

**After Accession to the WTO:  
Corn Trade Within China and Between China and the Rest of the World**

**A Report**

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## **Tables of Contents**

<b>Background and Introduction</b>	<b>1</b>
<b>Goals and Objectives</b>	<b>4</b>
<b>Data</b>	<b>5</b>
<b>Domestic Markets for Corn</b>	<b>7</b>
<b>Price Relationships among Key Corn Domestic Markets in China</b>	<b>9</b>
<b>Coefficients of Variation</b>	<b>11</b>
<b>Integration Tests</b>	<b>11</b>
<b>Corn Imports After WTO</b>	<b>13</b>
<b>What is the “right” Price?</b>	<b>15</b>
<b>VAT Issues</b>	<b>15</b>
<b>TRQ Implementation and SPS Regulations</b>	<b>16</b>
<b>Corn Exports After WTO</b>	<b>18</b>
<b>The Timing of Exports and Export Prices</b>	<b>19</b>
<b>Accounting for the Export-Domestic Price Gap</b>	<b>20</b>
<b>Conclusions: Why Protect? Why Subsidize?</b>	<b>23</b>
<b>Summary of Key Findings</b>	<b>23</b>
<b>Motive for Protection and Subsidization</b>	<b>24</b>
<b>*****</b>	
<b>Appendix A: List of Corn Markets in Key Data Set</b>	<b>27</b>
<b>Appendix B: Summary of Trade and Domestic Policies</b>	<b>28</b>
<b>Appendix C: Summary of China’s Commitments in Agriculture and Corn</b>	<b>38</b>
<b>Tables and Figures and Maps and References</b>	<b>41</b>

## **After Accession to the WTO: Corn Trade Within China and Between China and the Rest of the World**

### **Background and Introduction**

On the eve of accession to the World Trade Organization (WTO), with the aid of border policies, China was the second largest corn exporter in the world. During the time prior to accession, China's corn prices were estimated to be more than 30 percent above world market prices (Huang, Rozelle and Chang, 2003). China's government explicitly admitted to providing subsidies for corn exports of up to \$US35 per metric, which accounted for almost all of the protection that corn producers in China were receiving. During the late 1990s and through 2001, with such high subsidies the nation's exporters were able to sell around 5 million metric tons (mmts) annually into world markets (Gale, 2003). Most of the shipments, especially in the 2000 and 2001, were sent to Korea and Malaysia. With such large shipments, the exports of other nations in the world (especially those from the US that traditionally was Korea's main supplier of feed grains) were displaced.

During the negotiation leading up to China's admittance into the WTO, China made a number of promises that were expected to affect its agricultural economy, in general, and the corn economy, in particular. In its most basic terms, the commitments in agricultural sector can be classified into 3 major categories: market access, domestic support and export subsidies. The commitments on market accession will lower tariffs of all agricultural products, increase access to China's markets by foreign producers of some commodities through tariff rate quotas (TRQs) and remove quantitative restrictions on others. In return, China is supposed to gain better access to foreign markets for its agricultural products, as well as a number of other indirect benefits. Special limitations on domestic support and the elimination of export subsidies are the other two critical issues that arose during the course of negotiations. Together with a number of other market-access commitments make China's WTO accession unique among all other developing countries that have been admitted to the WTO's new environment.

Although China's accession agreement is broad and innovative in some ways, some of the direct import market access commitments that China has made to WTO members actually do not appear to be overly large or threatening to domestic producers. Overall agricultural import tariffs (in terms of its simple average) declines from about 21 percent in 2001 to 17 percent by 2004. A continuation of earlier trends, the simple average agricultural import tariff fell from 42.2% in 1992 to 23.6% in 1998. Although important, when taken in the context of the discussion in the previous section about China's external economy reforms of the last two decades, one would have to conclude that the commitments are merely an extension of China's past changes. WTO in this way can be thought of as just another step on China's road to opening up its economy.

Although the agricultural economy as a whole was being liberalized during the late 1990s, during this period it should be noted that corn was treated differently than

most other commodities. Along with cotton (and to a lesser extent wheat), during the late 1990s, corn was the only commodity in which the real rate of protection rose. On the import side, state trading arrangements were the main barrier. Even if the world price of corn was far below China's as it was at times during the late 1990s and during 2000, importers were not allowed to bring in corn. On the export side, direct export subsidies allowed state trading firms to negotiate export contracts which reduced domestic supply and allowed domestic corn prices to rise.

Except for a subset of what China has called its “national strategic products,” including rice, wheat, corn, cotton, edible oil and sugar, after the nation acceded to the WTO, other agricultural products (horticulture, livestock, fishery, wine, tobacco, soybean and barley) have become part of a tariff-only regime. According to this part of the agreement, all non-tariff barriers and licensing and quota processes have been eliminated. For most commodities in this group, effective protection fell by varying amounts by January 2002; for some of the commodities the tariffs will fall even further by 2004. To the extent that tariffs are binding for some of these commodities, the reductions in tariff rates should stimulate new imports.

It is important to note, however, that although published tariff rates will fall on all of these commodities, imports will not necessarily grow immediately (or at all). Indeed, China has comparative advantages in many commodities under the single tariff regime. For example, lower tariffs on horticultural and meats might impact only a small portion of domestic market (e.g., those parts of the market that buy and sell only very high quality products—such as in the case of meats for five-star hotels that cater to foreigners). Although tariffs fall for all products, since China produces and exports many commodities at below world market prices, the tariff declines will not affect producers or traders.

Such movements, however, will almost certainly be (and can legally be) limited for a class of commodities called “national strategic products.” China's WTO agreement allows officials to manage trade of corn as well as rice, wheat, edible oils, sugar, cotton and wool with tariff rate quotas (TRQs). These commodities are covered under a special set of institutions. As shown in Table 1, column 5, except for sugar (20 percent) and edible oils (9 percent), the in-quota tariff is only 1 percent for rice, wheat, corn, and wool. However, the amount brought in at these tariff levels is strictly restricted (columns 2 and 3). For example, in 2002, the first 5.70 mmt of corn could come in at a tariff rate of 1 percent (row 3). The in-quota volumes, however, are to grow over a three year period (2002 to 2004) at annual rates ranging from 4 percent to 19 percent. For example, the corn TRQ volume increases from 5.70 mmts in 2002 to 7.20 mmts in 2004. China does not have to bring in this quantity, but provisions are in place that there is supposed to be competition in the import market so if there is demand inside China for the national strategic products at international prices, traders will be able to bring in the commodity up to the TRQ level. We return to this issue of TRQ management later in the report.

At the same time, there are still ways theoretically to import these commodities after the TRQ is filled. Most poignantly, tariffs on out-of-quota sales (that is above 7.20

mmt in 2004 for corn) will drop substantially in the first year of accession and fall further between 2002 and 2005 (Table 1, columns 6 to 8). If the international price of corn were to fall more than 65 percent below China's price after 2004, any trader is allowed to import corn (column 8). But, at least in the foreseeable future, most people believe such rates are so high that in the coming years they will not bind.<sup>1</sup>

After the first four to five years of accession, a number of other changes are scheduled to take place. For example, after 2006, China agreed to phase out its TRQ for edible oils. But China is likely to maintain the TRQ for corn after 2005, though during upcoming WTO negotiations the amount of TRQ will be negotiated. State trading monopolies also will be phased out for wools after 2004 and gradually disappear for most of other agricultural products. Although China National Cereals Oil and Foodstuffs Import & Export Co. and the Jilin Grain Group will continue to play an important role in managing rice, wheat and corn imports and exports, there will be an increasing degree of competition from private firms. For corn, the state trading share is scheduled to lower from 100 percent in pre-WTO era to 60 percent in 2004 and is expected to continue declining thereafter.

In its commitments to WTO accession, China also agreed to a number of other items, some of which are special to the case of China and are particularly relevant for corn. First, China must phase out all export subsidies. Although in 2001 most of the nation's export subsidies were used for supporting corn, the WTO agreement stipulates that China shall not introduce any subsidies on any agricultural products, including corn, in the future.

Moreover, despite clearly being a developing country, China's *de minimis* exemption for product-specific support is equivalent to only 8.5 percent of the total value agricultural gross domestic product (compared with 10 percent for other developing countries). Some measures, such as investment subsidies for all farmers and input subsidies for the poor and other resource-scarce farmers that are generally available for policy makers to use in developing countries, are not allowed to be used indiscriminantly in China. If such support is given, China must include it as part of its aggregate measurement of support.

Because China had these multiple commitments in a carefully-negotiated WTO agreement that would affect the way the nation supported corn (mainly, the elimination of corn subsidies, national treatment clauses and a unique TRQ implementation protocol), many observers thought that China was at the beginning stage of being a large corn importer. Instead, by the end of 2002 it was apparent that these predictions would not be realized during China's first year of membership. Imports of corn into China have been virtually zero since the nation's accession to WTO. Moreover, far from becoming an importer, China continued to export corn. In fact, since 2002, exports have accelerated. Exports in 2002 reached more than 10 mmts and monthly exports in 2002 were higher

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<sup>1</sup> Although 65% above tariff rates seem high, it is important to note that in fact when compared to other countries, this is low. Most Asian countries that have a TRQ system, high tariff bindings are 2 or more times higher than this.

than 2001 for almost every month (Figure 1). The increasing exports from China have raised the fraction of the market dominated by China in some of the markets, especially Korea, that traditionally imported large volumes of corn from the US.

## Goals and Objectives

Against this background, US corn producers and exporters understandably are interested in trying to understand what happened and what is going to happen in the coming years in China's corn markets. In trying to assess why we have observed the patterns of economic trade that characterize East Asian corn markets since late 2001, we have several specific objectives.

First, we seek to establish how well China's own domestic grain markets function. To do so, we will seek to establish the ways prices are determined in China's domestic corn markets and how integrated markets are. In addition to being of interest as a topic in its own right (for example, those engaged in foreign trade may be interested in knowing the nature of the domestic market of China once their corn enters the country), if China's markets are integrated, then we can compare China's domestic price of corn in a single city (e.g., in Dalian or Guangdong) with prices in the international market (e.g., China's corn, FOB-Dalian; or China's corn, CIF-Korea; or US corn, CIF-Guangdong; or US corn, CIF-Korea). Knowing these price relationships are key to helping us evaluate the rate of protection that China's farmers are enjoying and whether or not China has followed through on its WTO commitments.

Once we establish that China's corn markets are integrated, we can then move on to the two key objectives of the report. First, we can seek to understand why China did *not* import corn during the first 18 months after accession to the WTO. Using the import experience of other crops, we also can conjecture about how low US prices would have to fall (US corn, CIF-Guangdong) before importers would be able to bring corn into China. Second, we will seek to understand how it is that China could continue to export record amounts of corn after accession. In particular, we seek to understand remaining barriers to imports of corn into China *and* any remaining intervention that helps China's exporters in international markets.

Finally, in the last part of the report we will briefly discuss the policy implications of our results. While mostly conjecture, we will discuss different reasons about why China behaves the way it does. We will examine a political economy explanation. In addition, we also will examine who benefits relatively the most from protection of the corn sector and who get hurt by liberalization, an analysis that could help understand China's actions or at least the actions it might want to take to offset the effects of liberalization.

To meet these objectives, the rest of the report is organized as follows. First, we describe the main data sources used in the study. Next, we focus on analyzing the nature of China's domestic markets, seeking to understand how prices move, how prices are determined across space and the nature of integration across China. The following two

sections look at imports and exports, and the final section concludes with a discussion of why China may be protecting prices.

## Data

To assess the nature of China's markets in late 2001, 2002 and the first part of 2003, we first describe the data. We used data from a number of different sources. In each paragraph below, we describe each.

The main data on China's domestic market come from a price data set collected by Prices taken from the Jilin Province Grain and Oil Information Center (henceforth, *dataset 1*). This data set was provided to us by the Beijing Office of the US Grains Council in a file called, "98-02 Weekly Corn Prices from Jilin GOIC.xls." The website for the Jilin Province Grain and Oil Information Center is <http://www.jlgrain.com/grain/grainnews/corn.jhtml>. On a weekly basis between August 10, 1998 and February 24, 2003, weekly prices are reported for 15 of China's main corn production and consumption provinces, including Heilongjiang, Jilin, Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Shanghai, Hubei, Sichuan, Hunan, Fujian, Guangdong, and Guangxi (Meyer, 2002). Since September 7, 1998, there is a price from Liaoning for Dalian, the main port from which exports to foreign and other domestic markets (by ship) leave. These markets are the ones that we use in the Coefficient of Variation Analysis.

To examine corn markets more carefully in the northeast region of the country and through the country in the post-accession period, we used another data provided to us by the Beijing Office of the US Grains Council (henceforth, *dataset 2*). The data set came to us in a file called, "Corn, wheat, rice Price 2001 – Like.xls." The data in dataset 2 are first available after October 26, 2001, and they continue through February 25, 2003. This is more detailed data set that we use to analyze price relations during the post-accession period. Dataset 2 is more detailed than dataset 1 for two reasons. First, dataset 2 includes prices from three markets in Heilongjiang; three markets from Jilin; three markets from Liaoning (including two in production regions and Dalian); and market sites in Guangdong, Fujian, Jiangsu and Hubei. A list of the markets that we used and a description of their location and the nature of the price (that is, CIF or FOB) is in Appendix A. Map 1 shows the location of the main marketing sites. Second, dataset 2 also reports data more frequently, typically twice a week (every third day, then every fourth data).

The data from the Jilin Grain and Oilseed Price Information Center appears to be high quality compared to other price series. Unlike other price data sets that are available in China, there are few missing observations. There are also relatively few inconsistencies in the data. In other data sets, corrections frequently need to be made to the data to account for missing observations and to adjust for prices when they are written down in price "per jin" even though the data category is supposed to be price "per



kilogram.” Unlike our previous analyses of prices using other data sets from China, we made *no* correction to the data after they were provided to us by the US Grains Council.

In our discussions with the Monitoring and Marketing Divisions of the NIOG (the division in charge of collecting the data) we discovered that the data were mostly from members of the marketing arms of local grain storage bureaus (that are making daily corn sales), traders in major ports (Dalian and Guangzhou) and end users (in the south). In its most common way a member of MMD will make a call to the grain bureau personnel, trader and end user twice a week (Monday and Thursday). For example, in Dalian we were told that each Monday and Thursday about 9 traders who are involved with shipping grain from Dalian to South China are called. These traders tell the MMD official the average price at which corn is leaving Dalian at an FOB price. In the northeast (e.g., Jilin), we were told that MMD calls several grain bureaus in a region and has them provide unit value prices (value of shipments divided by volume) for the day. The MMD official averages the price in the district.

For illustrative purposes (e.g., for our CV analysis and the for the determinants of price analysis), we compare some of our results to results from 1988 to 1995 that were reported in Park et al. (2002) and to results from 1996 to 2000 for Huang, Rozelle and Chang (2003). Note, however, the data sources while attempting to measure the same prices, may be different, and hence not entirely comparable, due to differences in data collection methods. In other words, while illustrative of changes over time, the comparisons should only be used generally to help put the situation in the post-accession period into the context of China’s corn and other markets during the 1990s.

In the rest of the report, we also compare China’s domestic prices to various international prices. In the data file (“China’s corn Exp. & Value 94-02.xls”) information is provided on three variables on a monthly basis: a.) the export volume (which measures the volume in metric tons of corn as it physically leaves China); b.) the export value (in US dollars—converted from RMB at an exchange rate of 8.27 yuan to the dollar); and c.) the US Corn, Dalian-CIF price (reported in US dollars per ton). We call this *data set 3*. Information on the China export price (henceforth called, *China Corn, Dalian-FOB price*) and the price of US corn in Dalian (henceforth, *US Corn, Dalian-CIF price*) were also provided to us by the trade service staff of the US Grains Council. The price series extend from January 1996 through December 2002. According to a note on the “description of the data” in the file that contained the data, the data on China’s export volumes and values from 1996 to 1999 came from PRC Customs. From 2000 to 2002, the data are from the China National Grain & Oils Information Center, Analysis and Forecast Department. When cross checking these prices with those from PRC Customs, we find they are the same. The export prices are created by dividing export value by volume. After November 1996, since there were exports in every month, there are no missing values. The US Corn, Dalian-CIF price came from the US Grains Council.

Our report also draws on one additional data set on international prices and export volume that was provided to us by the Beijing Office of the US Grains Council. These data came from the Korea Office of the US Grains Council and include information on a.) the price of China Corn, CIF-Korea (the price of corn from China as it arrives in Korea



and has cleared customs; b.) the price of US Corn, CIF-Korea; and c.) the contract price of purchases from China at the date of the signing of the contract (between China's export agents—COFCO and Jilin Grain Group—and international trading firms) and the estimated date of arrival of the shipment into Korea.

Our interviews also asked traders and end users about the nature of corn markets in China, information that we use in our report to support the analysis of the secondary data. The survey focused in Changchun, Shenyang, Dalian, Beijing, Shanghai, Wuxi, Fuzhou and Guangzhou and were conducted in April and June 2003. The enumeration teams were interrupted for more than 2 months by the SARS outbreak. In each port, we used a number of “sampling frames” 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 50 people were interviewed.<sup>2</sup> We conducted the interviews on the basis of strict confidentiality. Map 2 shows the location of our interviews.

### **Domestic Markets for Corn**

In this section, we examine the nature of China's domestic corn markets during the post-accession period. This analysis is needed for two reasons. First, it is of interest for its own sake. Second, and more importantly, to study China's behavior at the border, we need to establish that the nation has a nation-wide, well-functioning market for corn. If the market for corn in China functions well, and price shifts in one part of the country are reflected in shifts in prices in other parts of the country, then we can use prices in one place as a standard for what is happening across China. Specifically, we will establish that prices in Dalian and Guangzhou are connected to supply and demand forces in the rest of China. When we establish this, in the next two sections of the report we can compare Dalian and Guangzhou prices to world prices to help us figure out China's export and import behavior.

While it may come as a surprise to some that China's markets are found to function remarkably well, the current state of the nation's corn markets are a result of 20 years of policy change, institutional transformation and infrastructure development. In this section we see the result of these fundamental changes in marketing structures.

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<sup>2</sup> Because of the absence of a single central authority that manages grain flows, the enumeration team chose their sample in a number of ways. In each location, we first visited the local grain bureau and obtained access to a list of all grain bureaus, the firms that they were running on a commercial basis, and their subsidiaries. We interviewed an official in the grain marketing division and transportation division. We also chose three firms that were owned directly by the grain bureau and three that were affiliated with the grain bureau. In several cities, the grain bureau had a list of large grain trading and grain using firms (e.g., mills and feed lots). In others, this was obtained from the market administration bureau. Five firms were chosen on the basis that they were private and had yearly sales that exceeded one million yuan. We interviewed at least 2 flour or rice mills and feed mills in each location. Finally, we visited the wholesale market and randomly chose 5 stalls to interview. The team also visited a number of other entities, such as the grain reserve, the local COFCO agency, and supermarket chains. In some cases, the managers of these entities knew the grain trade business well enough to answer our questions, in other cases they did not.

During the past 20 years, China's centrally-planned and bureaucratically-run grain system has been replaced almost completely by a domestic market that is dominated by thousands of private and commercialized state traders. Private and profit-oriented quasi commercial trade is the rule in rural areas, regional markets and interprovincial trade. Whereas trade once moved slowly through a planned system on overcrowded trains and small, slow-moving ocean-going junks, today there is a national network of corn trade that moves by train, truck and the most modern of ships and port facilities. Corn deals that used to be made during annual trade conferences set up by central bureaucrats in Beijing are now made daily among traders and users in the opposite ends of China through one of the world's most comprehensive cellular telephone system and rapidly expanding internet network. While documenting this transformation is beyond the scope of this report, we include a brief account of some of the major international and domestic trade policy and institutional changes in Appendix B.

In the rest of this section to examine China's corn markets after the nation's accession to WTO, we proceed as follows. First, we examine price relations among the major producing and using areas over time. This is mostly done with graphical analysis and while causality and the exact nature of the markets are not analytically determined with this description, we believe it is important to see visually that prices appear to move closely together. Second, we look at price determination in the Northeast as a function of distance from China's main export port, Dalian. We do this and compare our results to similar findings in the US in order to show that price relations from the port in Dalian to China's major producing areas in the Northeast operate in a way not too different than what is observed in the Mississippi Valley between New Orleans and the US's main producing areas. Finally, we do two tests of price integration, one looking at coefficients of variation among China's major producing regions during the WTO period and show that during this time period price differences among regions remain low, especially when compared to earlier time periods. In addition, we do standard statistical analysis to determine if markets are integrated.

Anticipating (and summarizing) our results, we find that China's corn markets during the post-accession period function well. Prices in key markets appear to move together, despite long distances between them. Across space in the Northeast, China's prices look remarkably like those in the US and the spatial price differences are sensitive to changes in the tax regime that is used for the rail system. Coefficients of variation show price differences among regions are low in the post accession period. And, prices are integrated statistically among all pairs of markets in the Northeast in our analysis and between Dalian and far-reaching markets, such as Fujian and Guangdong. In short, our analysis convincingly shows that China has a well-integrated market for corn. If this result is accepted, in the rest of our analysis, when we see changes in the domestic prices of Dalian or Guangzhou, we can be fairly confident that they reflect price relations across much broader regions of China.

## Price Relationships Among Key Corn Domestic Markets in China

Using data set 2, we can see how closely prices in Northeast China track each other (Figure 2, Panels A and B). In Panel A we plot the Dalian domestic price versus the prices in the three Heilongjiang market sites (chosen because they are the furthest Northeast markets from Dalian). While varying over time, the Dalian domestic price remains about US\$127/mt between December 2001 and February 2003. During the same period, the prices in each of the three Heilongjiang markets move almost in perfect concert with one another. While also varying over time, the prices in Heilongjiang during the post accession period are around US\$110/mt to US\$115/mt. Visual inspection also shows that although the market in Dalian and those in Heilongjiang are more than 1000 kilometers apart and prices vary by US\$12/mt to US\$17/mt, the prices in many periods are moving together. When the prices in Dalian move up (down), the prices in Heilongjiang tend to move up (down).

Similar patterns of price movements are found to exist between the two markets in western and central Liaoning and Dalian (Panel B). In fact, the prices in the two Liaoning producing areas track each other even closer than the markets in Heilongjiang, a finding that perhaps is not surprising given the fact that Liaoning is a smaller province with better transportation and communication infrastructure. The co-movements of prices among the producing areas in Liaoning and the consumption center of the province, Dalian, are easily perceptible. The narrower price gaps among producer (lower trend lines) and user areas (higher trend line) are a reflection of the closer distance (than when compared to Heilongjiang-Dalian figure).

Using data set 1, the patterns of movement across further points of China display similar patterns of close movements of prices (Figure 3, Panels A and B). While prices have moved together since the mid-1990s between Dalian and Guangdong and between Dalian and Fujian, the tracking among markets appears to be even closer in recent years. Almost every turning point (a shift from low to high or high to low) in Guangdong and Fujian can be found in the Dalian market. The close movement of prices occurs even though the primary way grain moves between the two sets of markets is by ocean going vessel. With the advent of private shipping and commercial trading, there are now many shipping lines and trading companies that move grain between the Northeast and South China's main consumption areas. The results from Figure 3, Panels A and B, when linked with those from Figure 2, demonstrate that prices in Heilongjiang appear to depend on shifts in feed demand and corn availability in Guangzhou and Fujian.

The only pairs of major markets that do not move together during the last several years are: a.) Dalian and southern Jiangsu (next to Shanghai); and b.) Dalian and Hubei (Figure 4, Panels A and B). While these price movements may mean that there is a market imperfection, when we talked with traders and users in the region, they had a ready explanation. During most of the year, there are flows of corn from Dalian into the region for use in the feed and livestock industry. During the fall, however, after the corn harvest in northern Jiangsu, northern Hubei and northern Anhui provinces (and provinces further north in the north China Plain), small traders move significant quantities of corn

out of these regional producing areas. The post harvest depression of prices that is common in almost every agricultural commodity market (likely due to limited and costly storage in the private trading system), depresses the price to an extent that the local price falls below the Dalian price plus transportation. As can be seen from Figure 4, this, in fact, is what appears to be happening. Every 10 months or so late in the cropping year, the local price in Jiangsu (Hubei) falls (relative to the Dalian price) as local supply and demand forces and transaction costs create a regional market. When the post-harvest rush onto the market is used up, users turn back to Dalian and the prices in the Yangtse Valley and Dalian appear to move together during most of the rest of the year. The overall trend in both sets of prices also shows that both markets—either when trading with each other directly or not—appear to be reacting to similar nationwide economic forces (since they move up and down across the years similarly).

In addition to observing co-movements of corn prices between regions over time during the post-WTO accession period, our data (data set 2) also shows that prices of different feed types move together (Figure 5). In south China, early rice is sometimes used as a feed, albeit in the view of most livestock producers, a slightly inferior one. However, even though the price of corn is higher than feed rice across China, the ratio of corn to feed rice is almost identical in markets in different province. Figure 5 illustrates that even though the ratio of corn to feed rice varies over time in Guangdong and Fujian, the trend of the ratios in each of the province almost perfectly tracks one another.

### **Price Determination**

We also can use statistical analyses to analyze of the behavior of prices of corn in another dimension. In this subsection we examine price behavior across space, holding time constant. If China's markets function well, then there is a greater likelihood that when a price changes in one region of the country (e.g., there is a price shock arising in Dalian that occurs from increased demand for exports or shipments to elsewhere in China), that prices will change throughout the rest of China. If price formation does not appear to be consistent with the existence of adequately functioning markets, price shifts at the border (e.g., Dalian) may not be experienced elsewhere in China. Indeed, if markets in China are fragmented, shifts of prices in the coastal areas near the border could be sharper (for a given shift in demand), while in large regions of the country away from the border, producers could be shielded from them. Hence, the hypothesis to be tested 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 created in part by market forces. As a standard, we compare our results from northwest China with those from the Mississippi Valley in the US.

A simple plotting of the relationship between the price of corn in Dalian and those in Liaoning, Jilin and Heilongjiang during post-accession period (December 2001 to February 2003) illustrates a price contour that is consistent with the existence of well-functioning markets (Figure 6). Since the main demand center in the Northeast and point of export for corn to foreign markets and to south China is Dalian, 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 Dalian (e.g., the Jilin market) is, on average, about RMB 70/mt lower than the price in Dalian. In percentage terms, this means the price of Jilin corn is about 6 percent lower than the price of corn in Dalian.

The results of regression analysis of the relationship between prices (entering the equation either in linear or log form) in the local market and the distance from port and a series of time period dummies (one for each time period of analysis—that is, one for every ½ week in the sample and an interaction term) find similar results for corn in the Northeast (Table 2). Holding all other factors constant, as corn marketing sites move farther away from Dalian, the price falls (row 1). The magnitudes of the coefficient on the distance from Dalian change for each of the periods, their sizes still fall in a reasonable range (for each 1000 kilometers, the price of corn fall by RMB 54.4/mt (column 1). In log form, our results show that for each 1000 kilometers, the price falls by 5.6 percent (column 2).

Interestingly, the magnitudes of the transportation/transaction costs are similar to those reported in Park et al. (2002). They also are similar to those found in the US. When plotting similar data and running similar regression on corn in the Mississippi valley we find pattern of spatial price spread similar to those in China. In summary, the findings are consistent with China having well functioning, though emerging markets.

### **Coefficients of Variation**

In previous work, Park et al. (2002) use coefficient of variation (CV) analysis to examine improvements in market performance. Using CVs (the standard deviation divided by the mean) as a measure of dispersion (measured across all markets for each period of analysis), they show that during the 1990s, the average spatial variation among markets across China in wheat, soybean and corn markets fell from around 0.50 to around 0.15.<sup>3</sup> When we use data set 2 to examine coefficients of variation across time in the Northeast during the post-accession period, we find that the measure is low (less than 0.06) and mostly steady (Figure 7). When we use data set 1 set to examine CVs across our sample markets in China since the late 1990s, the CVs also are all below 0.10 (except for several months in 1997 and late 1999/early 2000—Figure 8). Clearly, markets, according to CV analysis continue to show fairly narrow ranges of price dispersions.

### **Integration tests**

In this section we use more formal tests of market integration. To do so, we apply the Engle-Granger cointegration approach to test for the integration of China's grain markets. Two or more price series are cointegrated (even if each is individually non-

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<sup>3</sup> Coefficient of Variation analysis provides a fairly rudimentary, but intuitive, way to examine changes in a market environment over time. It allows us to examine the changes in the dispersion of prices over time. If the average dispersion of prices falls over time, we can say that markets are improving. One of the weaknesses of the measure, however, is that it can not distinguish between increases in competition or integration (that might make prices among regions fall) and improved transportation (which could do the same). In the next section of the paper, we examine if traders are operating in a way in which prices in one area are integrated with another. In this way, CV analysis is supplementary with integration analysis.

stationary) if a linear combination of the variables (i.e., the differences of the prices) is stationary. We apply a two-step residual-based test. The first step uses the OLS regression of one price series on another:

$$P_t^i = a + \lambda t + bP_t^j + e_t, \quad (1)$$

where  $t$  is the common trend of the two price series and where  $e_t$  is the error term. The main reason for running the first step is that it provides the residuals,  $e_t$ , for the second step.<sup>4</sup> The second step then tests for the stationarity of the residuals from equation (1) using the augmented Dickey Fuller test:

$$\Delta e_t = \delta e_{t-1} + \sum_{j=2}^N g_j \Delta e_{t-j} + x_t \quad (2)$$

If the test statistic on the  $\delta$  coefficient is less (i.e. more negative) than the relevant critical value from the Dickey Fuller (D-F) table, the null hypothesis maybe rejected and the two series are said to be cointegrated of order (1,1). According to Engles and Granger, this implies that the two markets from which the price series come are integrated. The absolute value of the test statistics should be greater than 3 at 10% significant level. In our paper, we are conducting only the unit root test, where  $j$  equals zero, since the error term from equation (1) is an AR(1) process.

The results of the cointegration analysis support both our descriptive findings and the conclusions of the determinants of commodity price analysis, especially when they are compared to the findings of research on market integration in the late 1980s and early 1990s. Using the Dickey Fuller tests, all pairs of markets in the Northeast are integrated in a statistically significant way (Table 4). In addition, the other pairs of key markets on the national level, Dalian-Guangzhou and Dalian-Fujian, also are integrated (Table 5). Using the results from the 1990s as a base line (as shown in Park et al., 2002 for 1990 to 1995; and Huang et al., 2003 for 1997 to 2000), our current analysis shows that during the WTO period corn markets in China are remarkably integrated; 100 percent of the pairs in our Northeast sample are integrated. The integration of these markets is notable because in many cases, the pairs of market are separated by more than a 1000 kilometers. The corn markets also continued along their previous path of maturation. In middle part of the reform era (1988 to 1995), a time when markets were starting to emerge, only around 46 percent of corn markets showed signs that prices were moving together. In the late 1990s, the co-movement of prices between pairs of markets in a national sample of price showed that corn markets were almost fully integrated (about 93 percent of the pairs). Interestingly, although the prices in Dalian and Hubei and Dalian and Jiangsu markets do not move together in a statistical sense at the 5% level (which is not surprising, given the trends in Figure 4 and the market forces operating on the two markets in different times of the year), we do find that the Dickey Fuller statistic is not far from the critical value (Table 4).

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<sup>4</sup> The lags from the analysis using equation (1) do not play a direct role in the analysis. Intuitively, they tell the analysts the number of time periods (1/2 week to week long periods) over which the prices in the two markets have some kind of relationship. The second stage Dickey Fuller tests are the tests of interest.



In summary, our analysis finds that corn markets in China are fairly well integrated. Descriptive graphs of price movements among pairs of market over time, price determination analysis of price relations across space, CV analysis and formal cointegration analysis all show that prices in China's corn markets move together over time and across space. While of interest itself, the main use of these results is that for the rest of the paper the movements of prices in Dalian and Guangdong can be considered to be representative of price shift in the rest of China.

### **Corn Imports After WTO**

On the eve of the nation's accession to the WTO, China was heavily subsidizing exports. In 2001, exporters received up to US\$35/mt for each ton of corn that was exported at US\$100/mt. Although the published tariffs were fairly low, state traders controlled all imports. Even if corn was imported, it was assessed a value added tax, even though domestic farmgate procurement was exempt from the value-added tax, making imports subject to a different standard than exports. In short, corn producers enjoyed substantial protection from imports and domestic prices were aided by subsidized exports.

During the negotiations for accession, China's leaders agreed to a fairly aggressive set of concessions in all areas of agriculture, including those for corn. While Appendix C contains a discussion of some of the details about the most salient features of the agreement, suffice it to say here that the agreement for corn was far reaching. The agreement set up a TRQ for corn, lowered the within quota tariff to 1%, eliminated the state trading monopoly on imports by reserving part of the TRQ for private and commercialized public traders and end users, guaranteed national treatment for imports and promised to eliminate all export subsidies.

With such an agreement and with the prices that prevailed in world markets and inside China in the fall of 2001, it was expected that once China acceded to the WTO and implemented its commitments, traders would import corn and the TRQ would almost certainly fill. However, since China's accession, imports have been almost zero. In essence, the promises of China's import have not been met. In the rest of this section, we explore why.

In one sense the answer to why China did not import after the nation's accession to WTO is simple: world prices rose sharply while China's price stayed steady (Figures 9 and 10). In December 2001, the world market price (US corn, CIF-Dalian/Guangdong) was about US\$110/mt. The Dalian domestic price was about US\$125/mt and the Guangdong domestic price was about US\$135/mt. Clearly, if China implemented *all* of the provisions that it had agreed to and prices had stayed at these levels, imports would have almost certainly flowed in and likely China would have fulfilled its TRQ in 2002. However, almost immediately after China concluded the agreement, corn prices in the US began to rise. By mid-spring, the world market price of corn (US corn, CIF-Dalian price)



rose above the Dalian domestic price. By early summer, the world market price (this time, the US corn, CIF-Guangzhou price) rose above the Guangdong domestic price. In short, there was little reason for traders or end users to look to international markets.

With well functioning markets in China, when the world price (US corn, CIF-Guangzhou) rose above US\$135, traders and feed users in China clearly found domestic grain more competitive. This would have been the case even if there were no differences facing importers when handling world market or domestic market grain. According to the price gap in the descriptive data (in Figure 3, Panel A), the difference between the Guangdong and Dalian price is about US\$10.80/mt. This figure almost accords exactly with the estimated cost of shipping and handling between Dalian and Guangzhou (US\$10.04/mt) reported in Meyer (2002). Our interviews show that in Spring 2003, the price is still 80 to 90 yuan per metric ton (about US\$10). Hence, when Dalian corn is US\$125/mt, Guangdong traders would prefer domestic grain to an international shipment that was above US\$135/mt (since a 1% tariff, or about US\$ 1.35/mt must be added to imported grain). Hence, there is no reason to think that profit-driven traders inside China should have imported corn into China, at least by mid-2002.

Even with world prices becoming uncompetitive by the summer, some have argued that prices were low enough in the early part of the year (before June) that China should have imported grain in 2002. It is argued that China's tardiness in issuing TRQ allocations to end users and traders made importers miss the opportunity when prices internationally clearly were lower. In other words, despite rising world price during the first part of 2002, it is argued that had China met the letter of its commitment, there would have at least been imports in the first half of the year.

While this may be true, several issues work against this conclusion. First, China maintains that since the accession was so late in the year (December 1), there was no way that it could have moved quick enough to have issued the TRQs by January 1 as the agreement calls for. In essence, a GAO study by the US implicitly concurs with this assessment (GAO, 2003). Second, in mid-spring 2002, it was clear the the price of corn in the US was already rising. In fact, the July contract futures price on the Chicago Board of Trade (CBOT) in April (the relevant price for an importer considering to purchase corn from the US) was already trading above the price at which grain could be brought into China. During this same time, China's domestic price was steady and was even falling in Guangzhou. Thus, importers in China in early spring may have had difficulty striking a deal for under US\$135/mt. Instead of shipping to China for such a low price, traders in the US would prefer to sell into the US domestic market. Finally, China was still dealing with its newly issued GM policy, a policy that is WTO consistent and while primarily affecting soybeans also may have discouraged traders from entering into a corn contract, especially when the price difference was so negligible by mid-spring that it almost certainly would not be worth the risk of having a ship turned around or delayed. It should also be recognized that if soybean importers are having problems that importers of corn may meet even greater difficulties. Importing corn through a trading regime like that being set up in China will be more difficult because there are many companies that produce GM corn and each company often has multiple events. This

means that importers will have to get more approvals and ensure that imports on a certain ship will meet the requirements of the import permit.

In sum, then, it is hard to blame China for not importing corn since its accession. Even if China were committed to implementing all of the provisions of its agreement, it is hard to see that traders could have struck a profitable deal in the first months after accession. After those first few months passed, however, world price moved up so sharply that no profit-seeking trader or feed users would ever want to bring in any grain. Indeed, in our interviews with traders, many said that they would have been more than happy to bring in corn from international markets during this time if the price had been right; since at least mid-spring 2002 until now, however, the price has not been right.

### **What is the “right price”?**

So, what would the price have to be for importers to profitably bring in corn from world markets? While it is impossible to conclusively answer this question, there is evidence in the way that China has handled the trade of other commodities that we can come up with a plausible strike price, under which imports into China would start. This is not to say that the strike price is one that should be in place given the interpretation of many observers about the nature of China’s treatment of imports under its WTO agreement. It is, however, a price that at least in the short run should be considered a target price that world prices must hit before imports would almost certainly enter (that is, absent some other SPS regulation, such as restrictions relating to GM corn).

According to the letter of the WTO agreement, within quota imports are to be assessed an import duty of 1% (or about US\$1.40/mt at today’s prices). In addition, according to the WTO agreement, port authorities can charge reasonable port and custom fees. According to Meyer (2002), custom fees are 10 to 20 yuan/mt (or about US\$2.50/mt). These fees would apply to imported grain but not domestic shipments from Dalian. There are also additional (bonafide) handling fees that apply (about 16 yuan/mt or US\$2.00). Hence, even if China were to strictly adhere to the letter of its WTO agreement, at today’s domestic prices in Guangzhou (about US\$135/mt), the world market price would probably have to be about US\$128/mt (CIF—Guangzhou, before tariffs, custom and handling fees) before China imports. This gives domestic producer a small advantage in production (but it should be noted that all of these are WTO consistent).

### **VAT issues**

However, it is likely that China also would use other means to provide additional protection to its corn markets (as it is doing for markets for other agricultural commodities, e.g., soybeans). Most likely, China’s tax officials could assess a value added tax (VAT) at the border of 13% (or about US\$15/mt). If so, this would mean that the world market price would have to fall between US\$110/mt to US\$115/mt to be competitive, a price that is almost 20% below China’s current domestic price (or the price was common in China throughout the summer and fall 2002 and the winter of 2003).

So how is it that China can justify charging the VAT? In fact, in many circumstances (in many other countries and in the case of China for other non-agricultural commodities), assessing a VAT on imports is not illegal per se according to WTO rules. When domestic producers pay a VAT, a VAT is allowed to be charged on imports to “even the playing field” between domestic and world producers. Such a tax is not a violation of national treatment. Many countries assess VATs. China also does so, legally, for many imported products.

In the case of agricultural commodities, however, it is almost certainly at least a partial violation of WTO principles, if not completely a violation. The fundamental problem from China’s point of view is that farm gate procurement of agricultural commodities is exempt from the VAT. The VAT is only supposed to be assessed on the marketing margin of agricultural commodities (that is on the difference between what a trader bought the commodity for (from the farmer) and what he sold it for (to an end user, for example). Hence, if the marketing margin was 5% (a level that actually would be relatively high for China’s fiercely competitive agricultural commodity markets), the end product would include the equivalent of a 1% VAT (13% times 5%), not the full 13%. Hence, charging a 13% VAT on imports seems to be a violation of national treatment.

In response to such allegations, China’s economists have argued that of the costs incurred by farmers in their production of agricultural production, a substantial fraction is accounted for by inputs on which VATs were charged. For example, according to the national cost of production data, between 30% to 40% of the cost of production of corn was in material inputs that can be assumed to have paid a VAT during the manufacture and distribution process (chemical fertilizer—17%; seed—5%; plastic sheeting—1%; pesticide—1%; machinery—7%). In this case, farmers should get protection of between 3.9% to 5.2 % (that is, 30% to 40% times 13%). Hence, the argument goes, while assessing the whole VAT may not meet national treatment regulations, the allowable VAT on imports is more than 0. According to this logic, at most, a rate of 5% (to account for the VAT paid on inputs) PLUS 1% (to account for the VAT paid on the marketing margin) or about 6% should be allowed. If China were to move to this policy, then world corn prices (CIF-Guangzhou) would have to be about 10% (or US\$13/mt) below China’s to be competitive.

In some venues, I have heard economists and policy officials claim that the VAT at the border is needed because China’s farmer pay taxes that equal almost 10% of their per capita income. This tax, however, is not crop specific; the tax assessed on cultivated land, regardless of the crop being grown. The argument is that since this tax is so high, assessing a VAT at the border is not a violation of national treatment. According to discussions with almost all of those that have a familiarity with WTO issues, however, such a stance likely would not stand up to a WTO-based investigation. First, if this were the case, then a country could assess a duty on all imports to offset all taxes that a farmer paid. This would, of course, almost certainly completely stop all agricultural trade. Farmers in many other countries pay land and other agriculturally-related taxes that far

exceed 10% of per capita income and they are not able to have equivalent duties assessed at the border.

### **TRQ implementation and SPS regulations**

Of course, there are other policies that China may use if it decides (for whatever reason) that it does not want foreign corn flowing into the nation's borders, whatever the price. Currently one of the most debated issues is about the way the TRQs for corn and other commodities are being implemented. While full treatment of this issue is beyond the scope of this study (see US Grains Council, 2002; and Lohmar and Skully, 2003, for a more complete discussion), in short, according to the accession agreement, China should make the process transparent enough and be implemented in a way that encourages end users and traders to use the TRQs when profitable and not in a way that hinders imports.

Besides issues of non-transparency, the main charge against the current system is that the TRQ allocations are being fragmented to such a degree that many traders would not find it profitable or feasible to use their allocation when if a single user had a larger allocation it would be. In fact, the US Grains Council's own study does not believe the current system is too limiting. Although there are many holders, in fact, it is quite easy, if trade is profitable for a single agent to collect the orders of many TRQ holders and place an order. When the corn (or any other commodity) comes across the border, as in the case of imported speciality rices) the imported shipment can be sold off to a limited number of buyers inside China that are willing to pay the market value for the imported good and the profits divided among the TRQ holders. In fact, our own surveys concur with this assessment. In late June 2003, we interviewed 15 traders and end users in Guangzhou. Four of them had applied for and received TRQ import permits. Four of them told us that the only reason that they did not bring in imported corn was that the price of corn in the world was too high compared to China's domestic corn. They all said they would import, if the price was right. In summary, our analysis concurs with that of the writer of the US Grain Council's earlier study. Both studies find that most importers, domestic traders and end users do not believe the current system of TRQ implementation is a barrier to imports.

This logic is bolstered by the case of rice imports in the pre-WTO time period. An example of this was studied by the author of this report when he was writing for the US Rice Federation. During the late 1990s, the national government permitted traders to import a small quantity (about 0.5 mmts) of high quality rice from Thailand (Thai Jasmine). Although the domestic market for this high quality rice was fairly small, there were consumers that were willing to pay considerably more than the world market price. With little domestic production, there was a large price gap between the domestic price of Thai Jasmine and the world market price. After the government decided to allow a certain quantity of this rice into the nation, officials had to decide to whom the import permits should be allocated. Since most of the demand for such rice was in Guangdong, one way to allocate the quota would have been to give it to Guangdong traders or end users. However, this would have not been fair, since the Guangdong traders would have captured all of the rents (the price gap times the import quantity). Instead, quotas for

imports have always been fragmented among many users in order to be fair about the allocation of quotas with economic rents attached to it. When bringing in the rice into Guangdong, a trader makes a series of phone calls (which is fairly costless) and strikes a deal to act as an agent for the import permit holder. Upon bringing in the rice, the importer sells the imported rice to the highest-bidding end user and pays the import permit holder the difference between the world and domestic price, minus an agency fee (which is competitively determined, since there are a number of other importers).

Even more potentially threatening than TRQ implementation, China also has the option of creating labeling or safety rules on GM corn that could effectively preclude its import. Currently the rules on soybeans have been interpreted in such a way that they have not put up to large of a barrier to imports of herbicide resistant soybeans. But, there are still many unresolved issues. For example, in recent weeks, China has stopped Brazilian soybean shipments of soybeans because they did not have the proper documentation. Other SPS reasons could also be used.

In summary, then, although these scenarios are all plausible, they are all still conjecture. In fact, at current world prices, importers do not find world market corn attractive. Certainly with the current VAT tax in place, world market prices will have to drop by 10 to 20% before it is profitable. It is likely that we will have to wait until this happens before we can ascertain China's intention on its management of corn imports in a post-accession world.

### **Corn Exports After WTO**

To examine China's export behavior after its accession to WTO we examine the difference between China corn, FOB-Dalian price and the price of corn in Dalian's domestic market. If China has stopped intervening into corn market transactions internationally, then traders should be indifferent between shipping into international markets and into domestic markets. Without explicit or implicit subsidies (that are not allowed by WTO), China's domestic price should be the same as the export price since if the two prices differed (for example, if the domestic price were higher than the export price), profit-oriented traders would shift their sales to the market with the higher price. Without subsidies there should be no incentive to sell into a market with a lower price.

In the rest of this section, we seek to examine the relationship between the domestic and export price in Dalian as follows. First, we will discuss the nature of China's export sales. This will allow us to more precisely make comparisons between the domestic and export market. After this, we then will measure the price gap between the domestic and export market price during the first year after accession to WTO. Finally, we then seek to explain why the prices are different by seeking to identify the different components of the gap between China's domestic and export price.

## The Timing of Exports and Export Prices

A long time puzzle of observers of China's corn economy has always been how China's exporters have determined the price at which they export into the international market. Figure 11 graphs the Dalian domestic price since 1997 (from data set 1) against the price of exports (from China's customs data). When examining the relationship between the two price series, there is little in common. Turning points in one series often move in a different direction from turning points in the other. In other words, according to Figure 11, domestic prices in Dalian and China's export prices appear to be generated by two completely different sets of forces. While this is not surprising in the pre-accession period, after December 2001, China was supposed to stop providing subsidies to exporters, and exports were supposed to be made only on a commercial basis. Since China is continuing to be an active player in export markets, the lack of co-movement between the prices after December 2001 would suggest that the two markets have not become linked by the commercial behavior of traders.

During our interviews, and according to personnel in the US Grains Council in Beijing (who spend a lot of time interacting with international traders), the nature of the way China interacts with international markets may at least in part help explain the patterns that we have observed between domestic and export price series.<sup>5</sup> According to the long-standing business practice of China, contracts for corn exports are signed about 6 months prior to the time that the corn is loaded on a ship and ship into international markets.<sup>6</sup> Since the contract price of an individual shipment is contractually determined six month prior to the time that it is recorded by China's customs, Figure 11 clearly is not properly aligning the prices in the domestic and export markets. In fact, when China's exporters are trying to determine at what price they should ship into international markets, they are observing the domestic price of 6 month earlier. If so, it is no wonder that the two price series move in such different patterns. Many events can happen during a half a year that could make the domestic price move in a different direction than a price set by an export contract during a time 6 month earlier.

Hence, a more accurate way to compare China's domestic price and export price series would be to line up the current domestic price and export price, lagged by 6 months (Figure 12). By doing this, we are comparing the price in the domestic market with the price that China's exporters were agreeing upon at approximately the same time. When doing so, at least since early 2001 (several months prior to China's accession to the WTO), although there still is a gap between the price of domestic corn and the export price, the two series move more in concert with another. Compared this way, we can see that when China's corn export prices in Dalian are rising, domestic corn prices in Dalian

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<sup>5</sup> The six month gap between signing an export contract and the shipment of corn is also consistent with data that are reported by importers of grain into Korea. When Korean importers sign contracts with exporters in China, they must report the estimated time of arrival of the shipment. The average gap is about 6 months.

<sup>6</sup> We recognize that the gap between contract signing and the date of the clearing of custom in Dalian is not exactly 6 months. In fact, according to our interviews, it ranges from about 4 to 7 months (with infrequent exceptions). In the rest of our analysis we assume a gap of 6 months. Almost our exact same results hold, however, if we use 4 or 7 months.



are rising. Likewise, when China's corn export prices in Dalian are falling, domestic corn prices in Dalian are falling.

When we examine prices in this way we also find price relations that are relatively consistent with the findings of our work on nominal protection rates (NPR). In Huang et al. (2003) we report our findings of the gap that Dalian traders and users perceived between the domestic and international price. During our field work, we asked 4 traders and end users in Dalian in late fall 2001 (just prior to China's accession), "How much money would you lose, if you bought one ton of corn on the domestic market and sold the exact same corn into the international market (FOB-Dalian)?" In response, on average, we were told that a trader would lose 30 percent. Interestingly, this is almost the same percentage gap (about 29.8 percent) between the prices in our graph (China's domestic price—US\$135/mt MINUS China's export price signed during that period—US\$104/mt).

According to this logic, one can track the percentage difference that exists between the export price of corn in Dalian (when the contracts were being signed) and Dalian's domestic corn price during the first 11 months of China's WTO membership (Figure 13). By focusing on the observations during the time period to the right of the vertical line that designates the time of accession, it can be seen that in fact during the *entire* accession period China's exporters are still signing contracts and exporting grain at price below the domestic prices. Between December 2001 and October 2002, although the difference between the export and domestic price has fluctuated, exporters are still signing contracts for export on average of about 15 to 20 percentage points below the domestic price.<sup>7</sup> In particular since we will frame the rest of this section on this figure in October 2002, 11 months after joining WTO, the difference between the domestic price and export price (or contract price for shipping out about 6 month after this date) was 16 percent (domestic price in Dalian was US\$121 in September 2002 and exporters signed contracts for US\$104/mt (FOB Dalian).

### **Accounting for the Export-Domestic Price Gap**

So what accounts for the gap? There are a number of factors that have been discussed by economists and policy makers that may be accounting for the price differences. There are others that we need to allow for and attempt to verify or eliminate from consideration. First, and foremost, in the same way that China assesses a 13% VAT on imports, it pays a 13% VAT rebate on exports. The logic for doing so in general is exactly the same as in the case of imports – it is an attempt to level the playing field of export markets and China's domestic markets for China's exporters. Specifically, in the case of a country that uses VAT domestically as a source of tax revenue, a VAT rebate is

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<sup>7</sup> This range of percentage (15 to 20 percent) was true through the period in which we have data (which can allow us to examine the percentage gap through October 2002—because we only have data on exports of corn from China's Custom's Service through April 2003, which when lagged by six months can be matched against the October 2002 domestic price. In fact, according to our domestic data (which we can get through June 2003), the percentage gap has actually fallen to about 10%. The Dalian domestic price in June 2003 is about US\$128; according to the newsletter of the NGIOC, in mid-June, China's exporters placed a bid to export corn to Korea at US\$116/mt (which is about 10%--[128-116]/116).



permissible so that exporters (who buy products in China for export that have paid a VAT) are not at a competitive disadvantage in the international market when they are trying to compete against exporters from other countries that do not pay VAT taxes in their countries. Although such a tax rebate may not be valid in the case of exports of China's corn (this is a separate issue and addressed below), the export rebate can account for more than three quarters of the gap (13 of 16 percent) between the export and domestic prices.

In addition, economists in China have also explained the continued exports of corn by pointing to transportation tax reduction that they claim have reduced the price of China's exports versus world market prices. According to interviews and according to several published reports, the transportation tax was reduced which would effectively lower transportation costs by 40 percent in early 2002. If so, this would mean that the price gap between China's domestic price and the world market price would narrow. Reducing taxes is certainly a WTO-legal way to make a commodity more competitive on international markets, as long as the tax break applies to all commodities—those in the domestic market and those bound for export markets; and those of Chinese origin and those of from other countries.

However, because China's domestic transportation tax reduction was, in fact, applied to corn bound for both domestic and export markets, it can not be said to account for any part of the remaining gap between the Dalian domestic and Dalian export price. It could be that part of the fall in domestic price that occurred in the first six months after the accession to WTO was in part due to this tax policy (Figure 12).<sup>8</sup> If so, it also contributed to the narrowing of the price gap between China's domestic price and the world market price (e.g., US corn, CIF—Dalian—Figure 13). However, since both the Dalian domestic price and the Dalian export price *both* would have fallen equally, the remaining gap of interest (that is, between China's domestic price and the price at which they export grain) in 2002 is due to other factors, not the rail tax policy.

At other times, in other circumstances, importers in some countries (including Korea) have been known to “play games” to avoid taxes or foreign exchange controls. The idea is that it is possible that the exporter in the source country and the importer in the target country collude to manipulate the export price (FOB) and the freight bill so that, although the export price PLUS freight are the same, the recorded export price could be held artificially low. This would make sense in the case if duties in a country were only assessed on the imported good and not the freight. Such a case occurred in South Korea (though not for corn) after the 1997 currency crises when foreign exchange controls were placed on the amount of Won that could be changed for Dollars. In this case, the Bank of Korea limited the amount of currency a firm could exchange for the price of imported commodity, but did not limit the amount that could be exchanged to

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<sup>8</sup> The six month gap between signing an export contract and the shipment of corn is also consistent with data that are reported by our interviews. When Korean importers sign contracts with exporters in China, they must report the estimated time of arrival of the shipment. The average gap is about 6 months. The range, however, varies somewhat. If we use alternative gaps, the nature of the results, do not change.

pay for freight. Because of this, the prices of certain imports into Korea were set artificially low, while the freight prices were artificially inflated.

The question that is important for this report is whether or not this type of behavior is contributing to the observed price gap between the export and domestic prices. If the same happened for corn, then it would appear as if China was exporting corn that was below the domestic price, when in fact, the low, reported price was actually being offset by higher freight charges. To examine this, we need to carefully compare the FOB price of China's exports in Dalian and the CIF price of imports from China. As long as freight charges are reasonable, and as long as the CIF price in Korea of corn from China is nearly the same as the CIF price of grain shipped in from elsewhere during the same period (quality controlled), then this can be ruled out as one of the explanations of the price gap.

Two different sets of data both point to a story that suggests that the China-Korea corn trade is being conducted with prices and freight rates that are reasonable and undistorted. When we plot China's export price (FOB, Dalian) lagged by 6 months (which would make it about equivalent to the time that the contract was made) against the price of China corn (CIF, Korea) and the price of US corn (CIF, Korea), we find a close association between China's export price and the CIF price of imported corn from China and the US (Figure 14). In other words, the data in Figure 14 are consistent with a story that China's exporters agree on an export price (that leaves China six month after) that is based on the Korea CIF price on a certain date minus freight costs. If so, this figure would explain a puzzle that many observers have raised about how China determined its export prices (if the China export prices are not lagged, the relationship is harder to discern). And, as long as US\$6/mt is a reasonable figure to cover the transport cost between China's FOB price and the Korea CIF price for corn from China (which our interviews confirmed are typical), then, we can safely assume that freight-export pricing games can not account for any part of the observed gap between China's export and domestic price.

When using a data set from the Contracts Registration Records provided to us by the US Grains Council in Korea, we find the data from this alternative source also supports this conclusion. By matching the contract prices that were part of the agreements of China's exporters during the dates that are recorded as the expected time of arrival in Korea with the price of corn from China, CIF—Korea (Figure 15), we find patterns that are similar to Figure 14. In other words, our data show that the export price from Dalian (FOB) plus a reasonable freight charge (about US\$6/mt) almost exactly equals the CIF price of Chinese corn in Korea.

It should also be noted from Figures 14 and 15 that the price of feed corn from the US (CIF Korea) and the price of corn from China (CIF Korea) are almost the same, meaning that the Korean market considers corn from China and the US almost equal quality. Closer inspection actually finds that Korean users find US corn a bit more attractive than corn from China (about US\$1/mt to US\$2/mt or about 1%). While this might mean that part of the price gap between China's exports and the world market price

is partially explained by the fact that China's export grain is lower quality, it could only account for the price gap between the domestic Dalian price and the Dalian FOB export price if China was exporting a quality of grain that was lower than the grain being traded in domestic market. If anything, according to our interviews, the quality of grain being exported is higher, although many traders and port authorities believed there was no difference in quality. In other words, there is really no evidence that the gap is due to quality differences between domestically traded and export corn.

Hence, when putting this all together, we find that by the fall of 2002 (around September and October 2002), the price gap between the domestic market in Dalian and the price being signed for export out of Dalian remained at 16 percent. The gap during the mid part of 2002 was falling as China increased its export price as the world market price of corn rose.<sup>9</sup> In accounting for the gap between domestic corn in Dalian and the export price (FOB-Dalian), we seem to be able to rule out domestic transportation reductions (it affects both exports and domestic corn); price games between China's exporters and Korea importers; and grain quality differences. The only explicit subsidy that is given is for the VAT report. If exporters are receiving the VAT rebate (Gale, 2003, states that corn exporters actually did not actually receive it), then the VAT rebate accounts for about over 75% of the export-domestic price gap (13% of the 16%). This means that only less than 25% of the price gap is unaccounted for. Unless some other plausible explanation can be forwarded, it appears as if China is in some way continuing to pay subsidies to corn exporters. If only about half of the VAT (say 6%) rebate can be justified (see discussion in the previous section about VAT assessments on imports), our results are consistent with a story that as of the summer of 2002, China is continuing to providing subsidies to exporters that equal 10% of the value of the export price of corn. In other words, if traders had sold the grain bound for export markets into China's domestic markets (that is, if they would have sold it to a Dalian end user instead of putting it on a ship bound for Korea—comparing the Dalian domestic market price and the FOB, Dalian export price), traders could have made 10% more.

## **Conclusions: Why Protect? Why Subsidize?**

### **Summary of Key Findings**

In briefest summary terms our report has shown several key facts that when taken together appears to provide a consistent picture of how China has handled its trade policy in the case of corn during the first year after its accession to the WTO.

One [*domestic market integration*]: domestic markets in China are functioning better than ever. Prices across the country mostly move together over time; spatially price relations

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<sup>9</sup> In fact, as suggested in the previous footnote, as the world market price continued to increase during late 2002 and 2003, China continued to increase its export price. By June 2003, the gap was only about 10 percent, since its bid for corn exports to Korea in June was US\$116/mt while the domestic price is US\$128/mt.

appear similar to those in the US; the gap among regions is remains narrower than ever; and pairs of key markets are all cointegrated according to statistical test.

Two [*importing behavior*]: with the exception of the first several months of 2002, because of price rises in world markets, there is no real reason to think China should have imported during 2002 and 2003. Behavior in other markets (such as those for soybeans) suggests that China most likely plans on assessing a 13% VAT at the border, at least more than half of which does not appear to be valid. Even if the VAT were not assessed, China could use the way it implements TRQs (which actually appears not to be the case) or SPS-oriented rules to discourage imports. While this is pure conjecture and those committed to increasing agricultural trade in and out of China would hope it does not happen, given the behavior in the case of other commodities, it should not be surprising that there are times when corn imports are interrupted or at least subject to trade policy-related risks.

Three [*exporting behavior*]: despite promises under its WTO agreement, during the first 8 months of its accession to the WTO, China appears to have continued its practice of subsidizing exports of corn. The exact mechanism of the subsidy is not apparent. The 16% gap between the export corn price (FOB, Dalian) and the domestic corn price (in Dalian—in Fall 2002), however, is evidence that exports are proceeding on a non-commercial basis. At the most, according to our analysis, 6% can be justified as a VAT rebate. The rest is being channeled to the exporter through some other mechanism (either directly or indirectly). The bottom line is, however, that exporters during the first 11 months of WTO were still signing contracts at prices that were substantially below the domestic prices (and forgoing at least 10% profits by not selling into the domestic market).

### **Motive for Protection and Subsidization**

While it appears fairly convincing that through the first year of China's accession to the WTO that the nation is continuing to subsidize exports and most likely is planning to (at least) use domestic VAT taxes to protect China's producers from imports (if world corn prices fall), it is less clear why. We can think of two reasons. One is a political economy argument that plays itself out as a fiscal transfer from the central government to the Jilin government. Two is out of the nation's poverty concerns. While a complete analysis of these two motives is beyond the scope of our report, we raise them here as much to begin a discussion of these issues and as a way to begin to search for a way to phase out subsidies while trying to account for the interests that led to them in the first place.

The first and perhaps most obvious reason for subsidizing corn exports is that the subsidies over the years have constituted an enormous transfer of financial resources from Beijing to Jilin (and other Northeast Province?). With the state owned enterprise problems that have plagued China during the reform era, Jilin has been disproportionately hurt by the reform era policies. Its industries have become unprofitable and the fall in associated tax revenues have limited the expenditure power of the provincial government

to service the economy and help restore the economy. During the transition, however, Jilin has always seemed to have maintained an important place in the central government leadership (for whatever reason). With a voice in Beijing, Jilin leaders have tried to lobby for increased transfers of resources to which they believe they have entitlement due to the policy effects of many reform-era initiatives.

One important avenue for making such transfers may be through corn subsidies, which could account for a significant fraction of the Jilin Province on-budget revenues on their non-consolidated budget (that is on the part of the budget that is just for the province's activities, and not including the revenues of counties and other sub-provincial government units). When examining the volume of the direct export subsidies prior to the accession to the WTO (and not including the financial subsidies in low interest or forgivable loans), the Jilin government may have received the equivalent of about US\$150 million (5 mmts times US\$30/mt) in transfers. If our analysis is correct, and subsidies of around 16 percent are still being paid on 10 mmts of corn, the transfer may have continued at about US\$160 million. Given the annual on-budget revenue level of the Jilin government (about 10 billion RMB or US\$1.2 billion—ZGTJNJ, 2002), corn subsidies may have accounted for more than 10% of the revenues of the Jilin provincial government (a large sum of money if they can use it for any purpose, or if it is used by grain bureaus to pay back their grain debts to state banks).

There are other reasons why paying export subsidies may be understandable. When making the decision to export with the aid of subsidies, it should be noted that many observers have questioned the wisdom of China exporting to Korea at below market prices. When doing so, China is in essence providing benefits to livestock producers in Korea. However, when considering the alternative to exporting, China's actions may be more understandable. Much of the grain that is being exported is from stocks that were accumulated during the corn policy regime of China's previous premiere, Zhu Rongji. Hence, when deciding whether or not to use subsidies to exports, the opportunity cost must be considered. In this case, the opportunity cost equals the cost of storing grain for three years. In fact, three years of storage costs (on a per metric basis) almost exactly equals the per metric ton subsidy that was being paid to exporters during the pre-accession year. While using this as a basis for the amount of subsidy does not justify it, some observers have said that since the stocks in China have been reduced over time, leaders may stop making subsidies (since the rational from a fiscal point of view is lower). If this is the case, and if stocks are indeed being drawn down, it could be that China will use this opportunity to stop using export subsidies.

The other reason that China may be protecting corn is that (whether explicitly recognizes it or not) protection has provided support for many poor farmers prior to the WTO agreement and the liberalization that has been promised by WTO will invariable hurt a number of poor farmers. In two recent reports by the author of this report, I both show how poor corn farmers were helped by the increasing protection that corn enjoyed during the late 1990s and also show how (because of this rising protection in the time before WTO accession) is that poor corn farmers are the ones most hurt at least in relative

terms by liberalization after WTO. A summary of the details of these studies are in a paper that is available from the author upon request.

While these two arguments do not give China the right to go against its promises it made in its WTO agreement, it does help explain why they might try to push the boundaries of the agreement. Understanding the reasons why China is continuing to try to protect corn markets also may be useful. If indeed these two reasons are the main reasons that China is worried about liberalizing the corn sector, it should be noted that, in fact, there are ways that China should be able to meet their goals in a way that is completely consistent with the WTO agreement. Although China is not supposed to subsidize exports, it is allowed to provide up to 8.5% in aggregate measure of support under its accession agreement. Since it currently is, on average, only using at most around 2% of this available amount, China has leeway to support poor corn farmers in a way that conforms to their agreement. I am not suggesting the China begins to support corn prices. Indeed, in a recent report written for the World Bank that is being sent to China's government, we unequivocally suggest that the government does NOT support prices. Instead, we suggest that in its new push to modernize the nation through fiscal spending, the funds that are being spent on export subsidies be channeled into infrastructure and social welfare spending and allow farmers the choice in what they want to produce according to market prices. Poverty funds should be targeted the poor farmers that are being hurt. In other words, what should be obvious is that is China is committed to implementing its WTO agreement, addressing the concerns that may come from implementation, is not an impossible task for the government.

The actions of China's WTO partners might also help encourage compliance. Discussions among economists and policy makers in recent months have begun to show that the government also is interested in having other nation's carry through with the promises made to China. This would mean that barriers to entry into horticulture, livestock and other markets would make adjustment to the liberalization of China's trade policies easier and more fair. To the extent that the interests in the US help lobby for fair treatment of imports into the US, it will help facilitate the export of US corn to China in the coming years.

## **Appendix A**

### **List of 13 Corn Markets in Data Set from October 2001 to February 2003 (Middle Grade Corn Price)**

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Location of Market and Terms of Prices (FOB or CIF) for Data Set 2.

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East of Heilongjiang (FOB at Storage)

Center of Heilongjiang (FOB at Storage)

West of Heilongjiang (FOB at Storage)

East of Jilin (FOB at Storage)

Center of Jilin (FOB at Storage)

West of Jilin (FOB at Storage)

Center of Liaoning (FOB at Storage)

West of Liaoning (FOB at Storage)

Dalian Port Liaoning (FOB)

South of Jiangsu (CIF Feedmill)

East of Hubei train station (CIF)

Guangdong Guangzhou Port (CIF)

Fujian Xiamen Port (CIF)

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Note: Source of data: National Grain and Oil Information Center (NGOIC).



## **Appendix B**

### **International Trade and Domestic Marketing Policy for Agricultural Commodities**

#### *Trade related policies*

In general, trade distortions in agricultural sector have declined in the past 20 years (Huang and Chen, 1999). Much of the falling protection in agriculture has come from decentralizing authority for imports and exports and relaxing licensing procedures for some crops (e.g., moving oil and oil seed imports away from state trading firms). Other trade policies have reduced the scope of NTBs, relaxed the real tariff rates at the border, and changed quotas (Huang and Chen, 1999). Despite this real and, in some areas rapid, set of reforms, the situation for a set of commodities that leaders consider to be of national strategic importance, such as rice, wheat and corn, remain under the control of policy makers to a much larger extent (Nyberg and Rozelle, 1999).

In the case of corn prior to the accession to WTO, for example, although the import tariff rate has been low, leaders have not allowed the importation of corn except to those that hold licenses and import quotas. When traders bring in corn that is specified as being within the quota, the tariff rate has been only about 3 percent. The tariff rate for corn that would be brought in above the quota, however, was as high as 114 percent. No above quota corn has entered China, however, because in the case of corn trade, imports have to be arranged by state-traders. For the entire reform period, China National Cereals, Oils and Foodstuffs Import & Export Corporation (COFCO) has been the nation's single-desk state trading company for corn. They also manage the imports of other cereals and edible oils. COFCO is one of the largest state trade enterprises (STEs) in both Asia and the world. The value of imports (food and nonfood) by China's STEs likely exceeds that of all STEs in current WTO member countries. Over the past decade, COFCO has imported as much as 16 percent of world wheat that has been traded, and has exported as much as much as 20 percent of the world's corn (Nyberg and Rozelle, 1999). Even after China joined the WTO, COFCO continues to act as key agent in the international grain trade for national and provincial grain trading companies and has preferential access to import quotas.

However, COFCO itself has undergone a series of reforms since the late 1990s. Specifically, since the late 1990s, officials have tried to streamline importing procedures by commercializing COFCO and demonopolizing the trade of a number of commodities. For example, soybeans have been completely liberalized with a single tariff management scheme. The effective tariff rate on soybean imports has been only 3 percent after 1999. For rice and corn, the Jilin Grain Group Import and Export Company (JGIEC), a provincial level of STE established in April 2001, has taken over the import and export responsibilities of COFCO for most corn and rice exports from Northeast China. The establishment of JGIEC marked an end of complete monopolization of COFCO in China's grain trade. Moreover, within the COFCO network (COFCO has always had branches in each provinces and key municipalities), competition has also been introduced. Better incentives were also given to managers and branch officials to increase their attention to the activities that affect profitability. Also, an agency system

has been imposed to implement a payment-for-services policy. COFCO traders are supposed to only trade on behalf of their clients for a fee, not on their own account.

Despite the above efforts in commercializing corn trade, the trade liberalization in corn still should be considered minimal. Economic logic and casual observation gives us reason to believe that China's current system of corn trading causes substantial inefficiencies and creates distortions in the domestic economy. It is possible that such a system could even create uncertainty in world markets. Provincial grain companies serving China's domestic markets complain incessantly about the inconvenience and financial burdens associated with their dealings with COFCO (Nyberg and Rozelle, 1999). Although price stabilization has often been stated as a goal of trade policy, COFCO has failed in its bid to insulate China from fluctuations on international markets (Lu, 1999). As national and regional monopolies, both COFCO and JGIEC do not face competition in their dealings on global markets. They also often have considerable rents to protect. Lack of information also characterizes China's corn trade transactions, causing frustration to both domestic and international traders.

China has also had a policy to subsidize certain agricultural commodities from time to time. For example, China has used export subsidies in the years prior to its WTO accession to increase exports of two commodities, corn and cotton. By providing exporters with payments to encourage the export of corn, leaders have increased the protection of domestic producers by raising the price of domestic commodities. During interviews in the field during 2001, we found that corn exporters, especially those in Northeast China, received subsidies that averaged 34 percent of the export price. One trader said that for each ton of corn 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.

### *Domestic Agricultural Commodity Marketing Policies*

Corn and other grains marketing policies. Price and market reforms are key components of China's transition strategy to shift from a socialist to a market-oriented economy. The price and market reforms initiated in the late 1970s were aimed at raising farm level procurement prices and gradually liberalizing the market. These reforms included gradual increases in the agricultural procurement prices toward market prices, reductions in procurement quota levels, the introduction of above quota bonuses for cotton, tobacco, and other cash crops, negotiated procurement of surplus production of corn, rice, wheat, oils, livestock, and most other commodities at price levels higher than those for quota procurement, and flexibility in marketing of surplus production of all categories of agricultural products by private traders.

Nonetheless, even the partial rates of liberalization of commodity markets had an impact on productivity and commodity composition at the household and national levels (Huang, Rosegrant and Rozelle, 1996). The shift from the collective and household responsibility system also raised the price responsiveness of farm-households (Huang and Rozelle, 1996). As the right to private trading was extended to include surplus output of

all categories of agricultural products after contractual obligations to the state were fulfilled, the foundations of the state marketing system began to be undermined (Rozelle et al., 2000).

After a record growth in grain 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. Other than for rice, wheat, corn and cotton, the intention was to gradually eliminate planned procurement of agricultural products; government commercial departments could only continue to buy and sell at the market. For grain, incentives were introduced through the reduction of the volume of the quota and increase in procurement prices. For example, the grain bureau procured 28.6 million tons of corn in 1984, accounting for 44 percent of the nation's corn production in the same year. In 1985, in contrast, officials reduced the volume of quota procurement to 10.5 million tons. In the meantime, the negotiated procurement of corn with higher prices increased from 3.6 million tons in 1984 to 7.2 million tons in 1985 and 12.3 million tons in 1986.

Because of the sharp drop in the growth rate of corn output and other cereals and rise in food prices in the late 1980s, the pace of marketing reform stalled. Mandatory procurement of rice, wheat, corn, soybean, oil crops and cotton continued. Grain bureaus procured 10 to 17 mmts of corn at quota procurement prices in the late 1980s. To provide incentives for farmers to raise productivity and to encourage sales to the government, quota procurement prices were raised over time. The increase in the nominal agricultural procurement price, however, was lower than the inflation rate, which led to a decline in the real corn price.

As grain production and prices stabilized in the early 1990s, however, another attempt was made to abolish the compulsory grain quota system. Urban officials stopped sales at ration prices to consumers in early 1993. For a year and a half, the liberalization move succeeded. Then, while it appeared that both the state grain distribution and procurement systems had been successfully liberalized, prices rose sharply. Some people blamed the inflation that hit the entire economy on rises in food prices. As a result, the state compulsory quota system was again re-imposed in most parts of China since 1995.

Since that time, several new policies have been implemented. Government grain procurement once again became compulsory, but the volume of the quota procurement was reduced. Moreover, the quota procurement was supposed to no longer be at below market prices. In the late 1990s, corn quota procurement has been less than 10 mmts (except for 1996--11.3 million ton). Immediately after the price rises, China implemented another grain marketing policy that caused a great debate inside and outside of China. In late 1995, China's leaders started the provincial governor's "Rice Bag" responsibility system.<sup>10</sup> The policy was designed to strengthen food security and grain markets by making provincial governors and governments responsible for balancing the supply and demand of cereals in their provinces and for stabilizing local food markets and prices. Policies under the system included reimposing grain rationing to poor

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<sup>10</sup> "Rice" in China, sometime, meat staple food. "Rice Bag" here includes rice, wheat, corn and soybean.

consumers, investing in production bases inside the province and attempting to keep grain from being shipped outside of the province. If implemented, this policy may have reduced short-run agricultural price fluctuations, however, it would not have been without costs. It has been widely believed that the policy may have adverse impact on the efficiency of resource allocation, diversification of agricultural production, and farmer's incomes. Moreover, a great number of efforts to restrict the flow of grain were not successful. Market flows continued, being driven by the profits that traders could earn by shipping grain from low to high priced areas.

With three record levels of grain production in China in the late 1990s, and almost zero or negative inflation since 1997, rising grain stocks and declining food prices showed the economy had bounced back. Corn production rose rapidly. However, in some sense, the government's policies were a victim of their own success. With prices falling sharply, leaders worried of a repeat of the mid 1990s. Instead of proceeding with market reform, leaders actually opted to try to exercise greater control over agricultural markets.

In fact, leaders in the late 1990s attempted to curb market forces more than in earlier retrenchments. For example, in 1998 the central government initiated a controversial policy change prohibiting individuals and private companies from procuring grain from farmers.<sup>11</sup> In contrast to historical trend, grain quota procurement prices were first time set at a level more than market prices, which meant a transfer in favor of those farmers able to sell at that price (Huang, 2001; Lu 1999). The leader expected that the monopolized grain market through the commercial arms of grain bureau, grain bureau would be able to sell the procured grain at an even higher in the market and meet the nation's goal of raising farmer income. If the state could have exercised monopoly power in grain markets, they could have implemented the price supports while enabling the state grain companies (i.e., the commercial arms of grain bureau) to earn a profit and while reducing the government's financial burden of maintaining the a state-run grain procurement and marketing system.

The win-win (from the government's point of view) policies, however, did not work, primarily because the government could not suppress market activities of traders and the commercialized grain system employees. While the above market prices were offered to farmers in some years, cash strapped grain bureaus could not procure all of the grain that farmers wanted to sell. Grain production increased, but since grain bureaus were trying to sell grain to urban and commercial users at above market prices, they had few takers. Unable to stop the activities of millions of private grain traders, urban users continued to buy from their original channels at market set prices. Not surprisingly, stocks started to accumulate, the real price in the market fell even further, and the commercialized grain bureaus that had been forced to buy grain at high prices, now had huge stocks of grain that was worth less than they had bought it for and their debts rose greater than ever.

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<sup>11</sup> Farmers 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.

Perhaps most surprisingly through these recurring cycles of reform and retrench, commodity markets have steadily strengthened in rural China. The proportion of retail commodities sold at market prices has kept rising. According to Lardy (2001), the share of agricultural goods sold through the market was just 6 percent in 1978. By 1995 it had risen to 79 percent and by 1999 to 83 percent. Transaction costs have fallen while the degree of integration has risen (Park et al., 2002). As seen, markets are also robust. Despite attempts to intervene, the government has increasingly been unable to halt grain flows in their attempts to implement local price controls.

However, the cost of goods markets is that China's time-tested methods of executing grain policies no longer work. By 2000, the leaders found the retrenchment policies started in 1998 had reached none of the originally intended policy objectives. The incomes of farmers were falling as market prices declined. The financial position of grain bureaus continued to deteriorate. And finally, the government's burden rose to historic highs. In 1998, the government's grain marketing subsidies in the form of payments to farmers reached nearly 100 billion yuan. Although the program was scaled back, in 1999 and 2000 subsidies remained at a level between 60 to 80 billion yuan annually. Yielding once again the market forces, another round of liberalization was launched in 2000. Leaders decided to eliminate the grain procurement quotas in grain deficit regions (such as, in the coastal provinces of Zhejiang, Jiangsu and Shandong). By 2001, the liberalization efforts spread to inland, surplus regions.

In addition to the development of China's corn markets, the gradual, albeit stop and go, marketing reforms have also slowly reduced the tax burdens of corn farmers. Previous research by the authors shows the implicit tax that has been imposed on corn farmers through government grain procurement policy. The implicit tax is computed as the difference between the value of corn sold in the local free market and the value of the corn sold to the government grain bureau through the grain procurement system. The results of our previous analysis show that corn farmers, in general, have been taxed heavily by grain procurement policy. Importantly, however, with marketing reform, the degree of taxation has been declining significantly over time. For China as a whole, the average annual tax on corn farmers due to the procurement system fell from 9.12 billion yuan in the 1980s to 5.05 billion yuan between 1991 and 1995. The amount fell to 0.83 billion yuan per year between 1996 and 2000. Indeed, although historically, China's tax on farmers through the procurement system has been high, since 2000 with the elimination of procurement quota and the initiation of the payment of subsidies to farmers and traders, we may be witnessing the beginning of a regime shift from taxation to subsidization.

Livestock and feed marketing. Livestock was one of a few major agricultural commodities that have been liberalized since the middle 1980s. Currently, market prices of livestock are completely based on domestic demand and supply as well as a limit amount of trade. Pork is the major meat product, accounting for about two third of total meat supply in China. Households dominate the livestock industry. Most of households with pigs were typical backyard producers. Nearly two-thirds raised less than three pigs per year. In 2000, among all hogs raised in China, household backyard production

accounts for 78 percent; the rest is produced by farm households that specialize in livestock production (15 percent) and intensive, large-scale commercial producers (6 percent--CCAP, 2002). Households raise backyard hogs with a variety of feed mixes that include corn, sweet potato, other low quality food and feed grains, meal and waste products from home produced crops (e.g., potato vines).

With the rise of specialized households and the evolution of backyard hog raising in many areas, the way farmers feed livestock has changed over time. Most prominently, the role of corn as a feed has increased over time. It accounted for more than 75 percent of feed in the late 1990s and reached 78 percent in 2000 (CCAP, 2002). Currently, marketing and pricing policies of corn as a feed are the same as those of corn used as food, which has been fully discussed (i.e., it is being increasingly liberalized).

While policies historically have affected corn, China's most important feed, there has been only minimal interference in the other feed crops. Sweet potato and soybean meal are the second and third important sources of feed in China's feed sector. Grain policy has virtually ignored sweet potato and soybean. About the only type of direct policy influence has been due to the effect of the marketing and pricing policies for soybean meal. Since, soybean in China is categorized as grain, during the 1980s and 1990s when dealing with soybean meal in international trade issues, it was treated as a grain crop and subject to tight control by the government. However, in the late 1990s, restrictions of soybean meal imports were relaxed earlier than those for grain. As a result, there have been times when livestock producers would bring in large quantities of soybean meal, perhaps at levels beyond what they would have done had all markets been liberalized.

The role of sweet potato in China's economy has also been changing rapidly on both the supply and demand sides. Sweet potato is the fourth major staple crop and the second largest feed grain in China. While production has remained fairly stable at 20 to 23 mmts annually since the 1970s, sweet potato area has declined significantly. Hence, yield growth of sweet potato has generally been lower than corn (with the exception of the past several years).

On the demand side, the utilization of sweet potato has also changed rapidly. As a food staple, like corn, it has also declined. The proportion of sweet potato used as feed and for food processing surpassed the use for direct food consumption after the mid 1980s. Between the 1980s and the end of the 1990s, the use for food fell from about 50 percent of total production to less than 15 percent. In contrast, the use of sweet potato for feed and industrial uses grew significantly (Huang et al, 2000). By the late 1990s, feed use accounted for more than 40 percent and processing demand accounted for one third of total sweet potato production. Among all feeds in China, sweet potato contributed to about 7 percent in 2000 (CCAP, 2002).

Huang et al (2000) show that expanding the scale of pig production through the use of home-produced sweet potato is limited due to the small farm size and limited market. Although sweet potato was one of the first agricultural commodities to be



liberalized in the early reform period in China, interregional trade remains small. In many rural areas it is planted primarily as a subsistence crop intended to address household demand for feed and other uses. Given a declining share of backyard pig production over time and improving corn markets, its role as a feed in poorer areas is starting to wane. Moreover, the prospectus for the growth of sweet potato use in livestock production is not promising, unless new sweet potato feed technologies emerge. Financial analysis based on time series data shows that, although sweet potato once was relatively more profitable in certain cropping systems and feeding mixes than competing crops, such as corn and feed wheat, the relative profitability of sweet potato for many producers appears to have been declining since the mid 1980s. The study also shows that under trade liberalization, we do not expect to see much substitution of sweet potato for corn in animal feeds, since corn prices almost certainly will fall.

### *Infrastructure*

To take full advantage of the emerging opportunities from agricultural trade liberalization, a well-developed physical infrastructure is a pre-requisite. This section examines the development trends in the transport, storage capacity, communication, and the marketing information network. We then discuss their implications to both domestic and international trades.

Transportation. Although at the end of the Mao-era in the late 1980s, China's transportation infrastructure was poor, the expansion of the transportation system is one of the most successful developments in the nation's overall public investment program. Most impressive since it is the major means of transportation, accounting for 75 percent of China's total freight traffic, the road system has improved rapidly during the past 2 decades. The total length of the nation's road network reached 1.4 million kilometers in 2000, nearly doubled the length in 1980. In addition to construction of new roads, emphasis was also made on the upgrading of existing roads, construction and improvement of many bridges, and national highways. For example, more than 80 percent of the highway network is paved (NSBC, 2001). However, given the size of the country and the rapid development of the economy, the road network is still limited, and constrains the growth of the economy. Measured in road density, there was only 13 kilometers of roads for each 100 square kilometer of the total area in 2000.

The railway system, the second most important means of transportation and the major means for hauling freight and material across long distances, also expanded over last 20 years, although the rate of growth has not been as rapid as the highway system. China's total length of railways in operation was 50 thousand kilometers in 1980. After 20 years development, it increased to 59 thousand kilometers in 2000, rising by only 18 percent. Because of the relatively fast growth in both highways and airways, the share of freight traffic that is moved by railway declined from more than 20 percent in 1980 to 13 percent in 2000. For an economy that has been growing at an average of nearly 9 percent annually for more than 2 decades, China's railway development has become one of the critical infrastructure bottlenecks that has hindered interregional trade. To raise fiscal revenue for railway development, government has imposed a railway fee (or tax) on

every shipment that passes through the railway system. For example, when traders shipped grain by train, on average, they paid a 50 yuan per ton tax in 2001.

Although China traditionally has used their inland and ocean waterway resources to provide a cheaper alternative for shipping certain commodities, the progress in different parts of the country has been mixed. With continuous and rapid development of inland road transportation, the number of motorized transport vessels started to decline in the early 1990s, after expanding during the first decade of reform. Dead weight tonnage also has leveled off. In contrast, ocean shipping grew substantially. The volume of freight handled in the major ports increased from 217 million tons in 1980 to nearly 1.3 billion tons in 2000. Most of the growth came since 1990. Among the major coastal ports, Shanghai port is the largest, followed by Ningbo, Qinghuangdao, Guangzhou, Dalian, Qingdao and Tianjin. Because of the priority that the leadership has accorded to foreign trade, the construction of ports facilities have improved dramatically. The development of Dalian Port in Northeast China with the aid of a large World Bank loan and China's own investment has created one of Asia's largest, most modern grain terminal and has facilitated the transfer of corn (and soybeans) out northeast China to world markets and the rest of the nation.

Communication. Communications has long been one of most severe bottlenecks in the early reform period. In the late 1970s prior to rural economic reform, on average, nearly 300 people in China shared only one telephone. This situation did not changed much until the late 1980s when China started to heavily invest in telecommunication infrastructure. Since the early 1990s, telecommunication service has improved extraordinarily. The number of telephones rose rapidly, increasing from 12.3 million in 1990 to 57.6 million in 1995. During the late 1990s, the number of telephones more than quadrupled and reach 256.1 million in 2000. In 2000 the ratio of telephones to people reached 0.2 and is continuing to decline.

The other improvement that is improving communication is in the internet service. Although it began later than many more developed countries and grew slowly before 1995—in part due to the overstrained telephone system, internet service has grown remarkably fast in the past few years. The number of subscribers of internet services rocketed from 7200 in 1995 to more than 9 million in 2000. It is expected that this growth is still in the early stage and will accelerate in the coming years as China develops.

Implications for corn trade in 1990s. Improvements in transportation, storage, communication and other market infrastructure are likely to have significantly impacts on the market transaction costs, regional market integration and interregional trade of commodities, including corn. Using tri-monthly provincial grain prices from 1988 to 1995, Park et al. (2002) estimated a parity-bounds model of inter-regional trade for several sub-periods to characterize how the different dimensions of market performance has changed during the process of economic transition. For each period, they estimated the transaction costs between location pairs and other market performance indicators. They found that mean transaction costs in corn markets fell from 0.20 yuan/kg (in 1988

yuan) in 1988-89 to 0.17 in 1990-91 and 0.12-0.14 in 1992-95. A similar trend was also found for rice. As a share of market prices, however, transaction costs are relatively high on average: 15 to 20 for rice and about 25 percent for corn (though this is also changing rapidly). This study also concluded that although the transaction costs have declined over time, the absolute transaction costs are higher in China than those in the U.S., perhaps reflecting underdeveloped bulk shipping and handling capabilities, bottlenecks, or greater use of more expensive modes of transport (e.g., trucks versus rail).

Impacts of improved market infrastructure on regional grain trade are also found in official statistics on grain transportation by rail. In volumetric terms, grain transport (including both inter-provincial and inter-county shipments) that went by increased from 14.8 mmts in 1978 to 56.8 mmts in 2000. This rise in shipments demonstrates how China has in part overcome the earlier infrastructure bottlenecks. Marketing reforms appear to be positively affecting grain market performance.

In order to trace how corn is shipped from major production regions to consumption areas and to have detailed understanding of the trends in corn trade among regions, in 2001/2002 the Center for Chinese Agricultural Policy conducted an extensive field survey on corn regional trade. The survey team visited almost all major corn production areas as well as provinces that were large users. We also visited numeral corn wholesale markets and major ports. The survey revealed that a higher and higher volume of the corn grown in the northeast has been shipped to the rest of China. In the crop year of 1992/93, less than 15 mmts of corn in the northeast China was exported to other domestic markets. During the 2000/2001 crop year, the volume increased to 28 mmts, an increase of 86 percent.

As corn produced in the Northeast has a higher water content grain and since there are few mechanized drying facilities available, most of the corn crop cannot be marketed until several months after it is harvested in November. Hence, the marketing period is concentrated from April to September after farmers have dried the corn by hand. Among the 28 million tons of corn shipped from northeast China in 2001/2002, about 50 percent was sold to corn deficit regions in east and south China (China's sub-tropical and tropical regions). Most of the corn is transported by ocean shipping service. In addition, nearly 40 percent was transported to other regions that also produce corn, such as areas of the North China Plain. Corn shipped to these areas are typically timed to arrive after the local stocks have been used up, which is earlier since the harvest in north China is during August and September and drying can be done quicker (since the winters are milder). Most of the grain that is shipped to north China comes by the railway system. A smaller, but increasing share, is coming by truck. Only a small amount is shipped by rail and truck to the Northwest.

When farmers and traders in the Northeast have drawn down their stock, farmers in north China enter the market. Timing wise, from October to March, corn from north China basins replaces corn from the Northeast. In 2001/2002, about 20 million tons of corn was shipped from north China to east, central, south and southwest China. Most of the shipments use the rail system.

There is little corn that is shipped out of the northwest to other regions. Most of what does get shipped out goes to Sichuan province. The traders in the region estimated that about 1 to 1.5 mmts of corn is typically shipped from Northwest to other regions.

The increasing corn trade among regions in recent years has been facilitated by the improvements in marketing infrastructure and the reduction of long distance transportation fees. During our field interviews, we were frequently told by traders that the cost of moving one ton corn from Northeast to Guangzhou (a coastal city in Guangdong province, South China) was about 150 yuan (in current prices) in the early 1990s and it was only 135 yuan in 2001. In real terms, the transportation cost of corn fell by 54 percent during the 1990s.

Falling domestic transport costs also have important implications for China's international corn trade. South China, and particularly Guangdong province, is one of major livestock production regions and users of feed. Demand for corn has increased exponentially in the past 20 years due to the expansion of the livestock sector. Although at one time it was thought that such a high demand for corn would have to be met by imports, improvements in regional transportation capacity and the reduction of transportation costs by rail and ocean vessels have enabled South China to meet its rising demand through domestic production in Northeast and North China.

A comparison of domestic transportation tariffs with those of the rest of the world illustrates this point. In previous research we show the transportation costs of shipping corn from the Northeast to Guangdong, Chongqing (Central China), and Shanghai (Eastern China). The price per ton ranges from around 15 to 20 US dollars per ton. At these rates, the if there are no distortions in the market, China's producers will have a slight advantage in supplying grain (if production costs were equal), since the cost of shipping and insurance from New Orleans is between 20 to 25 US dollars per ton.

## **Appendix C**

### **China's Commitments in Agriculture and Corn**

In its most basic terms, the commitments in agricultural sector can be classified into 3 major categories: market access, domestic support, and export subsidies. The commitments on market accession will lower tariffs of all agricultural products, increase access to China's markets by foreign producers of some commodities through tariff rate quotas (TRQs), and removes quantitative restrictions on others. In return, China is supposed to gain better access to foreign markets for its agricultural products, as well as a number of other indirect benefits. Domestic support and export subsidies are the other two critical issues that arose during the course of negotiations. Together with a number of other market-access commitments make China's WTO accession unique among all other developing countries that have been admitted to the WTO's new environment.

Some of the direct import market access commitments that China has made to WTO members actually do not appear to be substantial or really. Overall agricultural import tariffs (in terms of its simple average) declines from about 21 percent in 2001 to 17 percent by 2004. A continuance of earlier trends, the simple average agricultural import tariff reduced from 42.2% in 1992 to 23.6% in 1998. Although important, when taken in the context of the discussion in the previous section about China's external economy reforms of the last two decades, one would have to conclude that the commitments are merely an extension of China's past changes. WTO in this way can be thought of as just another step on China's road to opening up its economy.

Except for national strategic products, such as grain, cotton, edible oil and sugar, other agricultural products (horticulture, livestock, fishery, wine, tobacco, soybean and Barley) will become part of a tariff-only regime. According to this part of the agreement, all non-tariff barriers and licensing and quota processes will be eliminated. For most commodities in this group, effective protection fell by varying amounts by January 2002; for most the tariffs will fall even further by 2004. To the extent that tariffs are binding for some of these commodities, the reductions in tariff rates should stimulate new imports.

It is important to note, however, that although published tariff rates will fall on all of these commodities, imports will not necessarily grow summarily. Indeed, China has comparative advantages in many commodities under the single tariff regime. For example, lower tariffs on horticultural and meats might impact only a small portion of domestic market (e.g., those parts of the market that buy and sell only very high quality products—meats for five-star hotels that cater to foreigners). Although tariffs fall for all products, since China produces and exports many commodities at below world market prices, the decreases will not affect producers or traders.

Such movements, however, will almost certainly be (and can legally be) limited for a class of commodities called “national strategic products.” China’s WTO agreement allows officials to manage trade of rice, wheat, corn, edible oils, sugar, cotton and wool with tariff rate quotas (TRQs). These commodities are covered under a special set of institutions. Except for sugar (20 percent) and edible oils (9 percent), the in-quota tariff is only 1 percent for rice, wheat, corn, and wool. However, the amount brought in at these tariff levels is strictly restricted. For example, in 2002, the first 5.7 mmt of corn will come in at a tariff rate of 1 percent. The in-quota volumes, however, are to grow over a three year period (2002 to 2004) at annual rates ranging from 4 percent to 19 percent. For example, corn TRQ volumes increase from 5.70 mmts in 2002 to 7.20 mmts in 2004. China does not have to bring in this quantity, but provisions are in place that there is supposed to be competition in the import market so if there is demand inside China for the national strategic products at international prices, traders will be able to bring in the commodity up to the TRQ level.

At the same time, there are still ways theoretically to import these commodities after the TRQ is filled. Most poignantly, tariffs on out-of-quota sales (that is above 7.20 mmt in 2004 for corn) will drop substantially in the first year of accession and fall further between 2002 and 2005. If the international price of corn were to fall more than 65 percent below China’s price after 2004, any trader is allowed to import corn. But, during the transition period, most people believe such rates are so high (e.g., 65 percent for grains and sugar in 2004 and edible oils in 2005) that in the coming years they will not bind.<sup>12</sup>

After the first four to five years of accession, a number of other changes will take place. For example, after 2006, China agreed to phase out its TRQ for edible oils. But China is likely to maintain the TRQ for corn after 2005 though the amount of TRQ will be certainly raised. State trading monopolies also will be phased out for wools after 2004 and gradually disappear for most of other agricultural products. Although China National Cereals Oil and Foodstuffs Import & Export Co. will continue to play an important role in rice, wheat and corn, there will be an increasing degree of competition from private firms in the importing and exporting of the grains in the future. For corn, the state trading share is scheduled to lower from 100 percent in pre-WTO era to 60 percent in 2004 and is expected to continue declining thereafter.

In its commitments to WTO accession, China also agreed to a number of other items, some of which are special to the case of China. First, China must phase out all export subsidies (most subsidies were used in corn export in 2001) and not to introduce any these subsidies on agricultural products in the future. Moreover, despite clearly being a developing country, China’s de minimis exemption for product-specific support is equivalent to only 8.5 percent of the total value of production of a basic agricultural product (compared with 10 percent for other developing countries). Moreover, some measures, such as investment subsidies for all farmers and input subsidies for the poor

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<sup>12</sup> Although 65% above tariff rates seem high, it is important to note that in fact when compared to other countries, this is low. Most Asian countries that have a TRQ system, high tariff bindings are 2 or more times higher than this.



and other resource-scarce farmers, that are generally available for policy makers to use in developing countries, are not allowed in China (i.e., China must include any such support as part of its aggregate measurement of support which should be less than 8.5 percent of agricultural output values).

Because of its Socialist background and the difficulty that the world has had in assessing the scope of the government's intervention into business dealings of all types, China was enforced to accept a series of measure governing the way that they will deal with the rest of the world in cases of anti-dumping and countervailing duties. Most simply, special anti-dumping provisions will remain for 15 years. According to these provisions, in cases of anti-dumping China will subject to a different set of rules that countries can use to prove their dumping allegations. In addition, the methods that countries can use against China to enforce anti-dumping claims when they have won will differ from most of the world. In essence, this set of measures makes it easier for countries to bring, prove and enforce dumping cases against China. It should be noted, however, that although the rules differ from those governing trade among other countries, China will get the same rights in their dealings with other countries, a element that could help them in some cases with their dealings with dumping matters when they concern their partners' exporting behavior. While issues related to safeguard measures could have significant impacts on China's many agricultural commodities, they are less relevant to corn and China is likely to increase its corn import in the post-WTO era.

China's WTO commitments and privileges associated with the measures in other parts of the agreement also will directly or indirectly affect its agriculture. For example, on agricultural chemicals, China has committed to replace quantitative import restrictions on three types of fertilizers (DAP, NPK and urea) by TRQs. Tariffs will be cut on accession and further cuts will be phased in by 2005 in almost all industrial products (e.g., tractors and pesticides). Furthermore, China will reduce significantly its non-tariff measures and eliminate all quotas, tendering and import licensing on non-farm merchandise by no later than 2005.<sup>13</sup>

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<sup>13</sup> For textiles and clothing, however, the current 'voluntary' export restraints will not be completely phased out until end of 2008, meaning that the expansion of exports may not expand as fast as they would under a less restrictive regime. Substantial commitments to open up services markets in China also have been made.

**Table 1. China's market access commitments on farm products subject to tariff rate quotas.**

	Import volume (mmt) (State trading share, %)			Quota growth (% pa)	In-quota tariff (%)	Out-of-quota tariff (%, as of 1 January)		
	Actual 2000	Quota 2002	Quota 2004			2002	2003	2004
Rice	0.24 (100) <sup>a</sup>	3.76 (50)	5.32 (50)	19	1	74	71	65
Wheat	0.87 (100)	8.45 (90)	9.64 (90)	8	1	71	68	65
Maize	0.0 (100)	5.70 (67)	7.20 (60)	13	1	71	68	65
Cotton	0.05 (100)	0.82 (33)	0.89 (33)	5	1	54.4	47.2	40
Wool <sup>b</sup>	0.30	0.34	0.37	5	1	38	38	38
Edible oils <sup>c</sup>	1.79 (100)	5.69 (40)	6.81 (10)	15	9	75	72	68
Sugar <sup>d</sup>	0.64	1.68	1.95	8	20	90	72	50

a: Figures in parentheses are the share (%) of non-state trading in import quota.

b: Designated trading in 2002-2004 and phased out thereafter.

c: TRQ regime will be phased out in 2006. In 2005, import quota will be 7.27 mmt with 9% in-quota tariff and 65% out-of-quota tariff.

d: Phased out quota for state trade.

Source: China's *WTO Protocol of Accession*, November 2001; CNSB, Statistical Yearbook of China, 2001.

**Table 2. Price and Log Price Determination Regression for All Periods(10/2001-3/2003).**

Explanatory Variables	(1) Dependent Variable: Price at level (RMB)	(2) Dependent Variable: Log Price
Distance from Dalian Linear (1000 km)	-54.4* (30.2)	-0.056* (30.35)
Distance*Group Dummy	-0.0235* (9.66)	-0.00003* (10.54)
Group Dummy	-89.55* (9.90)	-0.093 (10.02)
Constant	1058.84* (165.24)	6.97* (1064.88)
Time Period Dummies	Included	Included
Adjusted R-square	0.82	0.83
No of Observations	1152	1152

Note: In the parentheses are t statistics. Coefficients marketed with \* indicating statistically significant from zero at 1 % level.

The group dummy (gd) pick up one time period effect. When gd = 0, indicating early WTO accession period, gd = 1, indicating the recent period.

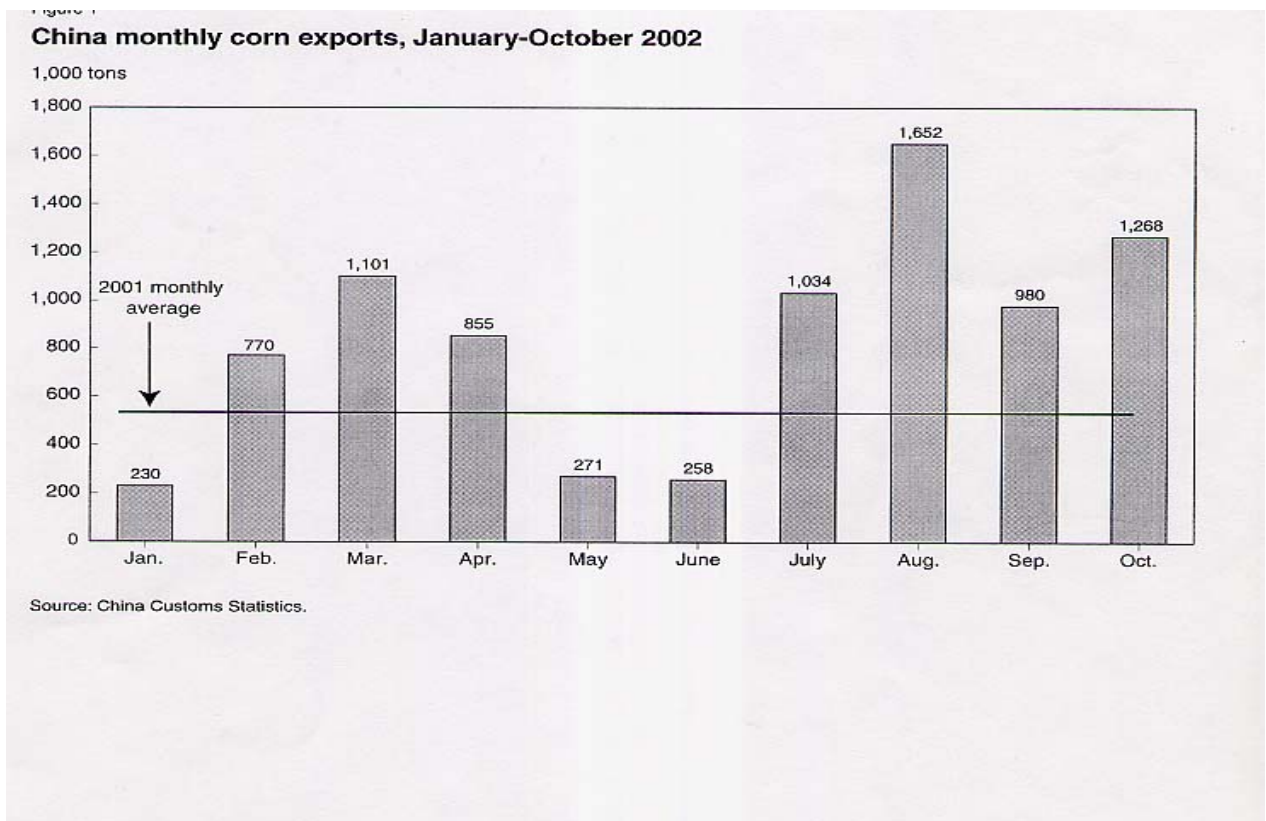
The F test statistic in (1) is  $F[2, 1022] = 120.87$ , in (2) is  $F[2, 1022] = 133.66$ . Both model reject the null hypothesis that there is no structure change.

**Table 3. Cointegration Tests on NE Corn Markets and Dalian Market**

Region	Test Statistics	Lags	5% Critical Value	Conclusion
<b>Augmented Dickey-Fuller Tests</b>			-2.89	Each one is unit root and Proved to be I(1), stationary at 1 <sup>st</sup> difference
1. Center HLJ	-1.98	9		
2. East HLJ	-1.99	9		
3. West HLJ	-1.78	9		
4. Center JLN	-1.99	9		
5. East JLN	-1.72	9		
6. West JLN	-1.62	9		
7. Center LNG	-2.24	10		
8. West LNG	-2.07	10		
9. Dalian port	-2.80	16		
<b>Augmented Dickey-Fuller Tests for Pair Markets</b>				All pair markets are cointegrated Dalian market is integrated with all other regional markets.
1. Center HLJ/Dalian	-3.34	9		
2. East HLJ/Dalian	-3.49	9		
3. West HLJ/Dalian	-3.16	9		
4. Center JLN/Dalian	-3.49	9		
5. East JLN/Dalian	-3.24	9		
6. West JLN/Dalian	-3.33	9		
7. Center LNG/Dalian	-3.98	9		
8. West LNG/Dalian	-3.84	9		
<p>Notes: 1. Augmented Dicky-Fuller test was implemented over the pair markets.  2. Guass program file “adf-test.prg” is used.  3. Data set used: dataset 2. Price series is bi-weekly and data are analyzed at the market level (that is, there are more than one observations per province)</p>				

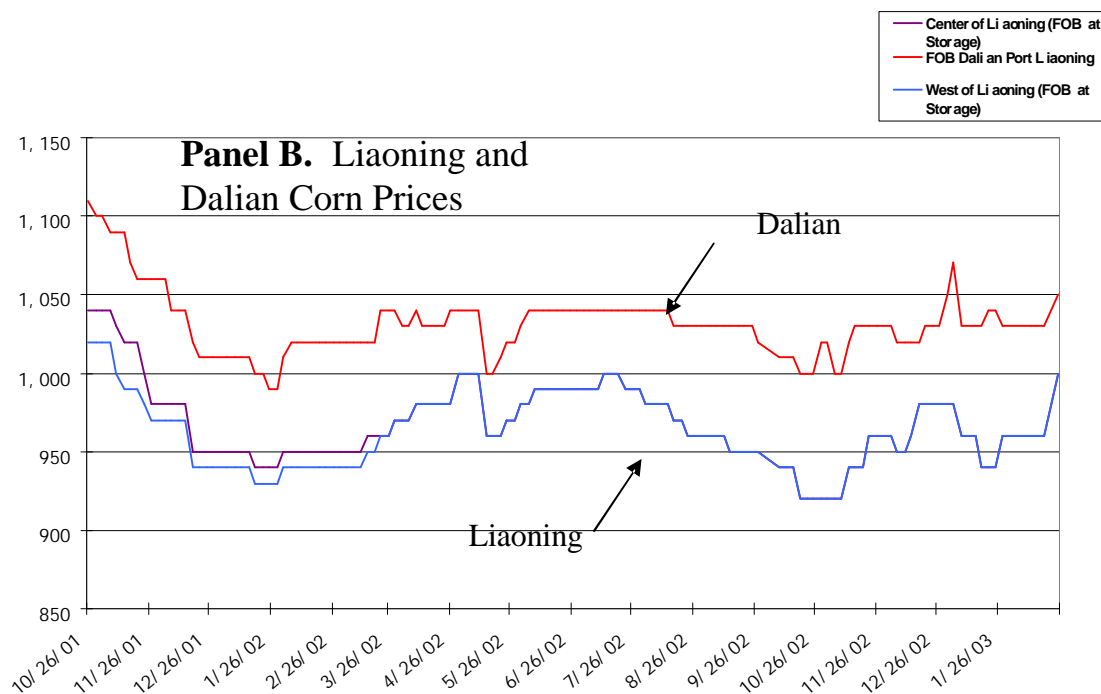
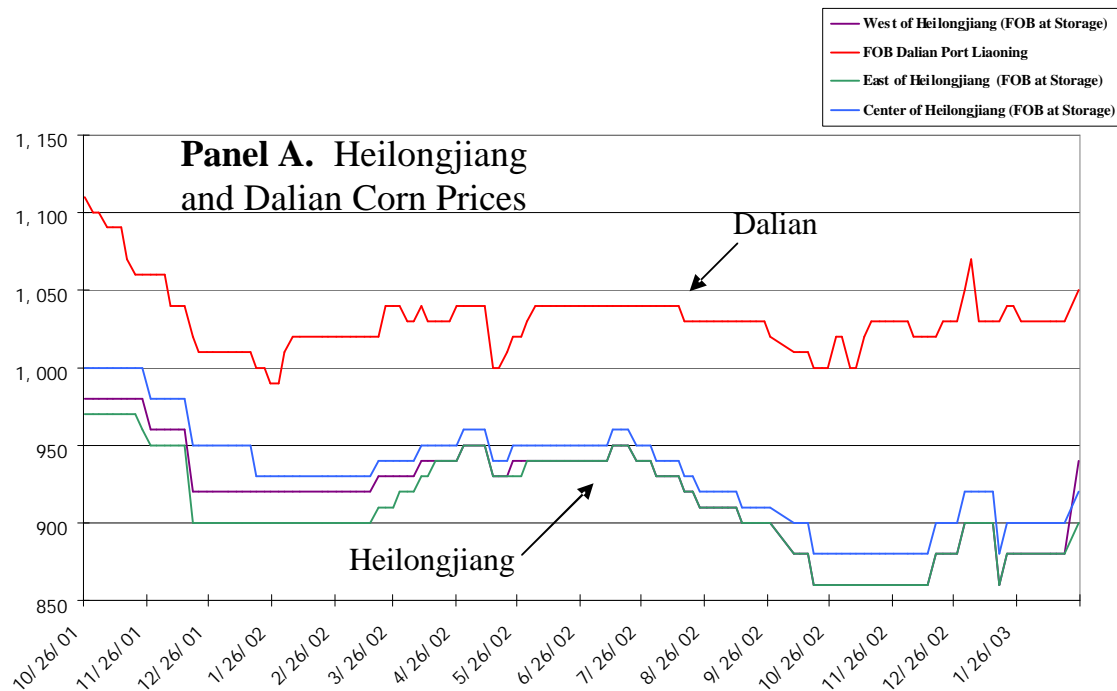
**Table 4. Cointegration Tests on Major Corn Consumption Markets and Dalian Market**

Region	Test Statistics	Lags	5% Critical Value	Conclusion
<b>Augmented Dickey-Fuller Tests</b>			-2.89	
1. Dalian port	0	7		Each one is unit root and Proved to be I(1), stationary at 1 <sup>st</sup> difference
2. Hubei	-0.8	4		
3. Jiangsu	-1.89	10		
4. Fujianf	-1.8	7		
5. Guangdon	-1.71	7		
<b>Augmented Dickey-Fuller Tests for Pair Markets</b>				
1. Hubei/Dalian	-2.46	6		Hubei and Dalian are not cointegrated
2. Jiangsu/Dalian	-2.71	6		Pair markets are cointegrated with Dalian, 5%.
3. Fujianf/Dalian	-5.09	6		
4. Guangdon/Dalian	-6.15	6		
Notes: 1. Augmented Dicky-Fuller test was implemented over the pair markets. 2. Guass program file “adf-test.prg” is used. 3. Data set used: dataset 2 and dataset 1. Price series are monthly and at the provincial level. 4. Johansen Test on all markets confirmed the results that there are 3 cointegrating equations. .				



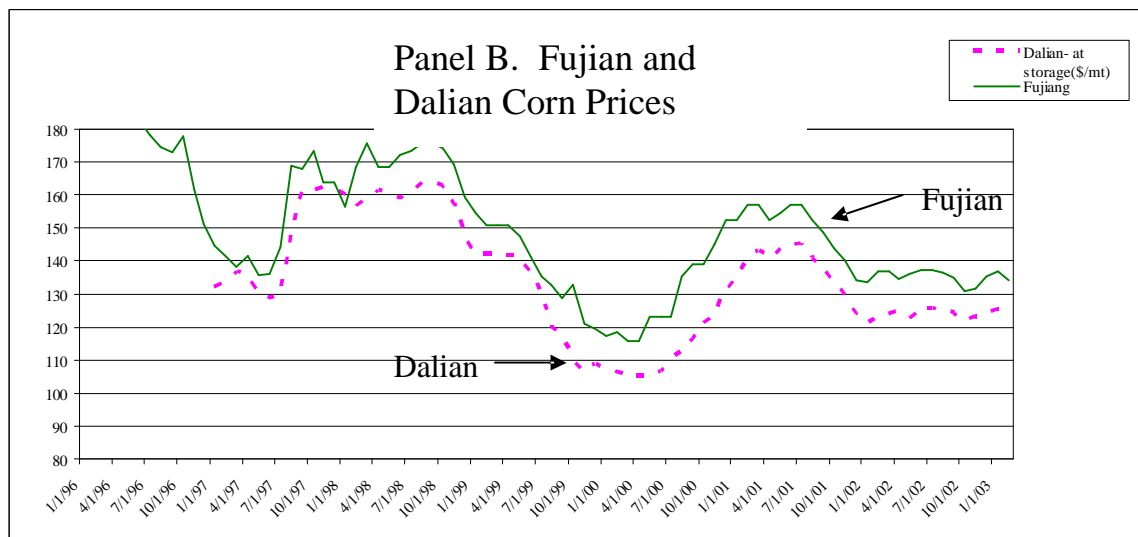
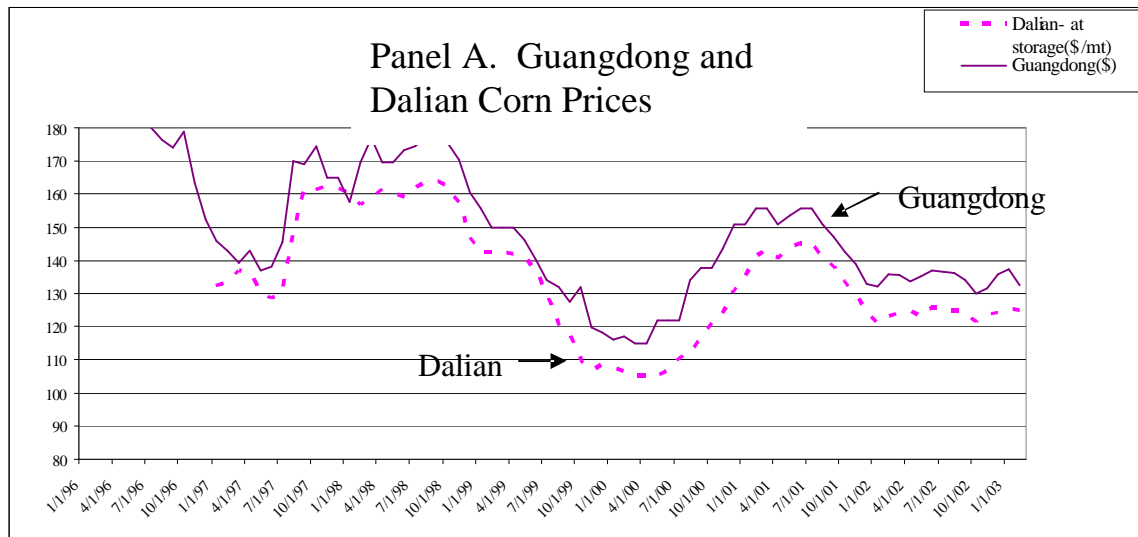
**Figure 1. China Monthly Corn Export, January-October 2002** [taken from Gale, 2003])





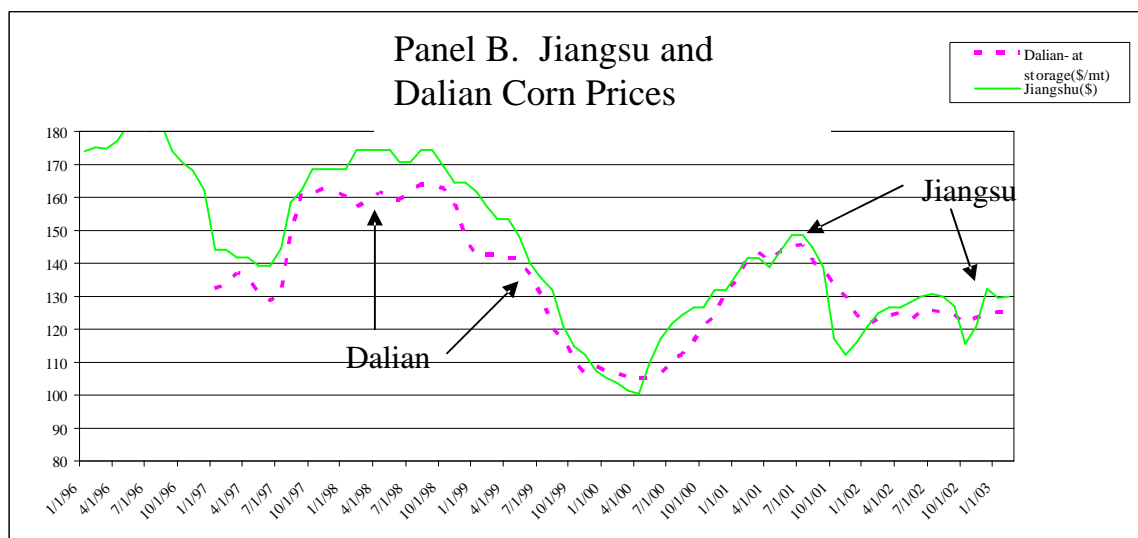
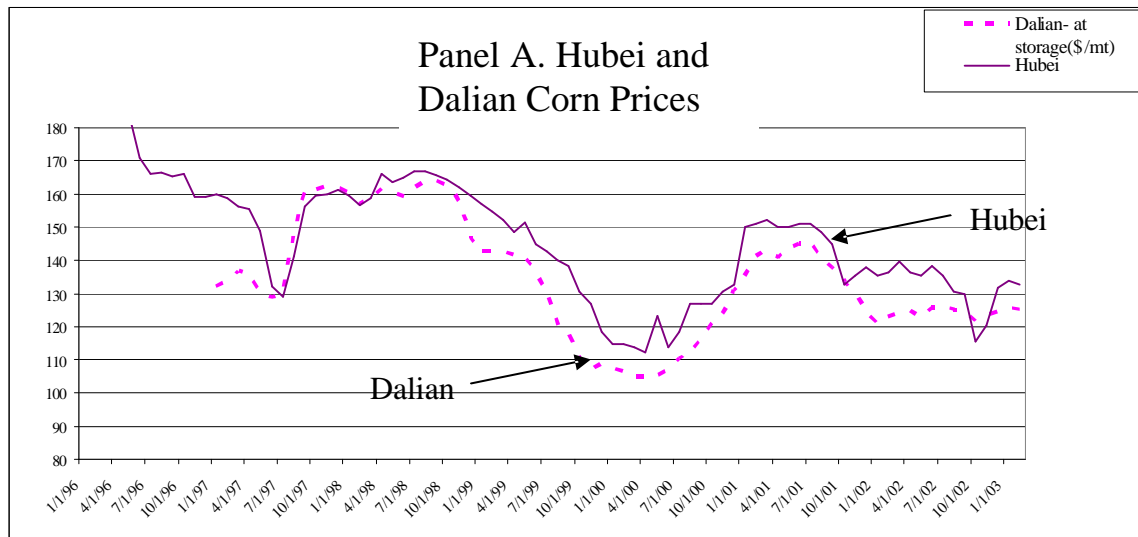
Data source: Data set 2—File: “Corn, wheat, rice price 2001 (3).xls”

**Figure 2. Corn Prices in Heilongjiang, Liaoning and Dalian (RMB/mt), October 2001 to February 2003**



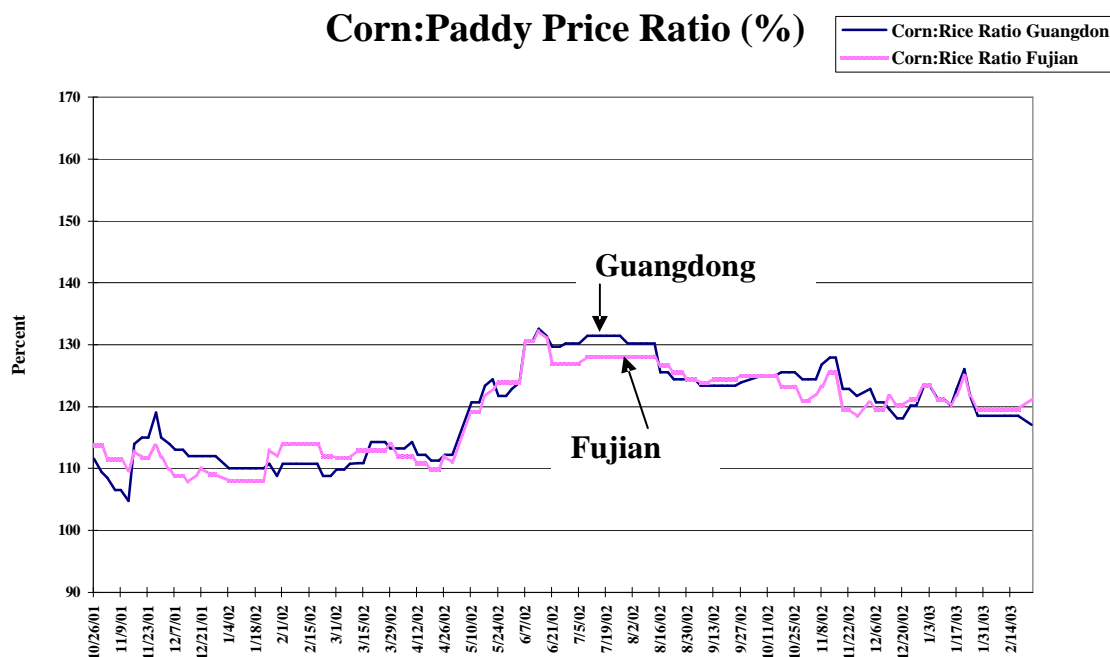
Data source: Data set 1—File: “1996-2001 Corn Price (2) –like.xls”

**Figure 3. Corn Prices in Guangdong, Fujian and Dalian (RMB/mt), 1996 to February 2003**



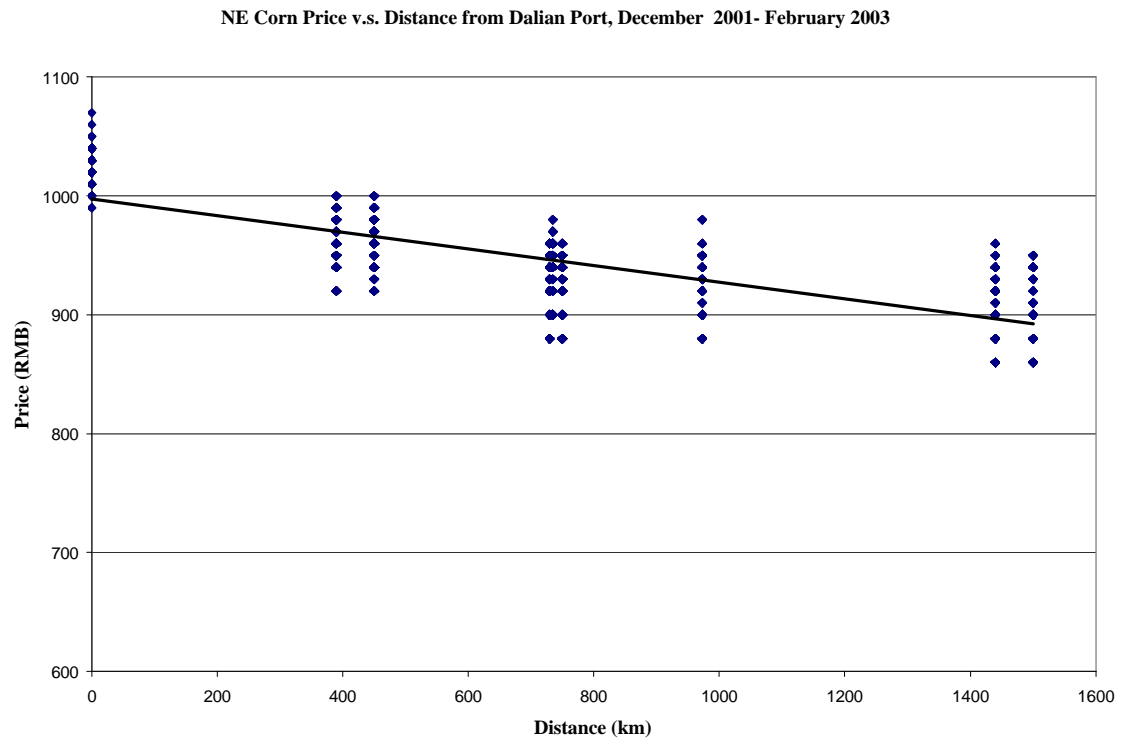
Data source: Data set 1—File: “1996-2001 Corn Price (2) -like.xls”

**Figure 4. Corn Prices in Hubei, Jiangsu and Dalian (RMB/mt), 1996 to February 2003**



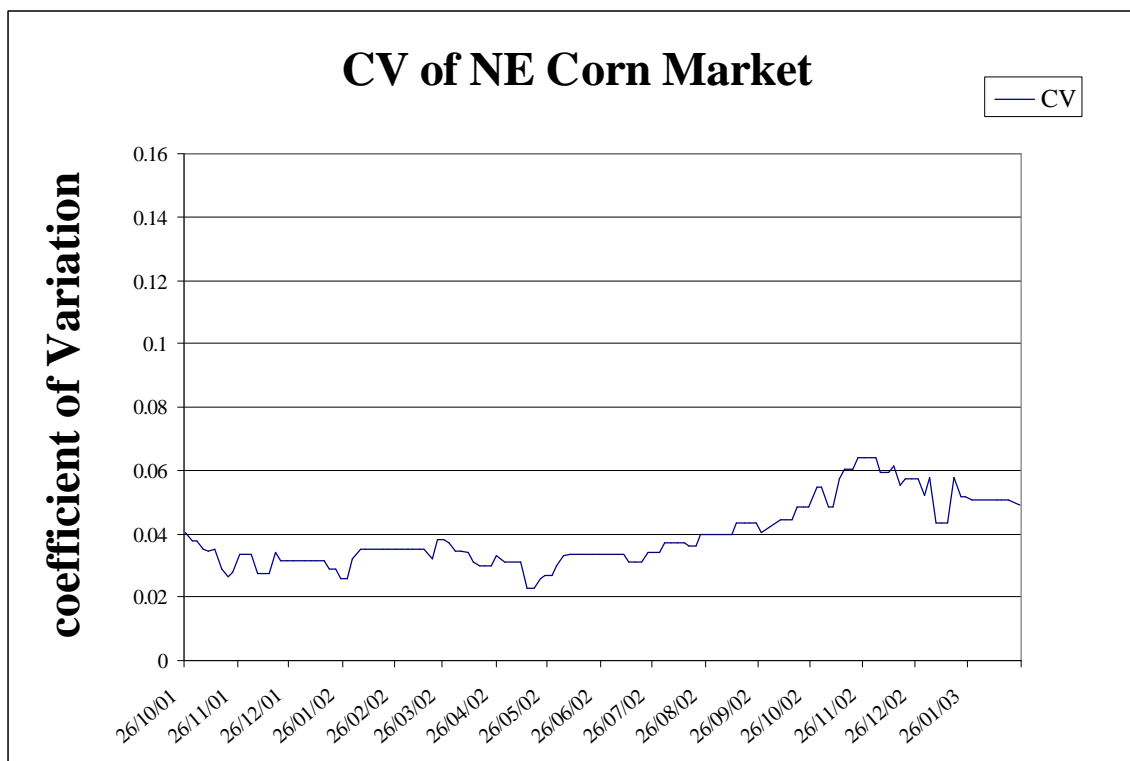
Data source: Data set 2—File: “Corn, wheat, rice price 2001 - Like.xls”

**Figure 5. The Ratio of Corn to Feed Rice (Paddy) Prices in Guangdong and Fujian Provinces between October 2001 and February 2003**



Data source: Data set 2—File: “Corn, wheat, rice price 2001 (3).xls”

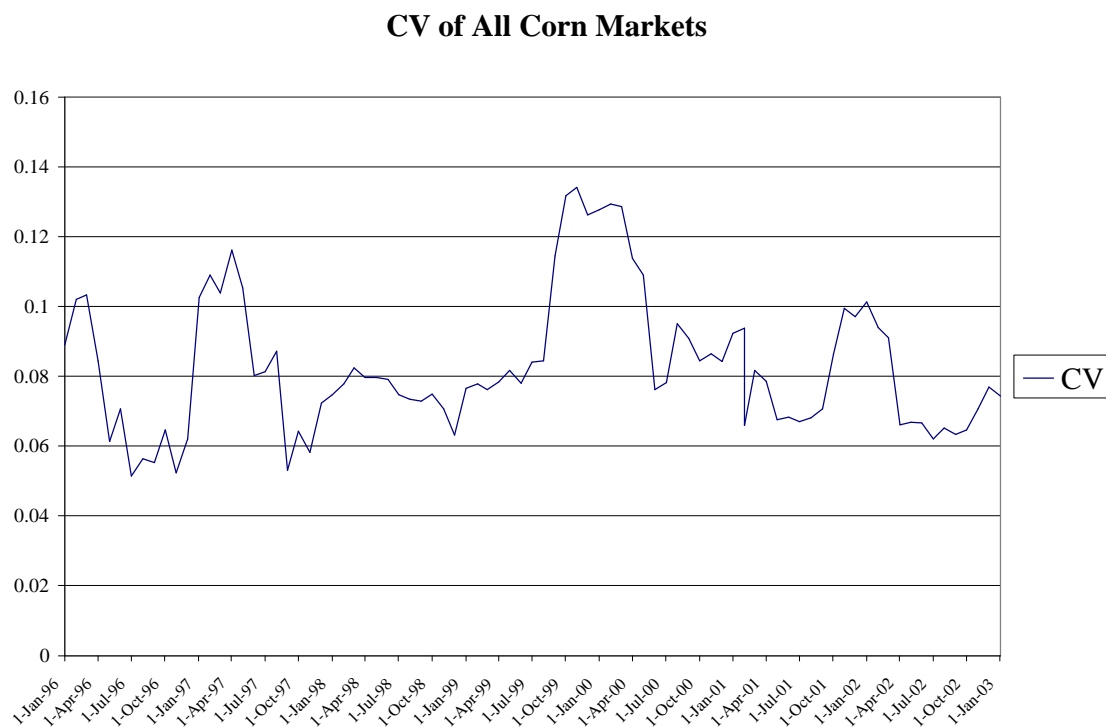
**Figure 6. Change of Corn Price across China as Markets Increase distances from the Port, 2000-2003**



Data source: Data set 2—File: “Corn, wheat, rice price 2001 (3).xls”

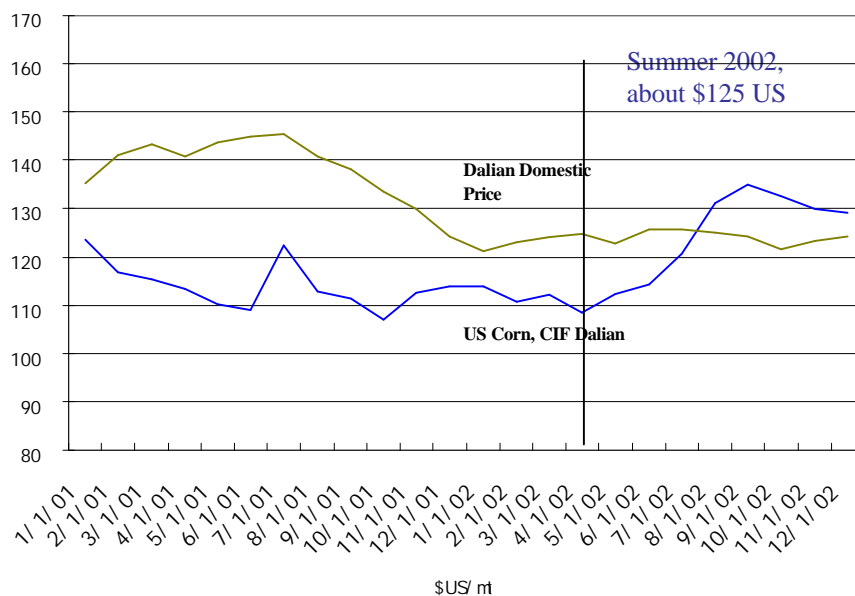
**Figure 7. Coefficient of Variation (Standard Deviation divided by the Mean) of Prices Across Northeast Corn Markets in NGOIC data set (n=9) in China, October 2001 to February 2003**





Data source: Data set 1—File: “1996-2001 Corn Price (2) –like.xls”

**Figure 8. Coefficient of Variation (Standard Deviation divided by the Mean) of Prices Across All Corn Markets in NGOIC data set (n=23) in China, 1996 to February 2003**

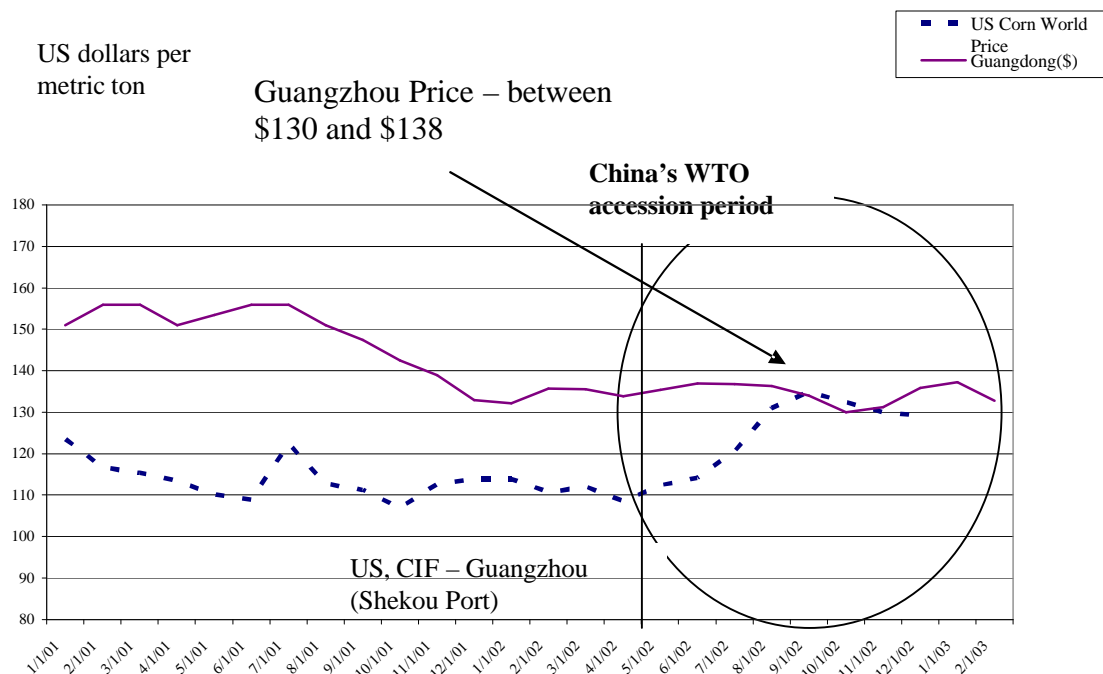


Data sources:

For domestic price, Data set 1—File: “1996-2001 Corn Price (2) -like.xls”;

For world price, Data set 3—File: “Exp\_domestic (2).xls”

**Figure 9. Corn Prices in China (Dalian Domestic Price) compared to the World Price of Corn (US Corn, CIF—Dalian).**

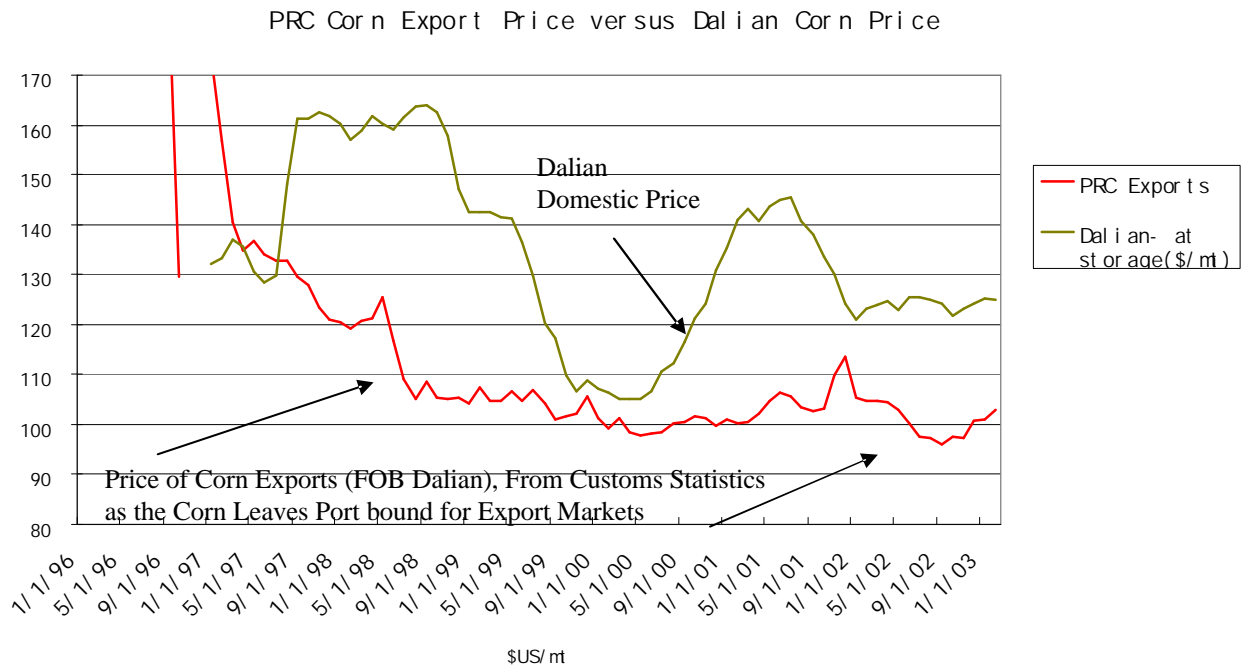


Data sources:

For domestic price, Data set 1—File: “1996-2001 Corn Price (2) -like.xls”;

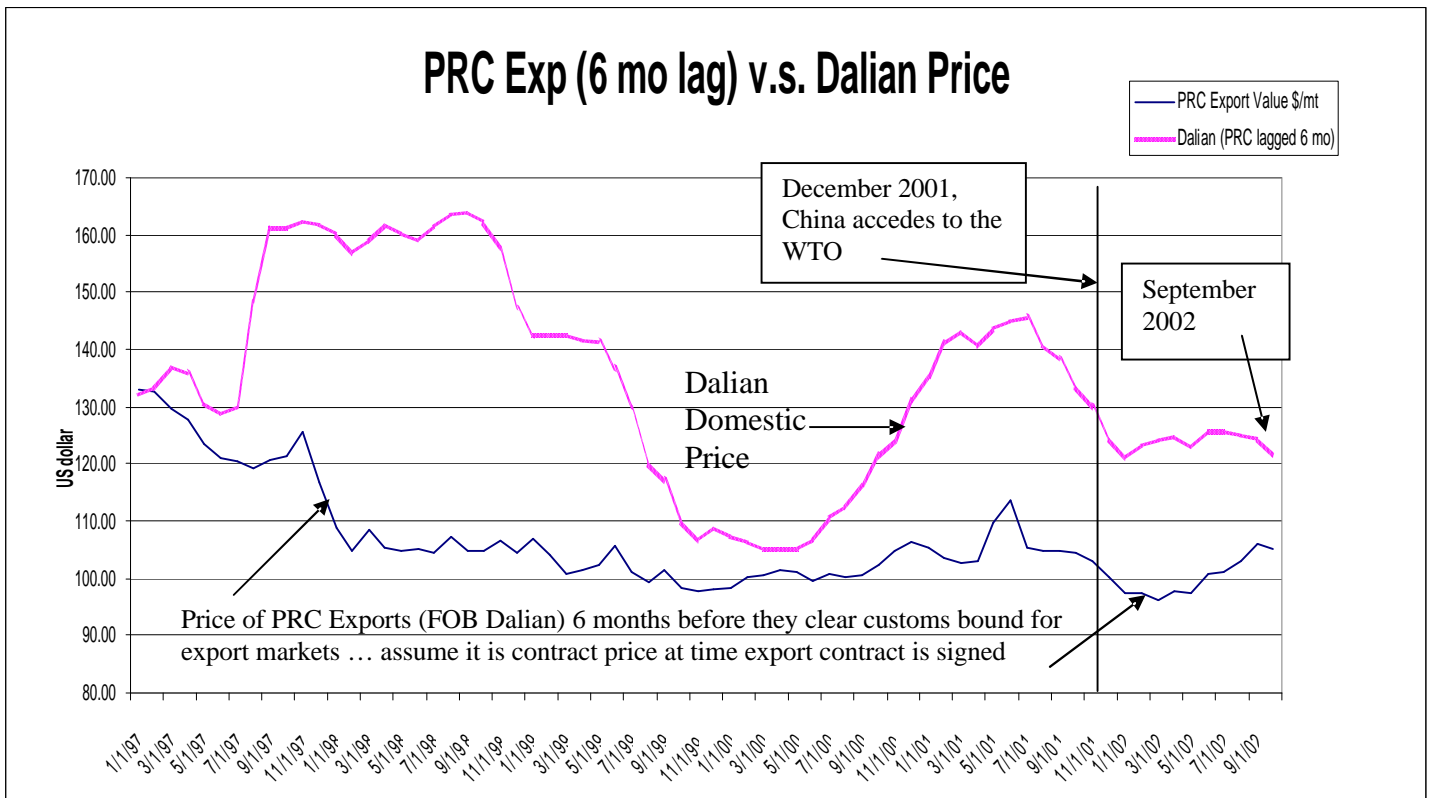
For world price, Data set 3—File: “Exp\_domestic (2).xls”

**Figure 10. Corn Prices in China (Guangdong Domestic Price) compared to the World Price of Corn (US Corn, CIF—Guangdong).**



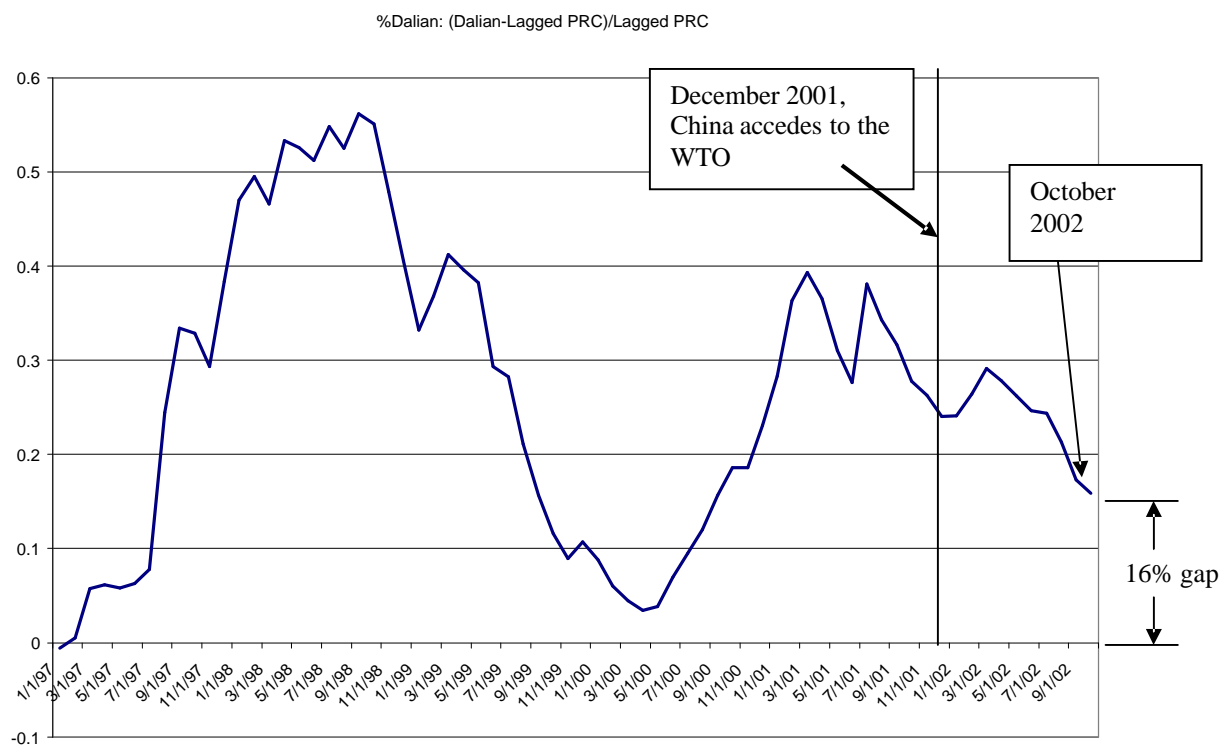
Data sources: Export prices from data set 3—File: “Exp\_domestic (2).xls”;  
Domestic prices from data set 1—File: : “1996-2001 Corn Price (2) -like.xls”

**Figure 11. China’s Corn Export Price (FOB, Dalian) and Dalian’s Domestic Corn Price (FOB).**



Data sources: Export prices from data set 3—File: “Exp\_domestic (2).xls”;  
Domestic prices from data set 1—File: : “1996-2001 Corn Price (2) -like.xls”

**Figure 12. Lagged (by 6 month) PRC Export Corn Price and the Contemporary Dalian Domestic Price in China through September 2002.**

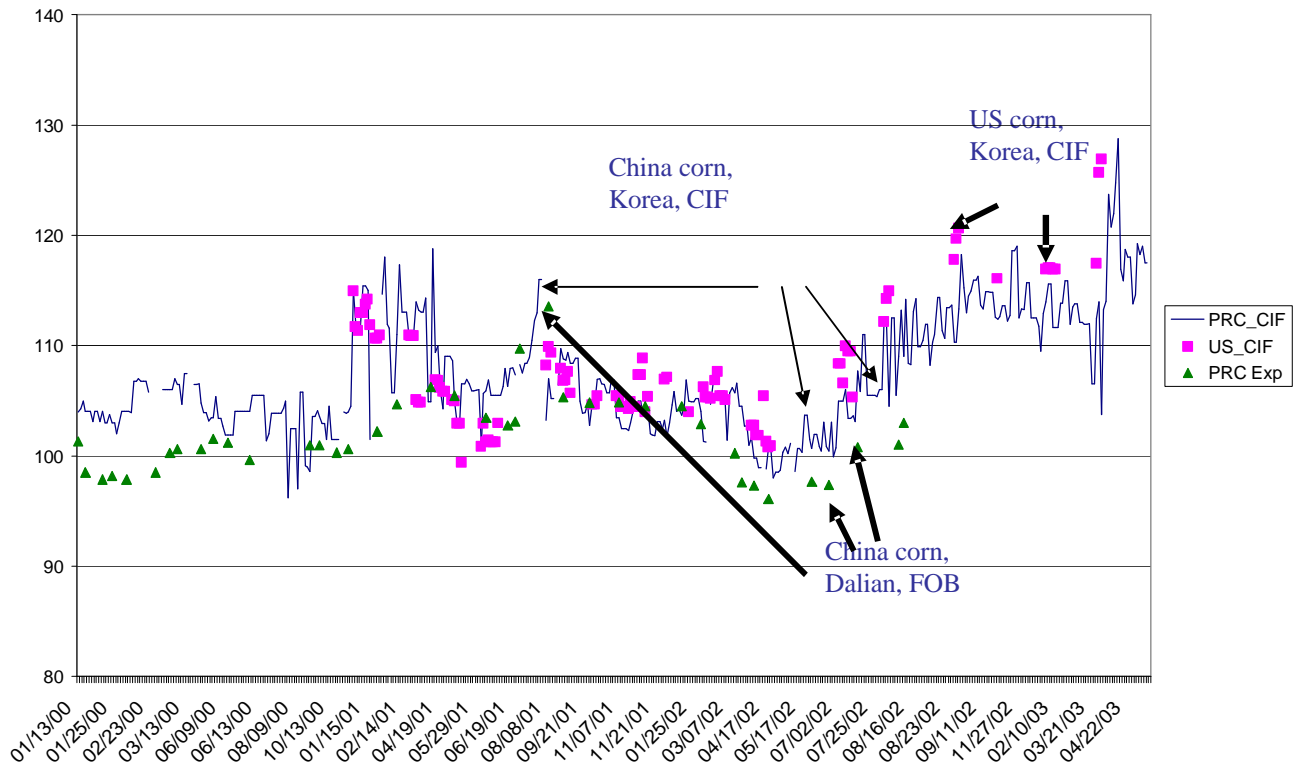


Data source: Calculated from Figure 12.

**Figure 13.—Percentage Difference between PRC Export Price (lagged 6 month) and Contemporary Dalian Domestic Corn Price between 1997 and September 2002.**

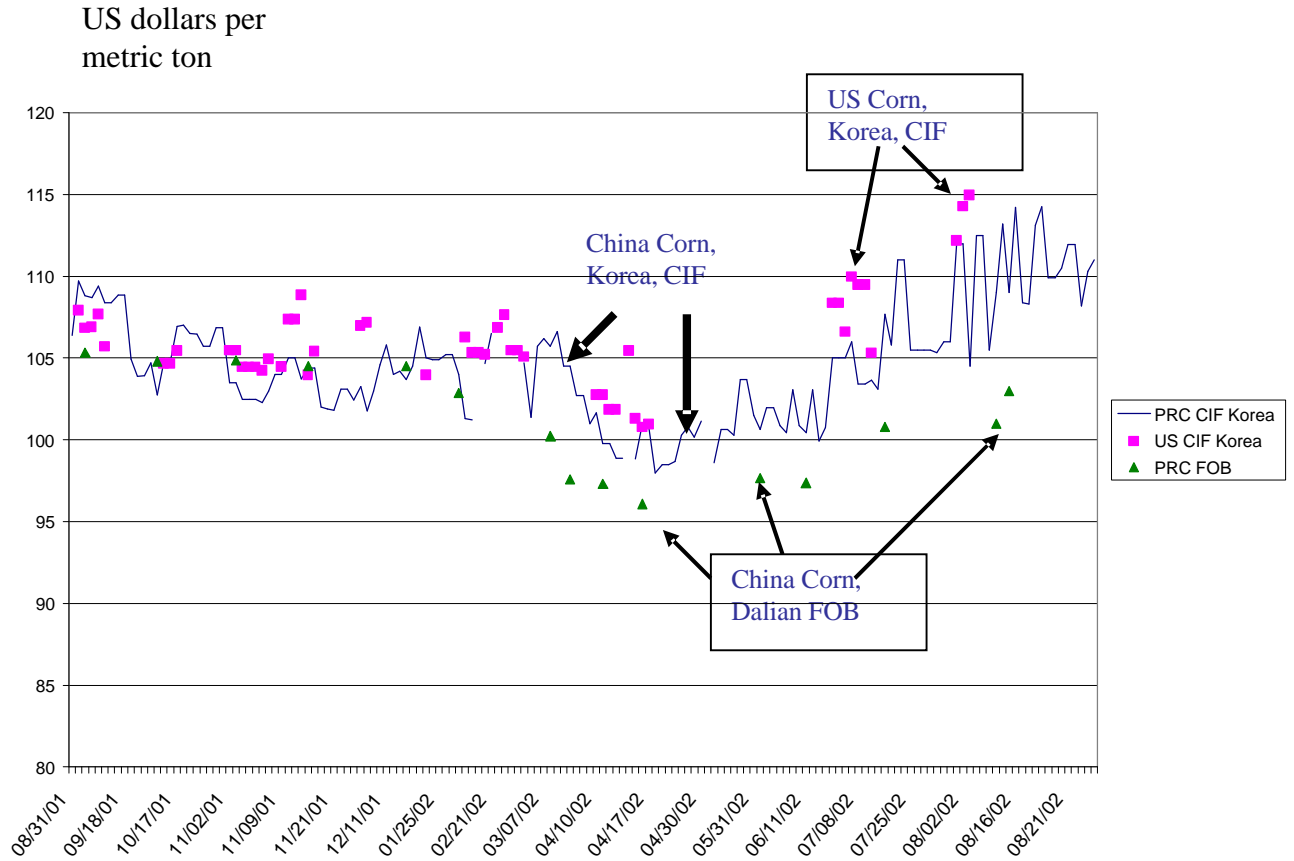


US dollars per  
metric ton



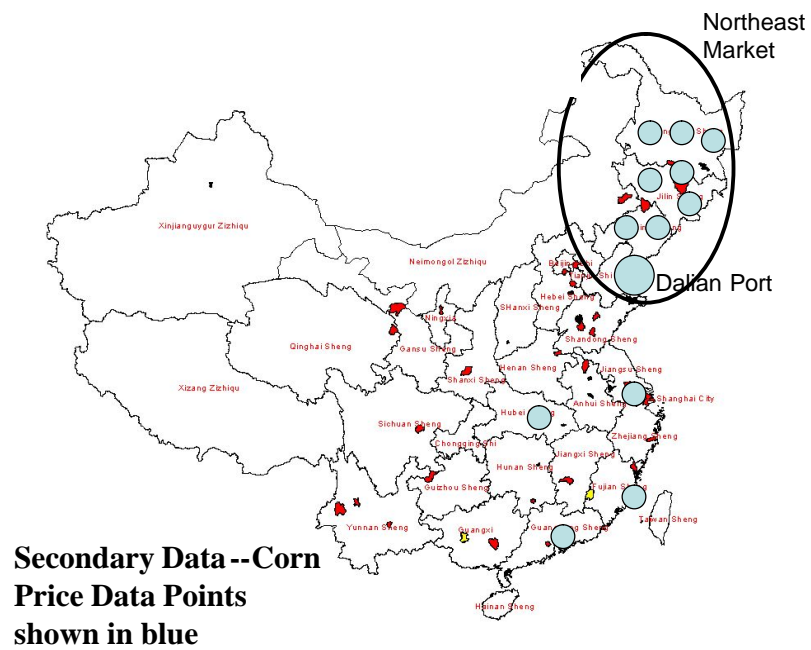
Data sources: Prices from Korea supplied by the Korea office of the US Grains Council; China's Export Prices from data set 3—File: "Exp\_domestic (2).xls";

**Figure 14. Prices of US corn (CIF—Korea) and China corn (CIF –Korea) compared to the price of China corn (FOB—Dalian) January 2000 to Spring 2003.**

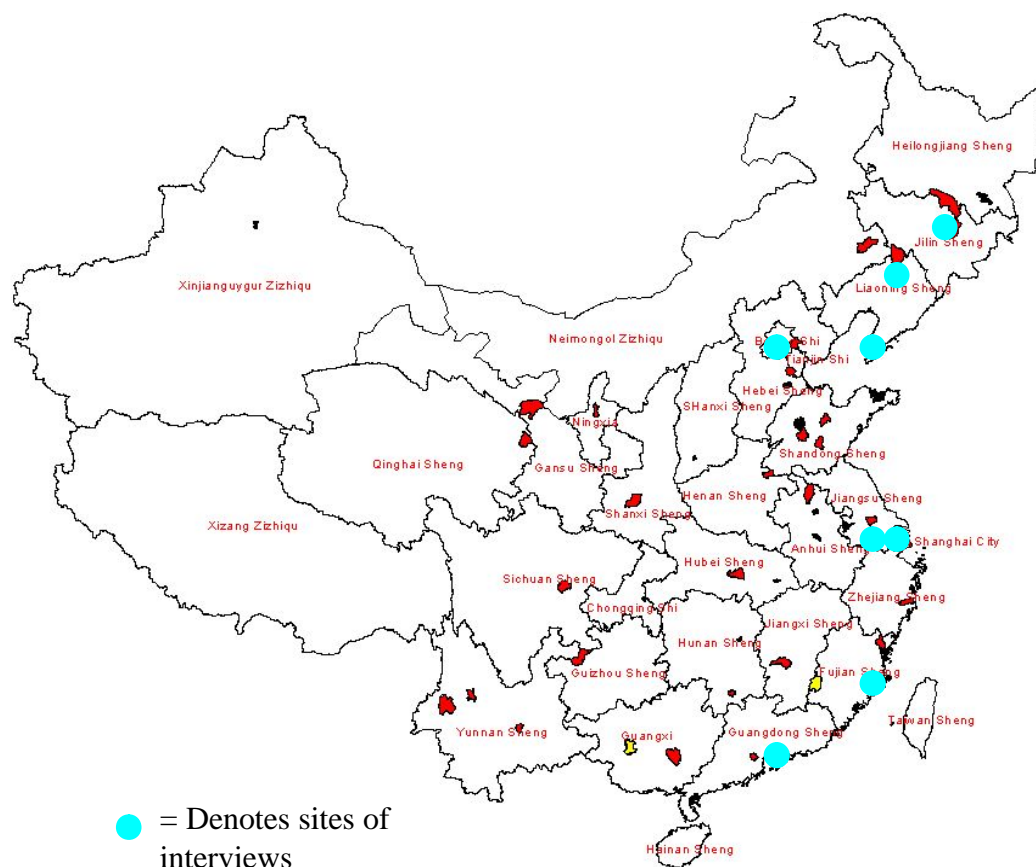


Data sources: Prices from Korea are from Contracts Registration Records supplied by the Korea office of the US Grains Council; China's Export Prices from data set 3—File: "Exp\_domestic (2).xls";

**Figure 15. Prices of US corn (CIF—Korea) and China corn (CIF—Korea) from Contracts Registration Records compared to the export price of China corn (FOB—Dalian) August 2001 to October 2002.**



Map 1. Location of Key Markets in the Data Set from the National Grain and Oil Information Center.



Map 2. Location of Trade and End User Interviews Conducted by Authors for 2003 Corn Import and Export Report.

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