea implemented its TRQ agreements. By putting the TRQ rice import quantities "out to bid," most of the TRQ imports that have entered the country have been extremely low quality because the right to import was given to the lowest bidder. In effect, this action, which Korean leaders can still claim to be in adherence to their WTO commitments, also serves to provide almost complete protection to its farmers.

China, a country that is equally as good in executing policies in ways that help its leaders meet national goals, should be expected to look and probably find ways to limit the impact of policies if they were thought to be damaging. For example, it is still unclear how licensing arrangements will be handled that will allow the private sector to bring in their part of the TRQ. One proposed stipulation is that TRQ allocations will be given to anyone that promises to re-export part or all of the grain or a good that is processed using the grain. Such a rule would partially insulate the domestic economy.

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[4] We are not suggesting that China will or is planning to implement policies in this way. In fact, there are many in the government who believe (maybe rightly so) that such policies, although inflicting some costs on some rural residents, will benefit China in the long run as it will help move the economy towards a direction that is more efficient. In this paragraph, I am merely raising the possibility about what might happen if China truly believed its interests were being harmed or its stability disturbed. Moreover, it is also likely the world will have its full attention of China's implementation and the nation may believe it is unable or unwilling to incur the cost of "foot-dragging."

One could imagine how other rules could be set up to only give these TRQ import rights to companies that would work in cooperation with the government in a way that would minimize any adverse impact of large imports.

China can also be expected to "fight" the removal of certain rules and regulations that are providing protection and which can be argued in some as being outside of their WTO obligations. For example, although the current tariff rate on soybeans is 3 percent and barriers to imports have largely been removed, our estimated NPR is still 15 percent. According to our calculations, which are supported by our interviews, it is almost certain that most of the protection is being provided by the unequal assessment of the value-added tax on domestic procurement and imports. Interestingly, the above tariff protection (15-3=12) is almost exactly equal to the difference between the value added tax that is assessed on imports and domestic procurement (13-1=12—see Table 2). Although from one point of view such a tax is clearly a violation of China's "national treatment" clause, China has put up an argument that its producers already pay local taxes equal to at least 12 percent of the value of their soybean sales and consequently they are not out of compliance. While many believe that China would lose such a case in the WTO disputes settlement process, it may be that the gains would not be enough to be worth a country to fight this battle. China is already importing a huge amount of soybeans and, if pressed on an issue (such as the removal of the value-added tax on soybeans), the nation's leaders could retaliate. For example, there are a number of actions China could threaten to take that might be able to convince a country wanting to bring a suit against China to drop it. Officials could develop an excuse to stop importing soybeans from the country filing the petition (such as stopping the import of soybeans that are suspected of being GMO since the nation is a center of origin of soybeans and importing herbicide-tolerant soybeans in some way represents an environmental threat since there are many weeds in China that are soybean relatives). Thus, while according to the letter of the law China should either have to eliminate the VAT on imports or assess it on domestic procurement, there might be ways it can stop or delay a further drop in protection. If the VAT is eliminated, soybeans imports should increase (and price should fall) in one more burst and then equilibriate, varying in the future mostly on the basis of supply and demand conditions inside and outside of China.

The case of soybeans before the WTO agreement, however, shows that when protection does come down and China allows more or less access to its markets (that is except for the official tariff and VAT), imports can surge. Before 2000, the import tariff for soybeans was as high as 114%, importers required licenses, and China' farmers grew most of the nation's soybeans. However, in anticipation of the China's WTO accession, tariffs were lowered to 3% in 2000. After this lowering, officials also phased out import quotas. Consequently, imports surged from 4.32 million metric tons (mmt) in 1999 to 10.42 mmt in 2000. In 2001, most observers believe soybean imports exceeded 14 mmt. Prices also fell and the nominal protection rates of soybean declined from 44% in the early 2000 to 15% in October 2001. From this case it is possible to see that when the protection rates are high and there is high demand for a commodity, imports can move up sharply.

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Based on the experience of soybeans, perhaps the most troubling commodity from the view point of China's farming community may be maize. China will have to almost certainly have to stop providing direct subsidies and the import of maize (and declines in exports) should be expected to rise significantly. Given the high NPRs and the high demand and willingness to import in the south of the country, the center of the nation's expanding livestock industry, aggressive importers may bring in large amounts of maize. It is also possible that falling demand for maize in the south, since it is supplied by imports, will cause maize prices to fall sharply in the north and northeast that in turn might lead to an improvement in the terms of trade across the border. But, whether the price can fall more than 30 percent to a point where northeast farmers find it profitable to export, is unclear. If China is forced to eliminate the VAT rebate for similar reasons, exports will suffer more.

But the agreement is a two way street. For products that China's producers have a price advantage on the world, WTO is supposed to provide better access to new markets. For example, meat producers still appear to receive less they would if they could sell their output at international prices. Vegetable, fruit and aquaculture producers should also be able to produce competitively for international markets. The real question is whether or not other countries will allow China to access its markets. The past track record is not good. China's closest trading partners have brought trade actions against China on a large and growing numbers of commodities, claiming dumping, predatory pricing and other unfair trade practices. For example, Japan, Korea and the US has retaliatory tariffs on commodities such as garlic, honey, apple and orange juice concentrate, tomato paste, shrimp, mushrooms, and many other high-valued, labor intensive commodities. The list of actions working its way through the US Federal Trade Commission portends that the list will grow. The question is whether or not China will begin to seriously fight to open markets for these goods and ones like them or if they will not fight for them because on an individual basis, the value of each commodity is small. Special anti-dumping procedures against China that are effective as part of their accession agreement will make it easier for nations to continue to win such cases even when there is no real violation by China of its WTO commitment and it is in fact a low cost producers.

However, the willingness of officials and commodity interest groups to oppose the imposition of trade sanctions against China's goods may change. It could be that China in recent years was reluctant to fight these battles because of its desire to enter the WTO and willingness to sacrifice small commodities in exchange for meeting its greater goal of entering WTO. However, now that China is in, it may find that by becoming aggressive politically, it can keep the number of such cases from ballooning. This is important, since part of the promise of WTO (and the upside of accepting an agreement that obviously will cause pain for some) was to let China access specialty markets with goods that its labor rich farming sector can do so better than any one else in the world.

Household Responses

While in the previous section, we argue that there are going to be losers, especially in the short run, when these households live in areas that are highly integrated

into the rest of the economy, they will have an ability to respond. Hence, even though there may be large negative effects in the initial period, the costs may diminish over time. For example, in the case of NAFTA's impact on Mexico, farmers in some of the border areas found their maize crop to be unprofitable in the first years after the onset of the implementation of the free trade policies. Undoubtedly, their incomes fell substantially. These farmers, however, did not stand still and continue to produce at a loss. Instead, they responded, adopted new technologies, and made investments that allowed them to take advantage of positive opportunities that arose in the wake of the free trade agreement. There are many cases in which farmers in Northern Mexico invested heavily—sometimes in partnership with US growers—in fruit and vegetable production to take advantage of falling protection on the US side of the border. In many cases after an initial investment period, profits were higher for Mexico's farmers than they were before they were producing for the protected domestic maize market. There is no way to be sure that all farmers ultimately came out better; in fact, some probably were net losers. But, because of the ability of farmers to respond, their losses in subsequent years can be substantially lower than the initial year.

Hence, in China the magnitude and severity of the negative impact of WTO policies on agricultural production will depend in part in how well households are able to respond. The rapidity with which the rural economy has evolved in the past when facing changes in the external environment (such as how they responded to the fiscal reforms in the 1980s with the rise of TVEs; the marketing responses to grain reforms in the early 1990s; and the restructuring of ownership patterns in response to banking reforms in the late 1990s) provides optimism. WTO policies themselves may help the rural economy respond even faster if they promote more liberalized credit, better property rights, the rise of wholesaling networks, and encourage foreign direct investment and more fundamentally will encourage the government to remove itself from the day to day involvement in the economy as a producers or investor and take an a role of facilitating the emergence of complete and efficient markets.

4. WTO Effects away from the Border: Price Transmission and Market Integration in Rural China

One of the greatest uncertainties regarding the question about how large an impact of WTO policies will have on China's rural economy, especially its agricultural producers, is how much below world market prices are prices faced by China's agricultural producers. In other words, if WTO policies were to partially or fully open China's markets, how much would domestic prices fall? We have addressed this issue above and briefly discuss our results in Appendix A.

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 impact 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 were fairly integrated by the mid-1990s. However, this conclusion should be qualified. First, although there has been a large improvement, this previous work still found large parts of the country, especially poorer areas, were not completely integrated. Moreover, the work is dated. Since the study, more than 7 years have passed and while markets have had even more time to mature, leaders have taken a number of policy actions that could possibly have led to greater fragmentation. Surprisingly, given the fragile nature of reforming China's agricultural markets, there is almost no recent work that addresses these questions. We do take a first step in this direction in this section.

Why is it important to know if China's markets are integrated or not? If markets do not operate well and there is poor integration, the effects of WTO policies on producers in isolated areas will be greatly attenuated. According to a study by Taylor (1998) of 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, WTO 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.

Alternatively, if markets are well integrated, a sharp drop of prices in coastal areas will be followed by a sharp drop of prices in inland areas. If integrated markets do transmit price effects into inland areas, since some of the poorest farmers in China are those in remote areas that are dependent on agriculture and many of China's poorest households are relatively undiversified, it could be that there will be a large impact on the incomes of those least able to cope with it.

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Assessing the Determination of Price and Market Integration in China (between Coastal and Inland Markets)

To assess how integrated and developed markets in rural China are in the late 1990s and 2000, we proceed as follows. First, we describe the data. Second, we examine how prices are determined. We want to examine if prices across China's marketing regions act behave as if they are in an integrated, well-functioning market. If so, we should expect to see prices fall as market locations move away from the main consumption centers, in the case of China's, its main ports. We should also expect to see prices fall as markets are further away from road and railways. Third, we will test for integration and conduct direct tests of how well prices in different markets move together.

Data. The data come from a unique price data set collected by China's State Market Administration Bureau (SMAB) in Beijing. Nearly 50 sample sites from 15 of China's provinces report prices of different agricultural commodities every 10 days. The prices are the average price of transactions that day in the local rural periodic or wet market. The Ministry of Agriculture's Research Center for Rural Economy (RCRE) assembles them in Beijing, making them available to researchers and policy makers. Map 2 illustrates the location of the sites.

We examine rice, maize, and soybean prices from 1996 to 2000 (except for maize that was only available through 1998). These 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 formation at the national level and 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. Product homogeneity makes it possible to include a broader geographic range of buyers and sellers in a single analysis, and we are able to assess the integration of markets spread out over 1000s of kilometers. For example, the sample includes maize-producing regions in Shaanxi and Gansu Provinces and a maize-consuming region in Guangdong. However, because trading patterns differ from those of rice, for the purposes of establishing distance from the major consumption region, China is divided into three maize and soybean marketing regions: coastal China (north of the Yangtse Valley between Beijing and Shanghai); the North-South coast-inland axis (a marketing region running between Guangzhou, Wuhan, Xian and further north); and the NE (between the northeast provinces and Beijing).

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 State Statistical Bureau. Deflation facilitates transaction cost

comparisons across time and allows us to disregard transaction cost increases within periods associated with inflation.

We also conducted extensive field-work, visiting nearly every major producing and consuming region in China over the past year to gain a better understanding of the institutions and policies affecting rice, maize, and soybean trade and to collect information on trade patterns. Interviews were conducted with national, provincial, and county grain officials, traders in buying and selling regions, transport officials (responsible for rail, trucking, and shipping), futures and wholesale market staff, managers of grain retail outlets, and local private traders in rural periodic markets. Traders in major grain exchange centers and officials in provincial capitals provided estimates of the volume and direction of grain flows and transport, handling, and other transaction costs. Interview data are used to restrict the sample to pairs of provinces that actually trade rice and maize, where appropriate disaggregate results regionally, validate our transaction cost estimates, and assist in interpreting the empirical results.

We also have put together a data set that provides several characteristics that theoretically should affect the price that traders and producers should receive in an area if markets are functioning well and are integrated. We know how far each market is by way of the shortest and most commonly used transportation route from the consumption center (Guangzhou, Shanghai, Beijing and Dalian). This variable is called "distance from the port." We also know how far a market is off a national highway and the distance to the nearest grain terminal on the rail system. Descriptive statistics are provided in Appendix Table 1.

Price Determination. Our first test of how well markets are functioning depends on the analysis of the behavior of prices of several of China's main commodities, maize, soybeans, and rice. If China's markets function well, then there is a greater likelihood that price effects in one region of the country, in this case shocks caused at the border from increased imports or exports (or increased consumption in the coastal market), will affect producers (and consumers) in other parts of the country. If price formation does not appear to be consistent with the existence of adequately functioning markets, whereas the border effects may still be sharp (indeed, they may be sharper since demand curves would be more inelastic), large regions of the country should be shielded from the falling or rising prices. Hence, the hypothesis that we are interested in is that price relations across China's regions exhibit characteristics that make it appear as if China's domestic producers, consumers and traders face price pressures that are being created in part by market forces.

A simple plotting of the relationship between the price of rice in South China in 2000 and the distance from South China's main port city, Guangzhou, shows a price contour that is consistent with the existence of well-functioning markets (Figure 6). Since the main demand center and point of export for varieties of rice produced and traded in south China is Guangzhou, one would expect that in an integrated marketing system, as a market became more remote, the price should fall. Indeed, the price in a market a 1000 kilometers away from Guangzhou (e.g., a market on the Yunnan Plateau),

is, on average, about 0.20 yuan lower per kilogram (or about 11 percent of the average rice price in China—see Appendix Table 1).

The results of a multivariate analysis of the relationship between price and several factors, including distance from port and measures of the access of the market to transportation infrastructure, finds similar results for maize, soybeans, and rice across China (Tables 5 and 6).[5] Holding all other factors constant, as maize marketing sites move farther away from the Guangzhou and Shanghai, the price falls (row 1). Although the magnitudes of the coefficient on the distance from port variable change from year to year, their sizes still fall in a fairly narrow range (from 0.16 yuan per kg to 0.39 yuan per kg). This is what one would expect from markets for commodities for which traders use fairly similar transportation routes, equipment, and infrastructure to get their products to markets. Since the value of the commodities on a per kilogram basis differ, the transportation/transaction cost in percentage terms varies from commodity to commodity. Soybean is lowest (about 5 percent average in 1999 and 2000); rice is the second (8.7 percent in 2000 and 6.6 percent in 1998); maize is the highest (22 percent in 1998). Interestingly, the magnitudes of the transportation/transaction costs are similar, though lower, than those reported in Park et al., 2002. This result, however, also should not be surprising, since China's infrastructure has improved so rapidly in recent years as has the nation's transportation sector (Luo, 1998; Sumner et al., 2001).

The case of rice is somewhat more complicated. Although the simple relationship between rice price and distance from the port (either Guangzhou, Shanghai, Qinhuangdao, or Dalian) is negative (Table 1, column 1), when other variables are added (using a specification similar to those used for maize and soybeans), the coefficient on the distance from port variable becomes positive (column 2). The coefficients become negative again only after either a squared distance term or a set of two dummy variables is added to the regression (columns 3 and 4). Both of the changes to the specifications suggest that in 2000 rice market, there was a non-linear relationship between distance to port and price. In other words, in 2000 rice price begins to fall as markets move away from the port. However, after rice prices hit a certain point (in this case about 1600 kilometers from the port), the price begins to rise. Interviews with traders in Guangzhou, Kunming and Beijing provide an explanation for the finding. In some years, (e.g. in 2000, the year we find this price non-linearity), production in the surplus regions of the Yunnan Plateau was lower than normal. If so, it is possible that the regional rice price rose high enough so traders could not earn a profit shipping rice to the Guangzhou market after paying for transportation and procurement price. In fact, during interviews with traders we found that most of the rice produced and sold in Yunnan markets that year stayed inside the province. Hence, in this year, we should not expect to see a linear relationship between price and the distance from the coastal port. Analysis of the

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[5] The cases of maize and soybeans might be expected to provide the strongest cases since, unlike rice (China's main food grain), feed grains are inherently more homogeneous nature, quality-wise. Also, maize and soybean markets should be more robust from year to year in any given region, since a larger fraction of the output of feed grains is typically marketed, and less is used on farm for the own consumption needs of the farm family—a feature that may make it so local growing conditions (i.e., if there was a drought or flood that reduces on-farm output, but would not reduce the family's consumption needs) will be more likely to affect the participation of food grain farmers in output sales markets.

determinants of price in other years supports such an explanation. For example, in a more normal production year (e.g., 1996), the coefficient on the distance to port variable is negative and significant, using the same specification as in Table 6, column 2.

Hence, our findings in the rice market suggest that in some years, some inland markets are isolated from coastal and international markets. In other years, however, the links are reestablished. To the extent that it is local supply and demand characteristics that determine the participation and not a policy intervention (or infrastructure failure) that artificially isolates a region, the findings are consistent with China having well-functioning, though emerging markets.

Maize, soybeans and rice prices also vary in most cases in most years with the development of the regional infrastructure (Table 5 and 5, rows 2 and 3). In most regressions, the signs of the coefficients on the distance from the nearest national road and distance to the nearest rail variables are negative and significant in many of those cases. As one would expect, when a market is one a major road or rail link, the cost of getting that grain into the national marketing network and to the consumption center is lower and so the price of procurement would be higher. The further away the market is, the lower the price (in most cases). Such a finding is also consistent with competitive and integrated markets.

Integration tests. In this section we use more formal tests of market integration. Cointegration statistics measure the proportion of movement in one price that is transmitted to another price during the period of observation. The coefficient on the "causing" price is bounded between 0 and 1, where 0 indicates that there is no impact on the "affected" price variable (and markets are not integrated), and where 1 indicates that markets completely adjust within the analysis period. A coefficient inside the 0-1 interval indicates that prices adjust only partially within the period of observation (or that markets are integrated but frictions slow down price transmission). Two markets are cointegrated if the coefficient is not different than one at a 5 percent level of significance.

The results of the cointegration analysis support both our descriptive findings and the conclusions of the determinants of commodity price analysis in the previous page, especially when they are compared to the findings of research on market integration in the late 1980s and early 1990s (Table 7). In middle part of the reform era (1988 to 1995), a time when markets were starting to emerge (Park et al., 2002), a study using the same data as used in our present study found that between 20 to 25 percent of markets showed signs the prices were moving together during the study periods and sub-periods. According to their 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 Park et al. (2002) study as a base line, our current analysis shows that during the late 1990s, China's markets have not only continued along their previous path of maturation, markets in China, especially those for maize and soybeans, are remarkably integrated. In the late 1990s, examining the co-movement of prices between pairs of

markets in our sample, we see a large increase in the number of integrated markets. 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 number of pairs of markets for soybeans, japonica and indica rice show similar increases (rows 2 to 4).

Moreover, in many cases these markets were separated by more than a 1000 kilometers. For example, we frequently found prices to be integrated between markets in Shaanxi and Guangdong provinces and between those in Sichuan province and southern Jiangsu. Interviews with traders in remote parts of China support our findings. In one case, we were interviewing traders in northern Shaanxi, more than 200 kilometers north of Xian, the provincial capital. We found that on a daily basis purchasing agents of a large trading network originating in Guangdong would phone their regional headquarters nearly everyday receiving price guidelines for procurement. The regional coordinators, in turn, stayed in nearly constant contact with those in South China, the destination of much of their purchases. To the extent that there are many such networks (and indeed one can not help but run into grain buyers many times in any given day when working in villages in rural China), it is unsurprising that price data from the local markets in a remote inland location would more or less move with data collected from markets in the coastal regions.

Based on each of the market performance analyses, one must conclude that the impacts of WTO on China's agriculture will be experienced across wide regions of the nation, a finding that has both positive and negative implications for China's rural residents. First, to the extent that WTO will lead to price falls at the border (see previous section for discussion of the complicated set of factors that the realization will depend on), farmers of certain crops – most likely maize, cotton, wheat, and soybean – will suffer a cut in revenue. However, if prices rise due to the China's accession in the WTO, because agricultural traders are able to increase their exports, integration will allow some of China's farmers to benefit.

Moreover, if China's markets are broadly linked across large regions of the country, the mere size and number of people who will be affected actually may help attenuate the effect of negative impacts, at least as long as China's TRQ commitments are relatively low. The main reason for this attenuation is that the bigger region over which the price effect of a given quantity of increased imports is spread, the smaller the price effect will be (on the region it affects). To illustrate this point, assume an extreme case. If markets in China were completely isolated (in other words between the local areas around a major port and inland regions), one would expect coastal the price in coastal cities to fall immediately from the current price to the international price level, making any price gap disappear completely. Inland areas (which have been shown to be above the world market price), however, would not be affected and price received in the inland area would depend on its own supply and demand. Even if prices in the inland region were higher, the price gap between that region and the world market would persist. At the other extreme, if markets were perfectly integrated, the fall in the price gap would be somewhere between zero and the full fall, depending on the quantity that was imported.

Since China's TRQs are relatively small and since markets appear to be fairly well integrated during most years, it is plausible to expect that that price fall will be relatively small. Of course, if the price fall is small, this means that it would be more likely that the entire amount of the TRQ would be imported.

Assessing the Determination of Price and Market Integration in China (between Region Markets and China's Villages)

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 insure that many of China's villages will be affected by the shocks that hit the coast and are transmitted inland. To do so, in this part of this section we examine the extent to which villages are integrated into regional markets. Our test of integration will essentially test if farmers in China's villages are price takers (as in Figure 7, Panel A) or are villages isolated, making prices determined by local supply and demand (as in Figure 7, Panel B). In briefest terms, if variables that affect local supply significantly affect prices, we will assume villages are like those in Panel B and markets are not integrated to the village level; in contrast, if the local supply shock does not affect the price, villagers are price takers and markets will be thought to be integrated.

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).[6] 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.

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[6] The provinces are Hebei, Liaoning, Shaanxi, Zhejiang, Hubei, and Sichuan. The data collection effort involved students from the Center for Chinese Agricultural Policy, Renmin University, and China Agricultural University and was led by Loren Brandt of the University of Toronto, Scott Rozelle of the University of California, and Linxiu Zhang of the Center for Chinese Agricultural Policy, Chinese Academy of Sciences. Households were paid 20 yuan and given a gift in compensation for the time that they spent with the survey team.

Our regression analysis clearly shows markets in China are integrated down to the village level. The signs and level of significance of the coefficients on variables, such as the distance that a village is from the market, demonstrate that the further a village is from a market, the lower the price the farmer receives, which is the expected result. More importantly, the t-ratios of the coefficients of the village supply shock variables are all less in absolute value terms than 1.35, signifying that the output of the local village's crops do not affect the local price. One implication of this result is that it is factors outside the village that are affecting the price that farmers receive, making them price takers. In other words, farmers, even in China's remote villages, are linked to the markets of its main commodities.

5. **Conclusion and Summary for Section III (China's Accession to WTO and Agriculture)**

We started out this section talking about the number of different effects of WTO. Only a part of the effects will come from agriculture. Even in the short run, larger and mostly positive effects are expected to come in the non-farm sector. To the extent this is true, we should expect that WTO's accession will generally have a small, negative effect and larger positive effect on households. On balance, then, WTO will be good for the rural economy.

Even if the short run negative effects on agriculture are fairly substantial, one of the important things to remember is that there will be many other indirect effects of WTO. To the extent that it positively affects the efficiency of the rural economy, the longer run economy should be stronger and have broad positive effects. Moreover, the negative effects can be mitigated by the ability of households being able to respond in their production and investment decisions. Hence, as China enters the 21st century, it should combine trade policy and investment liberalization policy with a number of other transition and rural development policies in order to push for as rapid a evolution of China towards a modern economy as possible.

This study's focus on the agricultural sector showed that even in agriculture the mix would not be all negative. Our findings, based on new methods to collect data and create NPRs, show that indeed for some crops WTO will likely lead to a fall in prices and a rise in imports. Maize and cotton may be most affected. It is possible that soybeans and sugar could be significantly affected in the longer run (or the shorter run if tax policies are changed). There are also commodities in which China has considerable comparative advantage – e.g., rice, meats (some parts), and horticulture products) and, hence, WTO could provide benefits to those engaged in these activities. 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 rise (from rising exports) in part depends on how China's executes it WTO obligations. We show there is room for footdragging, which could delay that negative effects. The nature of the agreement itself also provides many means to limit the downside effects. Likewise, China's benefits are

going to depend on how well their trading partners honor their commitment and provide China with better access to global markets. To gain the most in the long run from this agricultural agreement, both China and its partners need to endeavor to try to live up to their agreements.

Our paper also found that unlike the case of Mexico, it appears as if most of China's markets may be well-integrated into the rest of the economy. And, most of the villages are well integrated into the nation's network of markets. This is good news and bad news for poor farmers in inland areas. 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 for large parts of China, its farmers will be affected. The problem, although it is a short run one, may be that it is this group of rural households that are most dependent on agriculture and least able to be flexible. 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.

Our results also generate findings that show the close relationship that exists among the degree of integration of an economy, the size of the price effect and the amount that fraction of the TRQ that will be imported. If China's markets are really so integrated, and leaders do not artificially delay the ability of traders to execute TRQs, our findings suggest that the price effects may not be too large (because they will be spread out across a large area of the country). However, if the price effects for a given quantity of imports are not large, the volume of imports may be larger than predicted by some and the bindings may be more likely to take effect. We do not expected in any circumstance that imports will ever exceed the limits put on by the TRQ.

Effect of Complete Trade Liberalization on Agricultural Prices

Although in this paper we argue that price shifts for many of China's most important commodities will not come anywhere near falling the amount of their Nominal Protection Rate (NPR), in this section for baseline purposes, we report on a study that projects that changes in prices of several key commodities if China were to move to a free trade regime. Unfortunately, we have not modeled the problem of what the price would be if China were to exactly import that amount of grain the filled is TRQs for corn, wheat, cotton, and soybean oil.

Modelling the Impacts of Trade Liberalization on China's Agriculture

In order to evaluate the impacts of trade liberalization on China's agriculture in the future, we use the Center for Chinese Agricultural Policy's Agricultural Policy Simulation and Projection Model (CAPSiM). CAPSiM is a framework designed to study how polices related to the macro-economy and trade, in general, and how those directed at agricultural commodities, in particular, affect the supply, demand and trade of agricultural products in China. In one sense, CAPSiM is a partial equilibrium model in that it primarily concentrates on the agricultural sector and does not explicitly model other sectors, such as rural industry and the non-rural part of the economy. Sector-wise, however, it is a general equilibrium model since it considers all cross-price impacts for both demand and supply equations. Within the agricultural sector, its coverage is comprehensive, including components on grains, cash crops, and major livestock and dairy products.

The model's structure is built on considerable previous research and uses a number of theory-based assumptions. Most of the elasticities and parameters used in the CAPSiM are estimated econometrically (see, for example, Huang, Rosegrant, and Rozelle, 1997). Price determination is accomplished by imposing homogeneity and symmetry. In the projection analysis prices can be determined endogenously or exogenously. CAPSiM explicitly accounts for per capita income growth, urbanization and market development (on the demand side), technology, agricultural investment, environmental trends and competition for labor and land use (on the supply side), as well as price responses on both the demand and supply sides. Details of the model description could be found in Huang, Rozelle, and Rosegrant (1999) and Huang and Chen (1999).

The livestock component of the model attempts to understand the determinants of the supply of livestock products, including the derived demand for feed, the consumer demand and trade of meat. Seven commodities are explicitly considered: pork, beef, mutton, poultry, eggs, milk, and fish. To project future supply, demand, and trade for each commodity, a separate equation is constructed, relating key determining factors (such as product prices, income, and year-end inventories) to the quantities of the

commodity that are supplied and demanded. Once the initial, unconditional supply and demand forecasts are made, if the endogenous price model is used, a domestic clearing price is iteratively computed for each commodity so that domestic supply and demand and international trade balance. If exogenous prices are assumed (that is, if it is assumed that China's domestic livestock and meat prices are a function of the world market price), supply and demand balance with trade flows. The derived demand for feed is estimated by applying feed conversion coefficients from our own survey work, China's Ministry of Agricultural, and the United States Department of Agriculture. Total feed demand is then allocated among the crops, with about 70 percent coming from maize in the first years of the projection period (though this amount increases over time).

Defining Projection Scenarios

Our strategy for understanding the effect of trade policy is to compare a number of alternative policy scenarios to a baseline scenario. The baseline scenario attempts to project future supply, demand, and trade under the assumption that China will follow its current reform plan, that is, we try to show what will happen if the nation continues to gradually develop and reform at its current gradual pace. In the baseline scenario, while trade restrictions are relaxed slightly, China's markets are still partly isolated from the world. Ideally, we would like to compare the baseline scenario to a set of projections that incorporates all of the conditions that China will be facing when WTO takes effect. Unfortunately, the precise outcome of current negotiations is still unclear. Instead, we start by assuming a more extreme scenario: what would China's trade pattern be if it rapidly liberalized its agricultural sector and reached a "purely free trade environment" for most agricultural commodities by 2005. We recognize, however, that as the nation moves towards free trade, there are two main types of mitigating factors. First, China's leaders will not just passively observe the trade outcomes as liberalization occurs. They have a number of domestic policy options, including the one the we will briefly consider: how China's supply, demand, and trade patterns will change if investment to the domestic sector, especially in the area of agricultural technology, is increased. Second, the WTO agreement itself will not force China to completely liberalize its markets. Instead, we will try to see how the provisions in China's agreement with the US will affect the move to liberalization.

All simulations begin with the base period, 1995. Base period data on production and utilization are three-year averages for 1994 to 1996, centered on 1995. The baseline scenario's assumptions are spelled out in detail in Huang, Rozelle, and Rosegrant (1999) and are briefly summarized in the appendix.

Alternative Scenarios: Free Trade and Free Trade with Increased Investment in Productivity Enhancement

While still not officially a WTO member, it is likely that China will join WTO by the end of 2000 given that the agreements that have been recently finalized by both the China-US and China-EU negotiating teams. Unfortunately, the exact form of the final comprehensive agreement is still unclear, since the individual agreements of China with

all of WTO's members have not been negotiated and/or made public. Without such information, trying to model the exact WTO agreement is speculative and premature.

Given the lack of information about the final form of the agreement, our strategy to increase our understanding of the impact of WTO on China's agricultural supply, demand, marketing and trade will be to assume that China will rapidly liberalize its agricultural sector and reach a free trade environment for key agricultural commodities by the year of 2005. Specifically, the free trade scenario in our study assumes that after 2000 officials will gradually reduce the tariffs, export subsidies, and trade barriers of 14 major agricultural products (7 grain products including rice, wheat, maize, soybean, sweet potato, potato and other grains, and 7 animal products). Tariffs fall for 5 years until they reach a zero level in 2005, representing a complete phase out of non-tariff trade barriers. Admittedly, this is an extreme case and represents a maximum impact of trade liberalization on China's agriculture. The actual initial impact of trade liberalization and China's joining WTO is likely to be between the simulation results of the baseline scenario and the free trade scenario.

The second part of our strategy is to try to understand what will happen if the government responds to minimize the impact, both through trade actions allowed by the WTO agreement and through other non-external sector policies. To do so, we will try to understand how the projected levels of imports and price rises correspond to the level of Tariff Rate Quotas (TRQs) and the tariff binding rates. Moreover, given China's long time commitment to domestic food security, it is likely that the government will respond to the new trade environment with some policy action. One particular action that is much discussed is to increase investment in the agricultural sector as a way of maintaining a strong supply (MOA, 1999). To simulate this action, we assume officials increase investment into agricultural research as a way of strengthening the technology base of producers.

Under the free trade scenario, in addition to the commodity tariff reductions, both import tariffs and other trade barriers for agricultural inputs, such as fertilizer and pesticide, will be reduced and eventually be phased out in 2005. Fertilizer and pesticide prices are assumed to decline by 20 percent from 2000 to 2005. All other assumptions are the same as those defined in the baseline scenario.

In order to simulate the response of China's agricultural officials, we repeat the projection of China's food supply, demand and trade toward 2020 under a free trade scenario, but assume that officials aggressively increase investment in agricultural technology from the baseline rate of 4 percent per year growth to the new rate of 6 percent annually. The assumption and likelihood of such scenarios are discussed in Huang, Rozelle, and Rosegrant (1999) and Huang and Chen (1999).

It is worth to note that the CAPSiM model is a country model. The impacts of China's trade liberalization on the world market prices are not examined given the nature of the model. It is possible that the increase in the import of feed grain under the free trade scenario will raise the international market prices of feed, particularly that of maize.

Similarly, our simulation results presented in the next section demonstrate that trade liberalization may increase China's pork and poultry exports. To account for this possibility, we assume that world pork and poultry prices will decline as China's trade liberalizes. The same logic is applied to the simulations of each commodity; if China becomes a large importer of a commodity, we assume the world price, at least in the medium run, does not follow its long run downward trend; if China is a large exporter, the down pressure on world prices is increased.

Impacts of Trade Liberalization on China's Agriculture

Price Impacts

Under the baseline scenario, the increases in the domestic production of rice, wheat, other grains, and the most of animal products will nearly meet the increase in the domestic demand for these commodities (see next subsection); consequently, the change in the domestic price from 2000 to 2005 (in real 1995 terms) of most the commodities will range only from –1 percent to 2 percent (Table A1, column 3). Stable domestic prices, however, imply that China's domestic grain prices, except for the price of rice, will continue to be higher than world market price during the projection period. In contrast, animal products, especially those in the livestock sector (e.g., pork and poultry), will continue to be heavily taxed. In fact, because world market prices are expected to continue to fall, the gap between grain prices in China and the world will actually increase under the baseline scenario.

In contrast, under the free trade scenario, China's domestic grain market prices (except for rice) will decline substantially from 2000 to 2005 (Table A1, column 4). The average prices of wheat, maize and soybean in China's domestic market will decline by 10 percent to 26 percent. While the impact will be borne differently by different regions of the country, those commercialized farmers in China who have been shipping wheat and maize into markets in which imports will rise (e.g., South China) will suffer the largest losses of welfare.

Not all subsectors of agriculture suffer price falls, however. Our projections assuming free trade by 2005 illustrates that trade liberalization will tend to increase the prices of animal products in China's domestic market (Table A1, columns 4). The domestic pork price in the free trade scenario will be about 14% higher than that in the baseline scenario in 2005. Similar positive effects of trade liberalization the domestic prices are found for poultry (10%), egg (4%) and aquatic products (6%).[i]

Table A1, column 5, also shows the price differences between the baseline and the free trade scenarios. The results indicate that the producers of crops will loss their income from the farming activities under the free trade scenario (compared to the baseline scenario) as the most crop product prices decline with the trade liberalization. While most of animal products (except for beef, mutton, and milk) producers will benefit from the trade liberalization.

Interestingly, livestock producers win two ways. They both enjoy the rises in the post-liberalization prices of meat, and use the less expensive feed grain. As a result, we should expect both a positive livestock supply response and a large increase in feed grain demand.

Table A1. Impacts of trade liberalization on agricultural commodity prices in China (the free trade vs baseline scenarios), 2000-2005

	Price in 2005 (yuan/ton in 1995 price)		Price change in 2000-2005 (%)		Percentage price difference in 2005 (%)
	Baseline	Free trade	Baseline	Free trade	Free trade vs baseline
Rice	2333	2415	-0.4	4.1	3.5
Wheat	1756	1406	-1.1	-20.2	-19.9
Maize	1459	1080	7.5	-20.1	-26.0
Soybean	2918	2322	0.4	-20.2	-20.4
Sweet Potato	1208	1066	0.7	-9.6	-11.8
Potato	1211	1085	-0.4	-9.5	-10.4
Other grains	2290	2097	-1.8	-9.7	-8.4
Pork	12795	14633	0.8	14.8	14.4
Beef	14666	14518	1.8	0.0	-1.0
Mutton	18841	18345	3.4	0.0	-2.6
Poultry	11643	12798	0.9	10.4	9.9
Egg	6557	6831	-3.5	0.0	4.2
Milk	3379	2672	1.5	-20.2	-20.9
Fish	9032	9529	-4.8	0.0	5.5

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Table 1. Changes in structure (%) of China's economy, 1970-2000.

	1970	1980	1985	1990	1995	2000
Share in GDP						
Agriculture	40	30	28	27	20	16
Industry	46	49	43	42	49	51
Services	13	21	29	31	31	33
Share in employment						
Agriculture	81	69	62	60	52	50
Industry	10	18	21	21	23	22.5
Services	9	13	17	19	25	27.5
Share in Export						
Primary Products	Na	50	51	26	14	10
Foods	Na	17	14	11	7	5
Share in Import						
Primary Products	Na	35	13	19	18	21
Foods	Na	15	4	6	5	2
Share in agricultural output						
Crop	82	76	69	65	58	56
Livestock	14	18	22	26	30	30
Fishery	2	2	3	5	8	11
Forestry	2	4	5	4	3	4
Share of rural population	83	81	76	74	71	64

Source: State Statistical Bureau, China Statistical Yearbook, various issues; and China Rural Statistical Yearbook, various issues.

Table 2. Differences in real value added tax rates on selected imported and domestic agricultural commodities in China, 2001.

Commodity	Imported value added rate (assessed on the entire value of the import)	Domestically traded good (not assessed when procured from farm; only assessed on marketing margin of the trader)[a]
Rice	13	<1
Wheat	13	<1
Soybean	13	<1
Cotton	13	<1
Rapeseed	13	<1
Maize	3 to 5	<1
Meat parts (e.g., chicken feet)	17	1

Source: Author's survey

[a] For example, in the case of soybeans that are purchased for 1.00 yuan from a farmer by a wholesale trader and then resold for 1.05 yuan, or at a margin of 5 percent) in a downstream market, the tax would the 13 percent value added tax that is the rate for soybeans times the value added by the trader, 5 percent. The total real tax rate would be less than 1 percent (13 percent times 5 percent).

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. 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		
Wheat [a]	1250	12
Maize	1150	32
Soybeans	1950	15
Cotton	9500	17
Sugar	2612	40
Exports		
Rice [a]	1954	-3
Pork [a]	11442	-30
Beef [a]	13743	-10
Poultry [a]	9904	-17
Fresh Fruits	5472	-40

Source: Authors' Survey

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

Table 5. Ordinary Least Squares Regression Explaining Soybean and Maize Price Variation in China and Selected Marketing Regions in China, 1998 and 1999 (Dependent Variable: Real Price of Maize or Soybeans).

Explanatory Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Maize price, 1998		Soybean price, 1999		Soybean price, 1998	
Distance from Guangdong:	-9.3E-05	-0.00029	-0.00039	-0.00021	-0.0004	-0.00019
	(9.32)**	(12.4)**	(-17.72)**	(8.01)**	(8.40)**	(3.24)**
Distance from Road [a]	-	0.005319	-	-0.00828	-	-0.00928
		(13.1)**		(9.91)**		(4.84)**
Distance from Rail	-	-0.00103	-	0.005106	-	0.001669
		(6.15)**		(8.29)**		(1.18)
Marketing Region Dummies:						
East (or Inland)	-	-0.34	-	0.245	-	0.23
		(6.09)**		(4.82)**		(1.98)**
West (or Coast)	-	-0.039	-	0.46	-	1.08
		(1.03)		(8.69)**		(8.89)**
Period Dummies [b]	Included	Included	Included	Included	Included	Included
Adjusted R-square	0.1401	0.525	0.3121	0.4069	0.1321	0.2992
No. of observations	318	318	648	648	648	648

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

[a] Distance of market from road was measured as distance in kilometers from nearest "national-level" road.

[b] Dummy variables were included for each sampling period throughout the year. Survey was conducted every 10 days. Therefore, we included 35 period dummies. The one for the first 10-day period of January was dropped.

Table 6. Ordinary Least Squares Regression Explaining Rice Price Variation in China and Selected Marketing Regions, 1999.

Explanatory Variable	(1) Full Sample	(2) South China Region	(3) Yangtze River Region	(4) Yellow River Region
Distance from Port:				
Linear term	-0.00016 (-7.14)	-.0003787 (-4.35)	.0000184 (0.26)	-.0000361 (-1.29)
Squared	5.17e-08 (8.41)	2.47e-07 (5.57)	-1.09e-07 (-3.24)	2.40e-08 (3.48)
Distance from Road[a]	-0.00378 (-12.04)	-.0034828 (-5.95)	-.0097497 (-5.70)	-.0046768 (-5.16)
Distance from Rail	-0.00025 (-1.66)	-.0004541 (-2.75)	.0058257 (2.92)	-.0023546 (-3.75)
Marketing Region Dummies:				
South	0.23573 (9.35)			
Yangtse	-0.05628 (-2.83)			
Northeast	-0.17794 (-5.37)			
Income	Not included			
Period Dummies[b]	Included	Included	Included	Included
Adjusted R-square	0.3088	0.4167	0.2239	0.1582
No. of observations	1170	307	343	520

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

[a] Distance of market from road was measured as distance in kilometers from nearest "national-level" road.

[b] Dummy variables were included for each sampling period throughout the year. Survey was conducted every 10 days. Therefore, we included 35 period dummies and the one for the first 10 day period of January was dropped.

[c] Northeast marketing region has too few observations

Table 7. 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
Rice, Yellow River Valley (mostly japonica rice)	25	60
Rice, Yangtse Valley and South China (mostly indica rice)	25	47

Note: Results for two periods from same data set. For results from 1989 to 1995 for maize and rice, see Rozelle et al. (2000). Rice results are for the whole country in 1989-1995. Results from soybeans for 1989 to 1995 from Wang (1998). Results from 1996 to 2000 are by authors.

Table 8. Soybean, Corn and Wheat **Village** Price Regression, 2000

| Explanatory Variable	(1) Soybean Price	(2) Corn Price	(3) Wheat Price		
Distance to the nearest county market	-0.029	-0.00064	-0.0095		
	(2.37)**	(-1.63)*	(3.24)**		
Village-Level Shock to Production	-0.04	0.12	0.081		
	(-0.17)	(-1.34)	(-1.02)		
Other Variables not shown	timing of sales / net purchase or seller /				
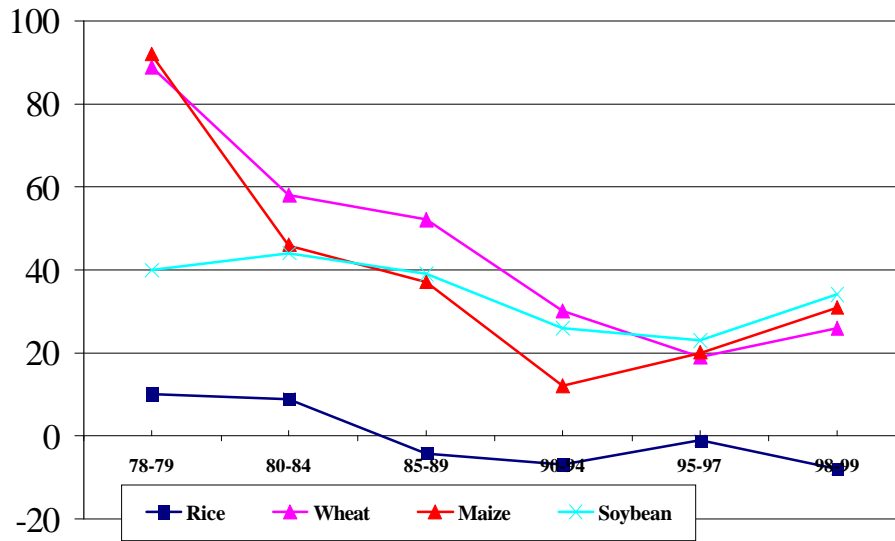
Source: Huang, 2001

Figure 1. Nominal Protection Rates of Major Agricultural Commodities, 1978 to 1999 (Percent)
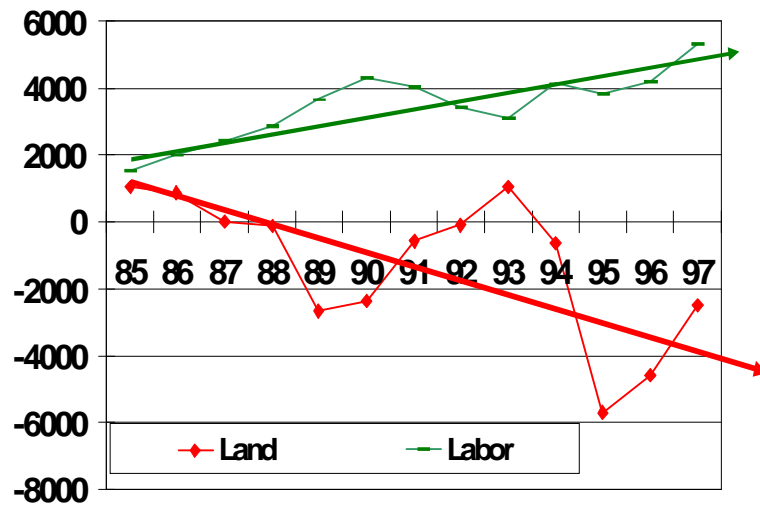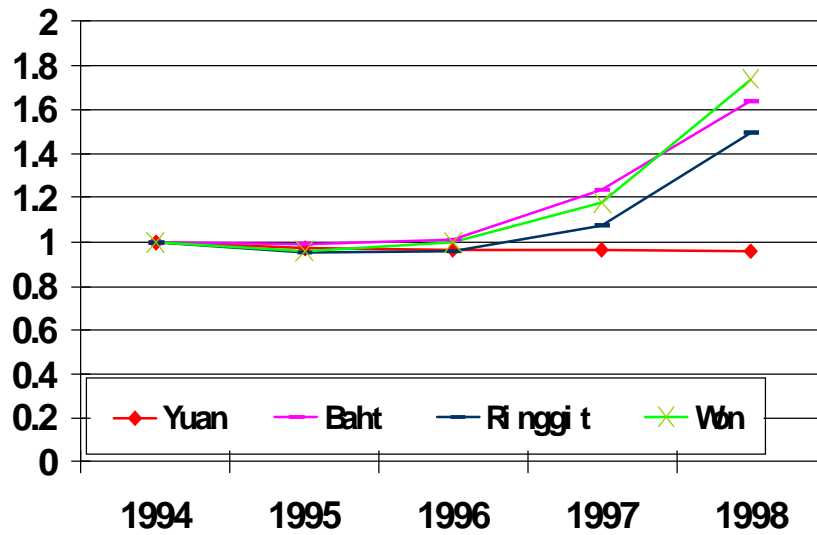
Source: Huang and Chen, 2000.

Figure 2. Agricultural Trade Balance by Factor Intensity (mil US$)
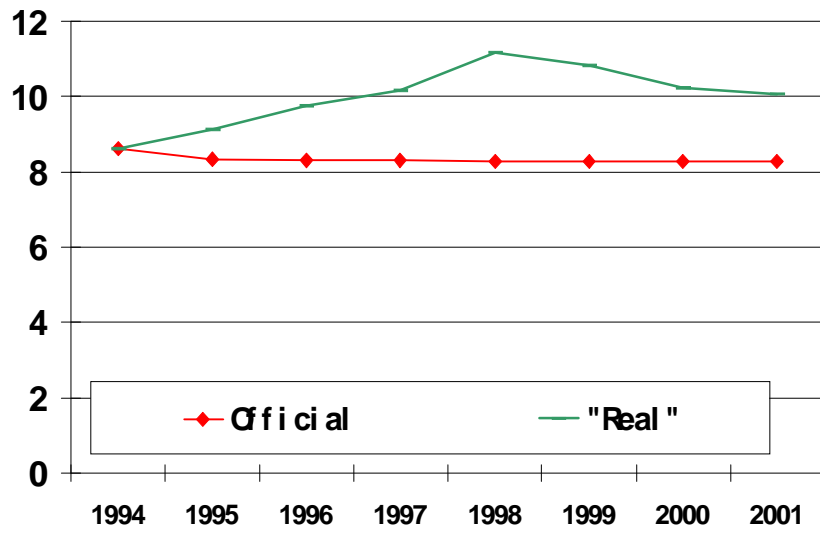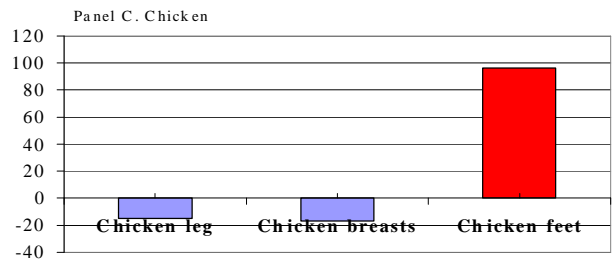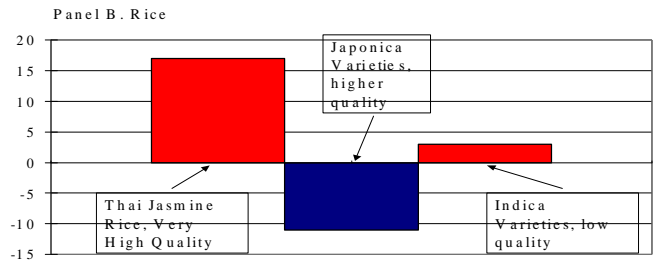
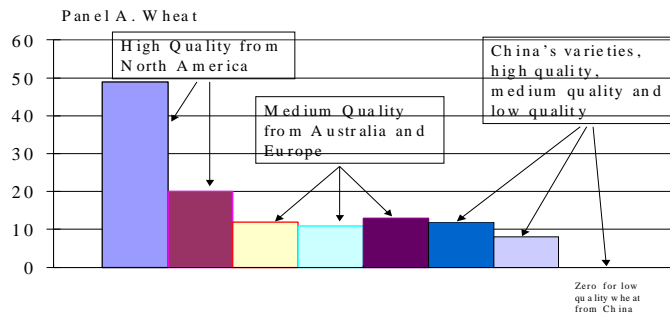Source: Huang and Rozelle, 2002

Figure 3. Official and "Real" Exchange Rate Yuan (RMB) to the US dollar

Source: Huang and Rozelle, 2002

Figure 4. Index of China's Domestic Currency (Yuan or RMB) versus other
Pacific Rim country currencies (1994=1)

Panel A. Wheat

High Quality from North America

Medium Quality from Australia and Europe

China's varieties, high quality, medium quality and low quality

Zero for low quality wheat from China

Panel B. Rice

Japonica Varieties, higher quality

Thai Jasmine Rice, Very High Quality

Indica Varieties, low quality

Panel C. Chicken

Chicken leg   Chicken breasts   Chicken feet

Source: Authors' Survey

Figure 5. Estimates of Disaggregated Nominal Rates of Protection
for Wheat, Rice, and Chicken, China, October 2001 (percent)

Distance from port

$y = -0.0002x + 2.0022$

Price (yuan)

km
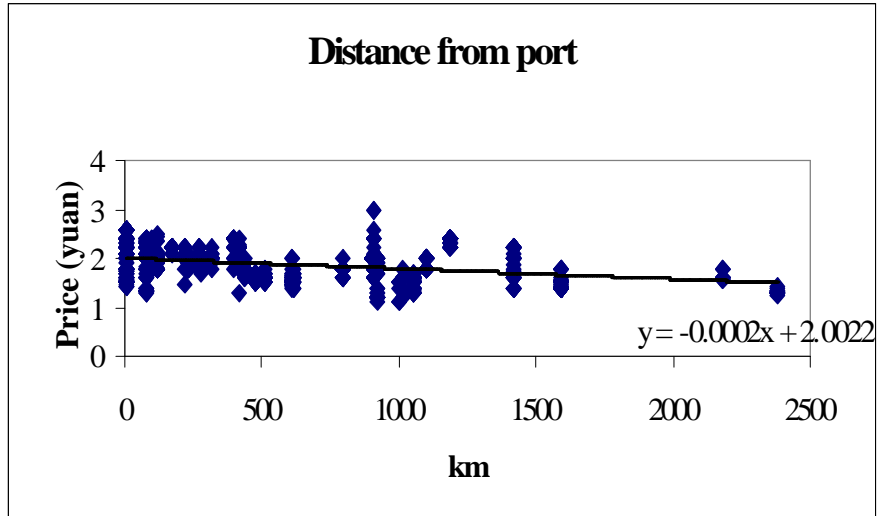
Note: Graph of bivariate relationship between rice price and distance from port. Slope of line given by the simple linear regression of rice price on distance.

Figure 6. Changes in rice price across China as markets increase its distance from port, 2000
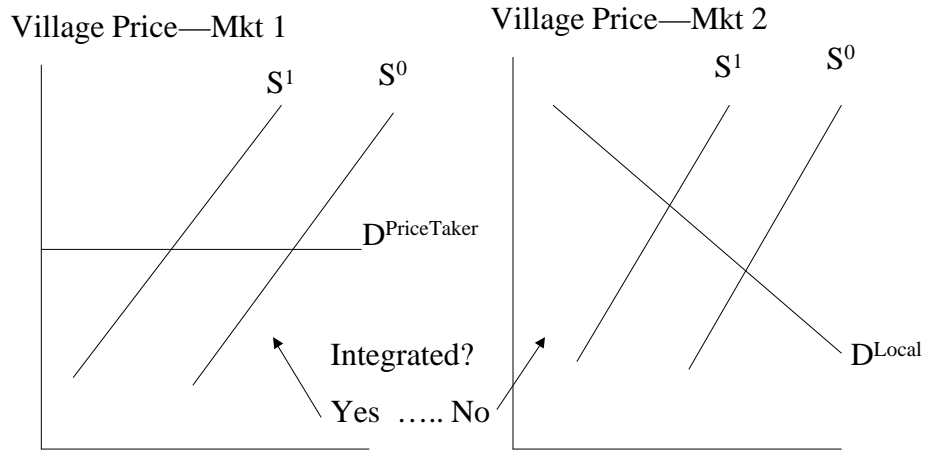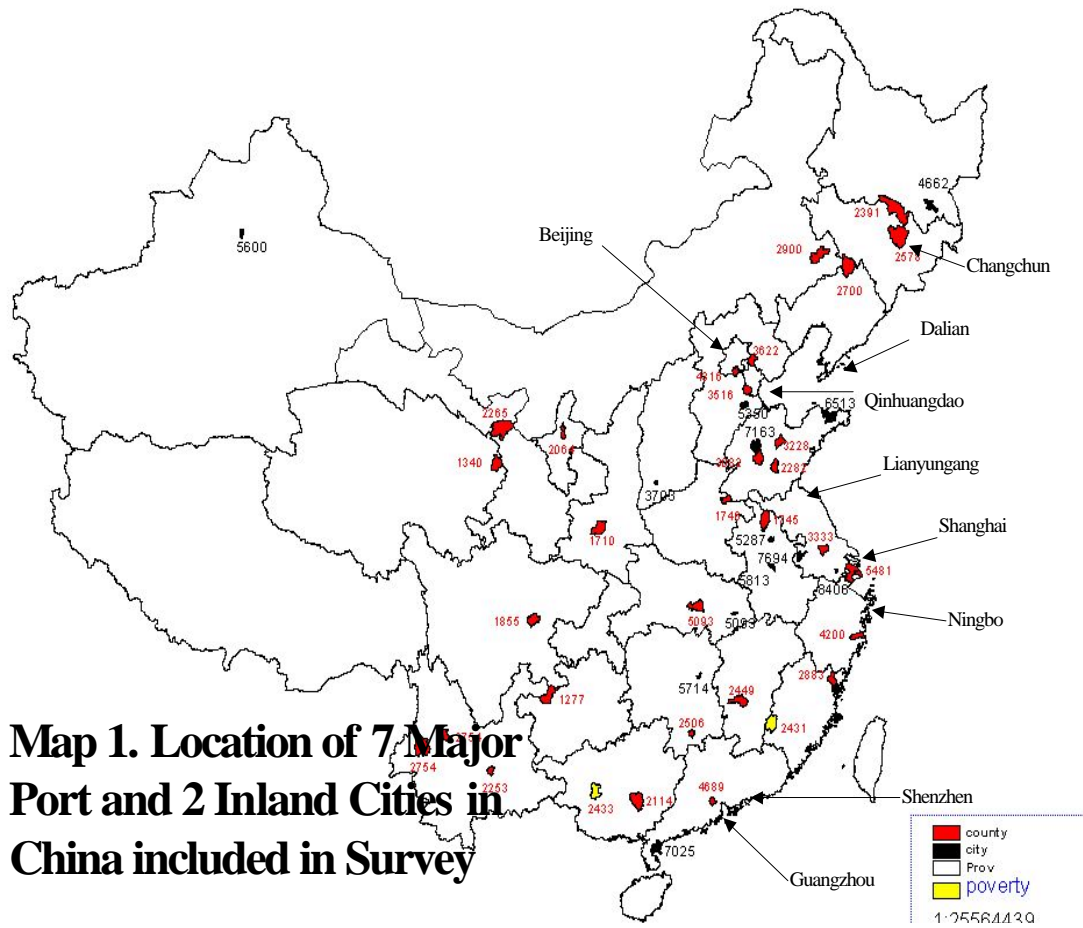
Village Price—Mkt 1

Village Price—Mkt 2

S^1 S^0

S^1 S^0

$D^{PriceTaker}$

Integrated?

Yes ….. No

D^{Local}

Figure 7. Schematic of Test of Village-Market Town Price Integration with Cross-section Data

Map 1. Location of 7 Major Port and 2 Inland Cities in China included in Survey

Beijing

Changchun

Dalian

Qinhuangdao

Lianyungang

Shanghai

Ningbo

Shenzhen

Guangzhou

county
city
Prov
poverty

1:25564430

Map 2. **Market distribution with province**

Heilongjiang Sheng

Jilin Sheng

Liaoning Sheng

Xinjianguygur Zizhiqu

Neimongol Zizhiqu

Beijing Shi

Tianjin Shi

Hebei Sheng

SHanxi Sheng

Shandong Sheng

Ningxia

Qinghai Sheng

Gansu Sheng

Henan Sheng

Jiangsu Sheng

Shanxi Sheng

Shanghai City

Xizang Zizhiqu

Anhui Sheng

Hubei Sheng

Zhejiang Sheng

Sichuan Sheng

Chongqing Shi

Jiangxi Sheng

Hunan Sheng

Guizhou Sheng

Fujian Sheng

Yunnan Sheng

Guangxi

Guangdong Sheng

Taiwan Sheng

Hainan Sheng

■ county
■ city
□ Prov

Appendix Table 1. A Summary of Price Data and Key Determinants for Rice, Maize and Soybeans in China, 1996 to 2000.

	1996	1997	1998	1999	2000
Rice					
Price (average annual price)	3.01	2.32	2.27	2.15	1.81
Average distance from the port [a]	-	-	-	-	882.22
Average distance from the railway [a]	-	-	-	-	39.70
Average distance from the national hwy [a]	-	-	-	-	11.97
Corn					
Price (average annual price)	1.56	1.22	1.32	N/A	N/A
Average distance from the port [a]	-	-	-	-	1125.91
Average distance from the railway [a]	-	-	-	-	34.54
Average distance from the national hwy [a]	-	-	-	-	13.17
Soybean					
Price (average annual price)	3.64	3.96	3.54	2.83	2.81
Average distance from the port [a]	-	-	-	-	638.15
Average distance from the railway [a]	-	-	-	-	18.93
Average distance from the national hwy [a]	-	-	-	-	10.98

[i] On the other hand, the trade liberalization will significantly decrease the domestic price of milk. The milk price under the free trade regime will decline by more than 20% over the period of 2000-2005.