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Distortions to Agricultural Incentives in China

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The purpose of this paper is to present estimations of indicators of direct and indirect interventions of China's government in agriculture. In order to put these indicators in context, the paper reviews China's experience with policy reforms since the 1950s and measures the extent of these reforms in the agriculture sector. Unfortunately, due to data constraints, we can only produce quantitative measures of price distortions since the early 1980s— that is, for the past 25 years. Because of the nature of China's agricultural experience over the last six decades, this review emphasizes the sectoral and macroeconomic policies and elements of the institutional framework that have influenced the incentive framework facing the sector's product and factor markets. The changes over the past quarter of a century in trade, price and marketing policies as they affect incentives for producing and consuming different farm products are reflected in estimated rates of government assistance to producers and consumers.

The main finding of our paper is that the nature of policy intervention in China has changed dramatically over the past 25 years, propelling the agricultural sector from one characterized by high distortions to one that is relatively liberal. In the 1980s and early 1990s (henceforth the *early reform period*) there were distortions in both external and domestic policies that isolated farmers and food consumers from international markets. Importantly during the early reform period, domestic marketing and pricing policies made prices that domestic producers and consumers faced almost independent of the effects of trade policy. Because of this, even in the case of an exportable commodity (e.g., rice), a commodity that appears to have been subject to little distortion at the border (meaning that that the international price of rice and the free market price of rice were nearly identical), domestic pricing and marketing policies did not allow producers to reap the profits from international-level prices and instead forced farmers to sell much of their

surplus to the state at an artificially low price. Hence, domestic policies levied a tax on farmers even though there was little distortion at the border. Similar dynamics characterized importable commodities (e.g., wheat and soybean) where despite fairly high rates of protection from trade policies, consumers were still being implicitly taxed and producers were receiving much less protection than they would have had their been a free domestic market for the importable.

In contrast, since the late 1980s and early 1990s (the *late reform period*), the liberalization of domestic markets has resulted in a reduction in distortions from domestic policies. During the late reform period the market gradually replaced the state procurement system as the primary mechanism for allocating resources, and market-generated prices have become the basis of farmer production and marketing decisions. At the same time, especially in the case of importable commodities, trade policy has also become more liberal, with distortions from border measures falling substantially. As a result, we find that by the end of the late reform period (that is, after 2000), China's agriculture is much less distorted in two ways. First, the differences between international and domestic market prices have narrowed considerably for many commodities, due to trade policy liberalization. Second, the elimination of domestic policy distortions means that when trade liberalization allows for increased imports or exports of agricultural commodities, prices in China's domestic market change and farmer incentives are directly affected by them.

In addition, we also examine the effect of input-oriented policies and exchange rate policies. We find that input-related policies have generated few distortions in the case of China since 1980. However, exchange rate policy, like changes to pricing and marketing and trade policies, has played a more important role. In the early reform era exchange rates were highly distorted and served to place an implicit tax (or reduce the amount of protection) on the agricultural economy. By the late reform era, however, the system of exchange rates was reformed gradually, which reinforced the gradual shift towards a more liberal agricultural economy.

Despite the finding that considerable liberalization has occurred due to policy reforms in both the domestic and external economy, in the mid-2000s — 25 years after the reforms began — there are still distortions to agriculture. In some cases, remaining

distortions are coming mainly from import tariffs which, while low by international standards, are still providing a degree of protection for a number of importables (e.g., sugar and dairy products). In the case of other importable commodities (e.g., maize), the use of export subsidies continue to keep a wedge between the domestic price in China and the international market. The latter are mostly disguised as domestic marketing, transport and storage subsidies, which are allowed under WTO rules for developing countries.

To show these results and to provide the reader with a fuller discussion of recent changes to the structure of China's economy, the policy environment within which the changes have been occurring, and the analytical approach and findings of the analysis of price distortions, the rest of the paper is organized as follows. In the next section we examine the changes in the performance of the economy and review the policy environment and reform agenda during periods of change. We examine the changes for two separate time periods: the Socialist era (1950 to 1979) and the Reform era (1980 to the present). The period is split like this not only because of the differences in performance and policy changes between the two eras, but also because, in the subsequent distortion analysis, we are only able to quantify the effect of China's liberalizing domestic and external changes after 1980. In the third section, we discuss our quantitative approach and sources of data. The results of the distortion analysis are presented and discussed in the fourth section. The final section provides concluding remarks.

Growth and structural change in agriculture since 1949

The post-World War II history of the Chinese economy clearly divides into the socialist era that lasted until December 1978, and the era that followed in which China transitioned towards a market economy.

The socialist era, 1949 to 1978

Socialist policies dominated the 1950s, 1960s and 1970s in China and had profound and complicated effects on agriculture. In this section, we briefly review the performance of the agricultural sector, laying out its successes and failures. Second, we recount the major policies—inside and outside of agriculture—that we believe are responsible for producing the outcomes that were realized during the Socialist period.

Performance during the socialist period

The record on the performance of agriculture in producing food and other raw materials for industry during the Socialist period is mixed, and in part depends on the standard against which the sector's performance is being judged. On the one hand aggregate trends show that agriculture played an important role in increasing food availability, especially that of staple grains (Huang et al. 2007). Between 1952 and 1978, total sown area only changed marginally, increasing by 6.3 percent; grain sown area also changed little, declining by 2.7 percent. Grain yields, in contrast, increased by 91 percent from 1952 to 1978, an annual growth of 2.8 percent. In aggregate, China's grain production rose by 86 percent, a rise of 2.5 percent per year. Indeed, the growth rate of grain production outpaced that of the population (1.9 percent), meaning that China's agricultural sector increased per capita calorie availability during the Socialist period.

While credit has to be given for the increases in the absolute and per capita levels of food and agricultural raw material availability during a time when many other nations in the world were suffering from falling food production, it is difficult to argue that agriculture's performance was stellar enough as to be considered a transformative force of the Socialist-era economy. Throughout the 1950s, 1960s and 1970s, China's consumers remained on strictly rationed diets. Coarse grains—maize, sweet potato, millet and sorghum—made up much of an average citizen's staple food intake. Cooking oil, sugar, meat and vegetables were not available on a daily basis for the typical consumer. Most telling, despite the growth, the average level of consumption in urban areas in the 1970s was still low, at only 2328 calories per capita, while for the average rural resident per capita calories was barely above the UN's average minimum requirement of 2100. Moreover, food production systems were so fragile that at times it was subject to

catastrophic failure, as was experienced during the famine of 1959 to 1961, a famine that killed more than 30 million people (Ashton *et al*. 1984).

In fact, food availability became such an issue that during the late 1960s and 1970s that China began to turn to international markets to supplement domestic production. Between 1973 and 1980, China imported on average more than 6 million tons of grain, mostly wheat. In peak import years, grain accounted for a large percentage of the value of China's imports. Obviously, at a time when China's planners were trying to jump-start China's industrialization with imported machinery and other technologies, the inability of the agricultural sector to produce enough food (not to mention foreign exchange earnings from exports) put a drag on the nation's development.

Beyond the performance of the food production sector of the rural economy (which is at best mixed), almost everything else about the record of structural change during the first three decades of agricultural development of the People's Republic is negative (Huang et al. 2007). For example, the production structure of cropping showed almost no change at all. In 1952 grain accounted for 88 percent of sown area, and grain was still being sown on 83 percent of the nation's sown area in 1970. Likewise, there was little change in the structure of the agricultural sector, according to a broader definition. The value of the cropping sector as a share of total agricultural output value was 83 percent in 1952 and was still 75 percent in 1970. Perhaps of greatest importance, income per capita of rural farmers and other metrics of wealth also reflected the stagnation of the agricultural sector. Despite the rise in grain output, rural earnings per capita in the 1970s were almost the same as they were in the mid-1950s (Lardy 1983). Annual per capita levels of rural consumption of almost every food even by 1978—nearly 30 years after the start of the Socialist era—were low, amounting to only 1.1 kilograms of edible oil and 6.4 kilogram of meat (Huang and Bouis 1996). The poverty rate was between 30 and 40 percent.

The stagnation of income, given (even modest) rising output, suggests that productivity growth was low. Although data sources do not facilitate rigorous analysis of total factor productivity, there appears to have been a complete absence of productivity gain or allocative efficiency increase. In fact, the work of Stone and Rozelle (1995) and Wen (1993) support just such a conclusion. Using aggregate data, both papers end up

concluding that total factor productivity growth between 1950 and 1978 was zero or close to zero.

Finally, there also was almost no sign of shift in the employment structure in the economy. While other rapidly developing countries in East Asia were diversifying the sources of income of the rural population and expanding employment in the off-farm sector, little was happening in China's rural sector (Lardy 1983). In 1957 about 84 percent of the population was in the agricultural sector; by 1970, the share of the population in the agricultural sector had risen to 85 percent (CNBS 2000); and by 1980 it was still 83 percent. Of the more than 400 million people in China's rural labor force in 1980, only 4 percent had a full time off farm job (deBrauw *et al.* 2002). In fact, according to data on percent of population in agriculture and GDP (World Bank 1985), for its level of income there were more people living and working in the agricultural sector of China than of any other country.

Socialist policies and institutions

Blame for the poor performance of the agricultural sector almost certainly can be placed squarely on the shoulders of poor policy. Even while local leaders were experimenting with privatized land through an ambitious set of land-to-the-tiller policies in the early 1950s, other factions of the Socialist leadership were already developing policies that were threatening the incentives embodied in private land ownership (Lardy 1983). The levels of investment believed to be required to promote industrialization were, in part, obtained through transfers from the agricultural sector. During the planning era, the prices of agricultural products were depressed to allow food to be sold at low, rationed prices to non-agricultural sector consumers. It is reported that the 'scissors difference'—the extent to which the agricultural sector was taxed by the prices of agricultural goods being set below their market values and the prices of industrial goods being set above their market prices—was large. The estimated taxation rate at this time was 26 percent in 1957 and 27 percent in 1978, primarily from direct taxation of the prices of agricultural goods (Yao 1994).

After the early 1950s farmers were organized into collectives and then communes, eliminating the household farm in China. The main negative effect of the communization

movement was one of absence of incentives. The basic problem was that individual families were not the residual claimants of production and decision making was left to a collective leadership (Putterman 1993). Farm workers were assigned points based on tasks which were difficult to monitor. While there is a debate over the extent to which the collectives were able to motivate farmers to exert effort and attempt to increase the efficiency of production on their farms (Dong and Dow 1993, Lin and Yang-, 2000, Chang and Wen 1995), most scholars believe that free riding and the inability to monitor agricultural labor undermined the incentives in agriculture.

Socialist era pricing and marketing policies also did little to either encourage the efficient production or allocation of goods and services. Prices were fixed by the state (Sicular 1988b). Between 1962 and 1978, the price of grain remained almost unchanged, being adjusted only three times, rising by a total of less than 20 percent. Input prices played mainly an accounting function, as shortages kept most producers from having access to the quantities that they demanded. Marketing institutions—monopolized by government parastatals—did not encourage the development of agriculture; there was little competition and marketing officials did not have an incentive to search out low-cost or high-quality producers. Through plans directed by the marketing system, production was carried out based on (mostly) planned acreage, target volume, quality and variety of production. Even the ratio between home consumption and marketed surplus was stipulated.

The system also served to help—at least in the short run—the state's effort at forced industrialization by keeping down the price of staples in order to allow the state to keep wages low. Except for the amount used for the farm-households' home consumption for food, feed and seeds, all production of grains and edible oils and fiber crops was procured only by the state at quota prices for a specified (compulsory) amount (Sicular 1988b). After the early 1960s, the state also procured, at a somewhat higher above-quota price to provide an incentive to increase production, any surplus output beyond the quota and consumption by farm families. The incentives, however, were targeted at collective leaders and not the farmers on whose effort labor depended. To suppress the demand for agricultural products that were in short supply (because they were priced low), marketing policy also exercised tight control over food marketing in urban areas. Almost all major

commodities were sold by government agencies to urban consumers and rural households in grain-deficit regions at low prices upon presentation of ration coupons.

During this same period fertilizer, pesticides and other material inputs, where available, were also sold through marketing channels monopolized by the state (Stone 1988). The Agricultural Inputs Corporation sold fertilizer on the basis of a carefully formulated plan stretching from the province to the village. Collective leaders needed fertilizer coupons to buy fertilizer and other inputs that were in short supply.

In an agricultural system dominated by either tens of millions of individual farmers or hundreds of thousands of brigades and teams there is a need for the state to play a major role in organizing investments, since individuals have little incentives to make a wide set of investments. In a number of areas, the Chinese government did make such investments between 1950 and 1978. National leaders arguably put their greatest effort into water conservation (Nickum 1998). In the early 1950s, China's irrigation and flood control systems were a shambles. The irrigated area was less than 20 percent of the total cultivated area (Stone 1988). After more than 20 years of investment by both national and local government and with the aid of uncountable man-years of corvée labor, China's irrigation area had reached more than 40 percent by 1978. By the mid-1970s, every major river system also was protected by an intricate network of dikes, dams and flood diversion projects.

In addition, led by a fully publicly-funded research and development system, China's agricultural scientists led the developing world in many areas and were responsible for generating many new breakthroughs. Breeders developed semi-dwarf, high-yielding rice varieties several years before the Green Revolution began in other parts of Asia (Stone 1988). Farmers were able to use hybrid maize and disease-resistant wheat varieties in the 1960s and 1970s, long before such technologies were available elsewhere in other parts of the developing world. In 1976 Yuan Longping created and commercialized the world's first hybrid rice variety (Lin 1991, Huang and Rozelle 1996). An extension system with nearly 500,000 agents was in charge of introducing the technology to brigade technicians (Hu and Huang 2001). By the mid-1970s most of China's cereals were improved varieties.

China's approach to planning, and its placement of the rural economy in the unplanned sector, also had dramatic effects on the nature of employment and China's structural stagnation (Lyons 1987). Because China's agricultural sector was so large and underdeveloped, leaders decided to make a sharp distinction between those that lived in rural and those that live in urban areas. Agriculture became part of the collective sector. In return for shipments of fertilizer and small amounts of capital and other inputs, the agricultural sector was expected to supply food and non-food commodities to the urban-industrial parts of the economy. All of the rest of the needs of the collective agricultural sector were supposed to be taken care of by the leadership of the collective with its own resources. Farmers were not allowed to freely move out of their collectives. The scope and magnitude of the gap in housing, educational, health, welfare and other services between rural and urban widened throughout the Socialist period. Without doubt these *hukou* policies and other restrictions preventing rural people from moving into manufacturing and service provision artificially limited structural changes during the Socialist era and suppressed rural incomes and productivity.

Two key external policies also worked against agriculture in the Socialist era. First, agricultural trade in the pre-reform era was also subject to the plan (Huang and Chen 1999, Lardy 2001). In essence, it was used to supplement the plan of the domestic economy. Given the nation's commitment to self-sufficiency in all areas of the economy, imports were to be used only for procuring those products—most of which were machinery and other productive investments—that could not be manufactured domestically and which would help facilitate meeting the plan. Almost all trade was made through eight state-owned trading firms. In the 1970s, the agricultural state trading firms monopolized nearly all food imports and exports. Hence, it was not in the nature of the institutional structure of the state trade apparatus to allow specialization in labor-intensive export crops which could be offset by imports of land-intensive staple crops. Agricultural trade was primarily looked upon as a means to generate foreign exchange.

Summary: socialist agriculture was a policy-driven disaster

After nearly 30 years of development, China's agriculture was a mess. It was not really playing any of its roles effectively. Although output was up, this was only due to

enormous investments of central and local government funds and mostly corvée labor financed predominantly by the sweat of farmers. Productivity and incomes were stagnant. There was no structural shift towards a more productive, higher efficiency sector. A large share of the population was locked into agriculture. The clearest finding from the analysis of the Socialist era is that this dismal performance was due mostly to more than two decades of the implementation of Socialist policies—both inside and outside the agricultural sector. Neither the organization of production, nor the pricing system and marketing institutions, provided adequate incentives. Some investments were effective, but far too few to offset the negative effects of poor incentives. Perhaps most inimical were the policies that trapped the rural population in a system that designated them as second-class citizens and did not give them their fair share of investment, services or opportunities. In short, the agricultural and non-agricultural policy environment undermined the role that agriculture could have contributed a healthier modern economy.

Performance during the transition era, post-1978

In this section, we first describe the performance of the agricultural sector and examine the role that it has begun to play since the onset of the Reform era in the late 1970s. Second, we examine in greater depth the policy initiatives—inside and outside of agriculture—that have helped launch and guide China's agricultural transition. We examine the reform strategy by looking at its various components, their implementation and the objectives of and rationale for each reform component.

The ups and downs that characterized the performance of agriculture in the pre-reform period disappeared after 1978. Whatever metric of success that there was in agricultural production in China during the 1950s, 1960s and 1970s was surpassed during the reform era, and agriculture finally began to carry out its various roles in the development process. Compared to the early and mid-1970s when agricultural GDP rose by 2.7 percent annually, the annual growth rate almost doubled to 7.1 percent during the initial Reform period from 1978 to 1984, before decelerating to 4.0 percent in 1985-95 and to 3.4 percent in 1996-2004 (Table 1, row 1). By world standards these are high rates of agricultural growth over such a sustained period.

At least in the early reform period, output growth—driven by increases in yields—was experienced in all subsectors of agriculture. Between 1978 and 1984, grain production in aggregate increased by 4.7 percent per year (Table 1, rows 2 to 4). Production rose for each of the major grains, namely rice, wheat and maize (rows 5 to 16). The success of agriculture in playing its role of supplying inexpensive food can be illustrated by an examination of grain prices in China. During the Reform era, with the exception of price spikes in 1988 and 1995 the real prices of rice, wheat and maize have fallen between 33 percent (maize) and 45 percent (wheat) from the late 1970s to the early 2000s.

Far more fundamental than rises in output and yields of the grain sector (although this certainly is connected with and in part made possible by the success in grain production), China's agricultural economy has steadily been remaking itself from a grain-first sector to one producing higher-valued cash crops, horticultural goods and livestock and aquaculture products. Like the grain sector, outputs of cash crops in general, and especially cotton, edible oils and vegetables and fruit, also grew rapidly in the early reform period when compared to the 1970s (Table 1, rows 14 to 21). Unlike grain, the growth of the non-grain sector continued throughout the reform era (with the exception of land-intensive staples such as cotton). The rise in some sectors has been dramatic. For example, between 1990 and 2004 the increase in vegetable production has been so fast that China as a nation is adding every two years the equivalent of the production capacity of California (the world's most productive vegetable region). The share of te total cultivated area that is dedicated to fruit orchards in China (over 5 percent) is more than double the share of the next closest major agricultural nation. China today can more closely be said to be following the saying "taking apples and onions as the key link" than being a grain-first agriculture as in the Socialist era.

China also is moving rapidly away from a cropping agricultural mentality. The rise of the livestock and fishery sectors outpaces the cropping sector in general and most of the subcategories of cropping too (Table 1, rows 22 and 23). Livestock production rose 9.1 percent in the early reform period and has continued to grow at between 4.5 to 8.8 percent since 1985. The fisheries sub-sector is the fastest growing component of agriculture, rising more than 10 percent per year between 1985 and 2000. Today, more

than 70 percent of the world's fresh water aquaculture is produced in China. Also, the rapid and continuous rise in livestock and fishery outputs has steadily eroded the predominance of cropping (Table 2). After remaining fairly static during the Socialist era, the share of agriculture contributed by cropping fell from 76 percent to 51 percent between 1980 and 2005. At the same time, the combined share of livestock and fisheries rose to 45 percent, more than doubling their 1980 share of 20 percent. It is projected that by 2008, cropping will account for less than 50 percent of agricultural output in China.

Moving off the farm

The reform era has brought even more fundamental transformative changes when looking at a picture of the rural economy based on a definition that is broader than agriculture. While the average annual growth of agriculture (as seen above) averaged about 5 percent throughout the entire reform period, the growth rates of the economy as a whole and of the industrial and service sectors were faster (Table 1, rows 1 to 4). In fact, since 1985 the growth of industry and service sector has been two to three times faster than agriculture. Because of the differences in the sectoral growth rates, agriculture's share of GDP has fallen from 40 percent in 1970 to less than 13 percent in 2005 (CNBS). Given the current growth of agricultural GDP and overall GDP, the share of agriculture will fall below 10 percent after 2010. The shifts in the economy can also be seen in employment. Agriculture employed 81 percent of labor in 1970. By 2005, however, as the industrial and service sectors grew in importance, the share of employment in agriculture fell to a reported 45 percent (CNBS).

Agricultural trade liberalization

While so much has been made of China's accession to the WTO as a turning point in its relationship with the world, in fact China's open door policy started much earlier (Huang and Chen 1999). In the process, China has turned itself from a hermit country into one of the world's great trading nations, including in the area of agricultural trade. From 1980 to 2000, the total value of China's agricultural trade grew by about 6.0 percent on an annual basis. Since 2000, it has more than doubled, making China the fourth largest importer of agricultural commodities in the world (Gale 2006). However, China is more than an

importer: in almost every year the level of agricultural exports has exceeded that of imports since the reforms began (Huang and Chen 1999).

Perhaps more remarkable is the shift in the composition of trade that China has experienced over the past 25 years. Figure 1 shows that net exports of land-intensive bulk commodities, such as grains, oilseeds and sugar, have fallen, while exports of higher-valued, more labor-intensive products, such as horticultural and livestock and aquaculture products have risen. In other words, China has begun to export those commodities in which it has a comparative advantage and import those in which it does not have an advantage. Disaggregated, crop-specific trade trends also show the same sharp shifts (Anderson et al. 2004).

The production and marketing environment

After more than 25 years of reform one of the most striking differences in the nature of agriculture is the role of government and local leaders in the production and marketing process. In contrast with the time during the Socialist era when local (commune and brigade) officials and bureaucrats in government supply and marketing agencies were deeply involved with all aspects of pre- and post-harvest decisions, by 2005 the situation had changed dramatically. Indeed, one of the most notable features of China's agricultural economy today (with several exceptions) is the limited extent of government involvement. Restrictions on land ownership aside, China today may have one of the least regulated domestic agricultural economies in the world. In a recent survey done by the Center for Chinese Agricultural Policy, with the exception of farmers that were renting village-owned orchards that had been planted in the 1980s and early 1990s, in 100 percent of the responses the farmer said that he/she made the planting decision and was not compelled by local officials (Rozelle *et al.* 2006). In another survey of households in eight provinces, all farmers in the survey stated that they purchased all of their chemical fertilizer on their own and that local officials had no role in the transaction (Zhang *et al*. 2005). Moreover, all purchases were made from private suppliers.

On the procurement side, whereas it used to be that government parastatals were responsible for purchasing the output of China's farms, today, a large majority of sales of grain, oilseeds and fiber crops and literally all sales of horticultural and livestock

products are to small, private traders (Wang *et al*. 2006). Indeed, even with the rise of supermarkets and processing firms that are catering to the retail needs of the urban population, a recent survey found that almost all purchases of fruit, vegetables, nuts and livestock products are by individual entrepreneurs who are trading on their own account. The existence of millions of small traders that are competing with virtually no regulation has meant that China's markets have become integrated and efficient (Park *et al*. 2002, Huang *et al*. 2004, and Rozelle and Huang 2004, 2005).

Productivity trends and rural incomes

While it is possible that agricultural productivity trends tell a somewhat different story of how transition affects agricultural performance than is the case for output (as it did in the pre-reform period), this is not so. First, as seen in Table 1, output per unit of land (i.e., yields) all rose sharply. In addition, for the entire reform period, trends in agricultural labor productivity (ALP), measured as output per farm worker, parallel those of yield. Moreover, several series of total factor productivity (TFP) estimates have been produced for China's agriculture (McMillan et al. 1989, Fan 1991, Lin 1992, Wen 1993, Huang and Rozelle 1996, Fan 1997, Jin et al. 2002). The studies uniformly demonstrate that in the first years after reform (1978 to 1984), comprehensive measures of productivity (either constructed TFP indices or their regression-based equivalents) rose by 5 to 10 percent per year.

In part due to rising productivity, and perhaps even more due to the increasing efficiency associated with specialization, shifting to the production of more higher value crops and livestock commodities and the expansion of off-farm work, rural incomes during the reforms have steadily increased (Table 3). Between 1980 and 2000, average real rural per capita incomes have risen from 771 to 2347 yuan. This annual rise (6 percent) is remarkable and is as high as the growth rates experienced in Japan and Korea during their take-off years. The amount of attention given to the rural income problem by the media might seem surprising, but the reason has to do with the faster rise in urban relative to rural incomes. The increasing inequality is not only between rural and urban but also within the rural economy, between those that began relatively rich and those that were poor at the outset of reform. The growth rate of rural per capita income for those in

the richest decile is higher than average, at more than 8 percent annually. In contrast, although incomes are rising (at 3 percent annually), the rates of increase for others are far lower than for the richest, meaning in relative terms the poorest of the rural poor are falling behind.

Summary of agriculture's performance during the transition era

In summary, whereas the Socialist era saw little transformation, during the transition period China's agricultural sector has changed dramatically. Although the sector grew, its fall in importance in the overall economy, in terms of both output value and employment, characterize modern growth. The structure of the sector itself also is changing, diversifying out of coarse grains into fine grains, out of staple grains into higher valued crops, and out of cropping into livestock and aquaculture. Trade patterns are also changing more in line with China's comparative advantage. One of the largest shifts is in the nature of the production and marketing environments; they have almost become laissez-faire and now involve little government intervention. Although the most dramatic changes have taken place most rapidly among the richer households, change is also occurring among the poor.

Institutions and policy bases of reform

Unlike in the transitional economies in Europe, leaders in China did not move to dismantle the planned economy in favor of liberalized markets during the initial stages of reform (Rozelle and Swinnen 2004). Policymakers only began to shift their focus to market liberalization in 1985 after decollectivization was complete. Even then, liberalization was start-stop (Sicular 1995). Lin, Cai and Li (1996) argue that leaders were mainly afraid of the disruption that would occur if the institutions through which leaders controlled the main goods in the food economy (such as grain, fertilizer, and meat products) were eliminated without the institutions in place that work to support more efficient market exchange. Throughout, leaders also were investing and changing the

rules under which domestic producers and consumers interacted with the external economy.

Pricing policies

Although early in the reforms China's leaders had no concrete plan to liberalize markets, they did take steps to change the incentives faced by producers that were embodied in the prices that producers received for their marketed surplus. Hence, perhaps one of the least appreciated moves of the early reformers was their bold decision to administratively increase the prices received by farmers (Lardy 1983, Sicular 1988b). Between 1978 and 1983, in a number of separate actions, above-quota prices (the payments farmers received for voluntary sales beyond the mandatory deliveries) were increased by 41 percent for grain and by around 50 percent for cash crops (Sicular 1988b). According to State Statistical Bureau data, the relative price of grain to fertilizer rose by more than 60 percent during the first 3 years after reform. During the early reform years, the rise in the above-quota price (a state-set price) represented a higher output price at the margin for farmers (Sicular 1995).

The important contribution of China's pricing policy was in the timing and breadth of the policy change. The first major price rise occurred in 1979, almost at the time reformers were deciding to decollectivize. However, following the leadership's decision to gradually implement the Household Responsibility System (HRS—discussed below), beginning first in the poorest areas of China, the price increases immediately affected all farmers, regardless of whether they had been decollectivized. By 1981, the time of the second major price increase, less than half of China's farmers had been allowed to dismantle their communes (Lin 1992). Hence, as long as there was some, albeit weak, link between the output price and production, the plan-based price rise would have led to increases in China's farm output. Empirical studies on China confirm that there was a strong impact of these price changes on output during the first years of transition (Lin 1992, Fan 1991, Huang and Rozelle 1996, Fan and Pardey 1997).

Increased incentives

China's rural economic reform, first initiated in 1979, was founded on the household responsibility system (HRS). The HRS reforms dismantled the communes and contracted agricultural land to households, mostly on the basis of family size and number of people in the household's labor force. Most importantly, after the HRS reforms, income and control rights other than the right to sell land belonged to individual households. That is, farmers became the residual claimants to their efforts.

There is little doubt that the changes in incentives resulting from property rights reforms triggered strong growth in both output and productivity. In the most definitive study on the subject, Lin (1992) estimates that China's HRS accounted for 42 to 46 percent of the total rise in output during the early reform period (1978 to 1984). Fan (1991) and Huang and Rozelle (1996) find that even after accounting for technological change, institutional change during the late 1970s and early 1980s contributed about 30 percent of output growth. Empirical researchers also have documented impacts that go beyond output. For example, McMillan et al. (1989) document that the early reforms in China also raised total factor productivity, accounting for 90 percent of the rise (23 percent) between 1978 and 1984. Jin et al. (2002) show that the reforms had a large effect on productivity, contributing greatly to a rise in TFP that exceeded 7 percent annually.

Domestic market liberalization policies

In addition to pricing changes and decollectivization, another major task of reformers is to create more efficient institutions of exchange. Markets—whether classic competitive ones or some workable substitute—increase efficiency by facilitating transactions among agents to allow specialization and trade and by providing information through a pricing mechanism to producers and consumers about the relative scarcity of resources. The major changes to agricultural commerce in the early 1980s almost exclusively centered on increasing the purchase prices of crops (Sicular 1988b, Watson 1994). In this way, the decision to raise prices should not be considered as a move to liberalize markets, since planners in the Ministry of Commerce made the changes administratively and the price

changes mostly were executed by the national network of grain procurement stations acting under direction of the State Grain Bureau.

An examination of policies and the extent of marketing activity in the early 1980s illustrate the limited extent of changes in the marketing environment of China's food economy before 1985. It is true that reformers did allow farmers increased discretion to produce and market crops in 10 planning categories, such as vegetables, fruits, and coarse grains. Moreover, by 1984 the state only claimed control over 12 commodities, including rice, wheat, maize, soybean, peanuts, rapeseed, and several other cash crops (Sicular 1988b). However, while this may seem to represent a significant move towards liberalization, the crops that remained almost entirely under the planning authority of the government still accounted for more than 95 percent of sown area in 1984. Hence, by state policy and practice, the output and marketing of almost all sown area was still directly influenced by China's planners. Reforms proceeded with equal caution when reducing restrictions on free market trade.

After 1985, although the process proceeded in a stop-start manner, market liberalization began in earnest. Changes to the procurement system, further reductions in restrictions on trading of commodities, moves to commercialize the state grain trading system, and calls for the expansion of market construction in rural and urban areas led to a surge in market-oriented activity (Sicular 1995). For example, in 1980 there were only 241,000 private and semi-private trading enterprises registered with the State Markets Bureau, but by 1990 there were more than 5.2 million (deBrauw et al. 2004).

Despite its start-stop nature, the extension of the right to private trading, to include surplus output of all categories of agricultural products after contractual obligations to the state were fulfilled, began to undermine the foundations of the state marketing system (Rozelle et al. 2000). Other than for rice, wheat, maize and cotton, reformers eliminated all planned procurement of agricultural products, such that government commercial departments could only continue to buy and sell if they did so through the market. For grain, incentives were introduced through reductions in the volume of compulsory delivery quotas and increases in procurement prices. Even for grain, after the share of compulsory quota procurement reached 29 percent in 1984, it declined to 18 percent in 1985 and 13 percent in 1990. The share of negotiated

procurement at market price increased from 3 percent only in 1985 to 6 percent in 1985 and 12 percent in 1990.

Technology and water infrastructure development

Agricultural research and plant breeding in China remain almost completely organized by the government. Reflecting the urban bias of food policy, most crop breeding programs have emphasized fine grains (rice and wheat). For national food self-sufficiency considerations, high yields have been a major target of China's research program except in recent years when quality improvement was introduced into the nation's development plan. Although there have been several private domestic and joint venture investments in agricultural research and development, policies still discriminate against them.

Today, the record on reform of the agricultural technology system is mixed, and its impact on new technological developments and crop productivity is unclear. Empirical evidence demonstrates the declining effectiveness of China's agricultural research capabilities (Jin *et al*. 2002). Our previous work found that while competitive grant programs probably increased the effectiveness of China's agricultural research system, the reliance on commercialization revenue to subsidize research and make up for falling budgetary commitments weakened the system.[1] It is possible that imperfections in the seed industry partly contributed to the ineffectiveness of research reforms in crop breeding. Since the late 1990s there has once again been a sharp rise in spending on agricultural research and development.

Investment by the state in water control—both irrigation and flood control—swamps the amount invested into agricultural research. As noted above, in the 1950s to the 1970s most of the state's effort was focused on building dams and canal networks, often with the input of corvée labor from farmers. After the 1970s, greater attention was focused on increasing the use of China's massive groundwater resources (Wang et al. 2005a). By 2005 China had more tubewells than any country in the world, except possibly India. Initially investments were made by local governments with aid from

[1] These findings are based on a series of intensive interviews and survey data gathered by CCAP from a wide range of agricultural ministry personnel, research administrators, research staff, and others involved in China's agricultural research system.

county and provincial water bureaus. But by the 1990s the government was encouraging the huge shift in ownership that was in any case occurring, as pump sets and wells and other irrigation equipment went largely into the hands of private farming families (Wang *et al.* 1995b). At the same time, private water markets (where farmers pump water from their own well and sell it to other farmers in the village) were also encouraged. The main policy initiative after the mid-1990s in the surface water sector was management reform, with the goal of trying to make water use more efficient.

Trade policy

In addition to important changes during the 1980s and 1990s in foreign exchange policy (changes that saw the nation's currency depreciate steeply and trading rights become more accessible to traders), there were a number of other fundamental reforms to China's international trading system. Lower tariffs and rising imports and exports of agricultural products began to affect domestic terms of trade in the 1980s. In the initial reform years, most of the fall in protection came from a reduction in the commodities that were controlled by single desk state traders (Huang and Chen 1999). For many products, competition among non-state foreign trade corporations began to stimulate imports and exports (Martin 2002). Although many major agricultural commodities were not included in the moves to decentralize trade, the moves spurred the export of many agricultural goods. In addition, policy shifts in the 1980s and 1990s also changed the trading behavior of state traders. Leaders allowed the state traders to increase imports in the 1980s and 1990s.

Moves to relax rights of access to import and export markets were matched by actions to reduce the taxes that were being assessed at the border. After the elimination of restrictions on imports and exports of many of China's agricultural commodities, a new effort began in the early 1990s to reduce the level of formal protection. From 1992 to 1998, the simple average agricultural import tariff fell from 42 percent in 1992 to 24 percent in 1998 and to 21 percent in 2001 (Rosen *et al.* 2004).

Overall, protection in the agricultural sector has declined in the past 20 years. Much of the falling protection in agriculture has come from decentralizing authority for

imports and exports, from relaxing licensing procedures for some crops (e.g., moving oil and oil seed imports away from state trading firms), and from changes in the foreign exchange rate system. 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 control of a set of commodities that leaders consider to be of national strategic importance, such as rice, wheat and maize, still remains with government officials to a large extent (Nyberg and Rozelle 1999).

Given the changes made prior to the nation's accession to the WTO, it is not surprising that, while it was a major event in China (and it will have an effect on many sectors), in its most basic terms it is really a continuation of previous policies. Hence, the commitments embodied in China's WTO accession agreement in the agricultural sector—market access, domestic support and export subsidies—are essentially just codifying and binding what China had already done in the 1990s.

Summary: China's transition era agricultural policies

The scope of China's policy efforts during the transition era is impressive. Policy shifts were made in pricing, the organization of production, marketing, investments, technology and trade. Although the rate of investment has risen during the reform era, China is probably still under-investing in agriculture compared to other sectors and other countries. Taxes—both those that are explicit and those implicit in pricing and trade policies—also have fallen. Although China is not heavily assisting the agricultural economy in the way that characterizes its neighbors in East Asia, it appears to be heading in the direction noted by Timmer (1998) in which developing nations, after a certain point, begin to turn from extracting from agriculture to making net investments in the sector.

In addition, outside of agriculture, many policies and other factors have affected the sector. Other rural policies, such as those that govern fiscal reform, township and village enterprise emergence, and privatization and rural governance, almost certainly have a large, albeit indirect, effect on agriculture. Urban employment policies, residency restrictions, exchange rate management and many other policy initiatives also affect

agriculture by affecting relative prices in the economy, access to jobs off the farm, and the overall attractiveness of staying on the farm.

When taken together, these policies have been shown to have a dramatic effect on China's agricultural sector. They have increased output of food, driven prices down, and improved supplies of non-grain food and raw materials for industry. The mix of policies—pricing, improved property rights, market liberalization, investment, trade—also have made producers more efficient. They have freed up labor and resources that are behind the structural transformation in the agricultural economy specifically and in the rural economy more generally. One of the most convincing indicators of agriculture in China beginning to play effective roles in the nation's development is that the importance of grain in shrinking inside the cropping sector; the importance of the cropping sector is shrinking inside the overall agricultural sector; and the importance of agriculture is shrinking in the general economy. Productivity is up, and rural incomes are up. Many of the increases in welfare, however, are being generated by individuals (and there have been more than 200 million of them) that have been able to escape from grain production and move into high-valued crops, or escape from cropping and move into livestock and fisheries production, or perhaps most importantly, leave agriculture (the rural economy) altogether and move into off-farm jobs (in the city).

Quantifying the distortions to agricultural incentives since 1980

The task of quantifying the policy-imposed distortions to incentives faced by farmers in China involves first explaining the methodology used, and in particular the way distortions in the market for foreign currency are dealt with, as well as the sources of data. Once this is done the results are discussed in detail.

Methodology and data sources

The main focus of the present study's methodology is on government-imposed distortions that create a gap between domestic prices and what they would be under free markets. Since it is not possible to understand the characteristics of agricultural development with a sectoral view alone, the project's methodology not only estimates the effects of direct agricultural policy measures (including distortions in the foreign exchange market), but it also generates estimates of distortions in non-agricultural sectors for comparative evaluation. Specifically, we compute Nominal Rates of Assistance (NRA) for farmers including an adjustment for direct interventions on tradable and non-tradable inputs. It also generates an NRA for nonagricultural tradables, for comparison with that for agricultural tradables via the calculation of a Relative Rate of Assistance (RRA – see Anderson et al. 2008).

This approach is not well suited to analysis during China's pre-reform era, when prices played only an accounting function and key prices such as currency exchange rates were enormously distorted. During the reform era, however, the price comparison approach provides valuable indicators of distortions to incentives for production, consumption and trade, and of the income transfers associated with interventions. Such an approach is necessary because of not only infra-marginal low procurement prices but also the complexity and non-transparency of the trade barriers applying to agriculture, including tariffs, licenses, quotas, tariff-rate-quotas, and state trading. Exchange rate distortions present particular measurement problems and require detailed analysis if price-comparison-based measures are not to be misleading.

NRAs and CTEs

The NRA is constructed by first estimating an NRA on output. The NRA on output is used to compare the price of a commodity in the domestic economy (at the port) with the international price of the commodity at the border (that is, cif in the port for an importable good; fob in the port for an exportable), taking into account inherent differences in product quality where appropriate. Conceptually, with the NRA on output we are trying to measure the extent of the distortions due to tariffs, exchange rate distortions, and other non-tariff barriers—at the border. A positive NRA indicates that the sector is being protected, while a negative NRA points to forms of taxation.

Because we have independent observations on the prices obtained by farmers in local markets, the next step is to estimate an NRA on output at the farm level taking into account both border distortions and domestic distortions affecting farmer returns. This NRA is calculated after allowing for quality adjustment, tax or subsidies, transport, storage and handling costs in moving from the farm to the wholesale level. Their difference arises from subsidy or transfer payments that cause the prices received by farmers to differ from what they would receive under competitive internal market conditions. As we will see, these internal subsidy/tax measures had enormous impacts on the returns to Chinese farmers, particularly in the early reform era.

An important difference of interpretation between the two measures described above arises in the period where domestic distortions came from the requirement to deliver a fixed quota of output at a (low) plan price, while allowing producers to sell above-quota output at a higher market price. Clearly, these delivery requirements reduced the incomes of farm households. However, the impact on output levels is less clear. Sicular (1988) makes the point that, in the short run, the output decision of a firm is determined by the marginal, rather than the average, return. Under these circumstances, the infra-marginal tax imposed by the plan delivery requirement might not have reduced the incentive to produce. More recent work on decoupled price incentives, however, suggests that average returns may have a greater impact on output in the longer-term than previously thought, when the incentives for firm entry and exit are taken into account (de Gorter, Just and Kropp 2008). However, the inability of Chinese farm households to sell their land probably reduced the extent to which households exited in response to their reduced incomes.

Our final NRA measures also capture distortions on the input side. To do this, we provide measures taking into account direct subsidies and differences between the international prices of inputs and the prices that farmers pay for these inputs. While these forms of protection (or taxation) are important in many countries, we find that they are generally relatively small and so the overall NRA is mostly determined by the NRA at the farm output level.

Finally, while most of the focus is on agricultural producers, we also consider the extent to which consumers are taxed or subsidized. To do so, we use a measure called the

Consumer Tax Equivalent (CTE). This measure is created by comparing the price that consumers pay for their food commodity and the international price at the border. As with the NRA, differences between the NRA and the CTE arise from distortions in the domestic economy that are caused by transfer policies and taxes/subsidies that cause the prices paid by consumers (adjusted to the wholesale level) to differ from domestic market prices. If a CTE is negative, it means that consumers are paying a price that is below the international market price and that consumers are being subsidized. (For the exact methodology used to calculate these measures, see Anderson et al. 2008.)

The foreign exchange regime

Prior to 1981 the official exchange rate was seriously over-valued in China. While this did not directly affect exports and imports because decisions on their levels were made by planners, it did create serious accounting difficulties since exports generally incurred a loss (Lardy 1992). If the official exchange rate is nevertheless used, it provides misleading indicators of the incentives created by the foreign exchange regime: since it makes all foreign goods look inexpensive in domestic currency terms, it over-estimates the extent of any protection provided to any good being considered.

In 1981, an Internal Settlement Rate intended to be aligned with the average cost of earning foreign exchange was introduced, providing at least some basis for meaningful comparisons between domestic and international prices. The introduction of the Internal Settlement Rate, at 2.8 Yuan per dollar for trade transactions in 1981, represented a near-50 percent devaluation relative to the official exchange rate. It was used only for non-trade transactions. This internal rate remained at 2.8 until January 1985, when it was merged with the official exchange rate.

During most of the reform period, the Chinese foreign exchange regime was relatively transparent in its effect. Between the late 1970s and 1994, it was one of those characterized by Kiguel and O'Connell (1995) as involving differential rates for different types of current account transactions. The overvalued official exchange rate was a key element of this system. Prior to 1979, enterprises had to surrender all of their foreign exchange earnings at that rate. However, a right for exporting enterprises to retain some of their foreign exchange earnings was introduced in 1979 (Lardy 1992, p. 707). Given

the pervasive shortage of foreign exchange in the economy, it is clear that the value placed on these retained earnings was, on average, considerably above the official exchange rate, even though the value of this reform was diminished by restrictions on the tradability of retained foreign exchange between enterprises, whose needs for foreign exchange inevitably varied considerably.

Over time, restrictions on trade in retained foreign exchange were liberalized, and a legal secondary market exchange rate emerged that was higher (more depreciated) than the official exchange rate. There was always a shortage of foreign exchange at the official exchange rate, forcing importers to meet their needs for additional foreign exchange at the secondary market rate. Under these circumstances, the exchange rate system created a distortion analogous to a tariff and an export tax. The exchange rate received by exporters was lower than that paid, at the margin, by importers.

To account for the effects of the exchange rate system, we construct an exporter exchange rate series using the retention ratio to calculate a weighted average of the official and the secondary market exchange rates. We use the secondary market exchange rate as an indicator of the price paid for foreign exchange, at the margin, by importers. Following the methodology outlined in Anderson et al. (2008), we calculate an estimated equilibrium exchange rate as the simple average of the importer and the exporter exchange rates. This arbitrarily assumes equal elasticities of demand and supply for foreign exchange, but this assumption does not affect the final results for any trade impacts since taxes on imports and taxes on exports have the same effect (the Lerner Symmetry Theorem).

The share of export earnings eligible to be retained rose over time, and the extent to which these rights were tradable increased. Initially there were limited opportunities to trade these rights, and their shadow value varied from firm to firm depending upon their foreign exchange earnings and their need for foreign exchange. Policy makers quickly recognized that it was important to be able to able to transfer foreign exchange between firms. Lardy (1992) notes that foreign exchange trading rooms were first established in Guangzhou (1980) and in Shanghai (1981). However, the exchange rates in these markets tended to be heavily managed, with the government seeking to set the selling price at, for example, the Internal Settlement Rate (Lardy 1992).

Formal foreign exchange adjustment centers (FEACs) began to be established on a large scale after 1985. These allowed firms with excess foreign exchange earnings to sell to ventures that sold their output domestically and needed foreign exchange. Over the next few years, a large network of these centers was established, and these markets became more closely integrated over time. By 1988, Lardy (1992) concludes that the price in the Shanghai market was subject to supply and demand, subject to the conditions on use of foreign exchange, including licensing requirements and import duties on imported goods. In parallel, the pricing policies for imported goods were becoming more liberal, such that by 1990 about 90 percent of all imported goods were based on the import price plus costs such as transport and tariffs (Lardy 1992).

During the transition period, the exchange rate regime had an extremely important influence on the returns obtainable from exported goods and the prices paid for imported goods. Even in the absence of explicit trade policies, overvalued official exchange rates tended to lower the returns to exported goods, and to increase the cost of imported goods, often by large amounts. The combination of an overvalued official exchange rate and a secondary market rate exchange rate at which importers could purchase foreign exchange legally allows us to assess the effects of the foreign exchange regime, and to be begin to assess the impacts of other trade policies.

The analytics of a multi-tier exchange rate system are relatively clear and easily seen in a partial equilibrium setting. Appendix Figure A3 shows the determination of the exchange rate in a market characterized by an upward-sloping supply of foreign exchange (perhaps determined by the marginal cost of generating additional assets) and a downward sloping demand for foreign exchange (perhaps determined by the extent of substitutability of imports for domestic goods). If there is an official exchange rate, E_0, at which exporters must surrender their foreign currency to the central bank, and a secondary market exchange rate, E_m , at which importers can buy foreign exchange, then the two-tier exchange rate system functions as a uniform tax on all exports or (equivalently) a uniform tax on all imports. Appendix Figure A3 shows the effect of such a regime. Setting the official exchange rate at E_0 reduces the returns to exporters relative to the equilibrium rate E. The resulting shortage of foreign exchange drives up its scarcity value and, in the presence of a secondary market, its market price for sale to importers, to

E_m. Under these circumstances, the two-tier exchange rate reduces export earnings from Q_E to Q_S.

Introducing a foreign exchange retention scheme of the type used in China during the transition raises the return to exports by allowing them to convert some of their foreign exchange earnings at the higher secondary-market rate. The result of this is to increase the supply of foreign exchange from Q_S to Q_S'. The increase in the supply of foreign exchange allows its price on the secondary market to fall to EM′. This reduces the cost of imported goods, and increases the demand for imports from Q_S to Q_S'.

The tax on exporters was diminished by the fact that exporters were allowed to retain some of their foreign exchange earnings and sell them on the secondary market. These retention rates have been estimated roughly as 20 percent between 1981 and 1984, 25 percent in 1985 and 1986, 44 pct between 1987 and 1990 and 80 percent between 1991 and 1994 (World Bank 1994). The resulting blended average received by exporters is shown as E'_x in the figure. The introduction of the foreign exchange retention scheme reduces the secondary market rate because of the increased incentive to supply foreign exchange.

The difference between the importer exchange rate and the estimated equilibrium rate is used as a measure of the exchange rate distortion component of protection to import-competing products. Similarly, the difference between the exporter exchange rate and the equilibrium rate is used as a measure of the exchange rate distortion to exportable goods. Using these principles, we obtain the results in Appendix Table A1. We use several different series for secondary market exchange rates: the internal settlement rate in 1981-1984; an estimated secondary market exchange rate in 1985-6; and the FEAC rate from 1987 to 1994. The idea is to take into account the information on the average exchange rates applying in Foreign Exchange Adjustment Centres when they operated (1987-94).

Raw data on the official exchange rate and several measures of the secondary market rate are presented in Appendix Table A1, together with the estimated foreign exchange retention rates and calculated measures of the exchange rates applying, at the margin, to exporters and importers during the period. The final column of the table shows the estimated “equilibrium” rate.

The data used

In compiling our data we necessarily had to make choices on the coverage of the commodities included in the study. Overall we have included 11 commodities: rice, wheat, maize, soybean, cotton, pigmeat, milk, poultry, fruit (using apples as a representative product), vegetables (using tomatoes as a representative product) and sugar (both sugarbeet and sugarcane). Over the study period, these commodities account for between 75 percent (in the late 1980s) and 60 percent (during the early 2000s) of the total value of agricultural output in China (Appendix Figure A4). Because decisions on production and consumption to China's domestic market prices were only gradually being allowed to respond to domestic prices, and because we do not have access to reliable data on secondary market exchange rates prior to 1981, we focus on data for the period beginning in 1981.

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

measure of protection. For more recent years, survey teams from the Center for Chinese Agricultural Policy interviewed traders in 10 cities around China in 2006. The data and sources for all of the commodities are in the Appendix.

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

Other data used in this study include tariff rates, tax and subsidies. Tariff rates are from the Office of Tariff Regulation (Import and Export Tariff Regulation and Import Tariff and Export Tariff Rebate Compilation). Agricultural tax data come from cost of production surveys conducted by National Development and Reform Commission. Subsidies (e.g., recent grain subsidies) are from various government documents. Aggregate input subsidies are from estimates of PSEs by the OECD (2005), which are disaggregated into individual commodities based on crop area share.

Results

One indicator of the success of China's reform policies can be seen indirectly by examining free market prices on four of China's most important crops (Appendix Figure A5). Despite the sharp rise in demand after 1980 for all commodities, as a result of increases in the population, rapid increases in income, the shift of the population from rural to urban and gradual marketization, prices were relatively stable over time and showed little trend. With an overall self sufficiency rate for rice, wheat, maize and soybean during the 1980s and 1990s of nearly 100 percent (Huang and Chen 1999), it is clear that China's domestic production kept up with growth in demand. The rise in supply as well as total factor productivity is shown in many papers to come from a reduction in the distortions to production incentives that were driven by a combination of improved

property rights, access to new technologies and other factors (Lin 1992, Fan 1991, Huang and Rozelle 1996, Jin et al. 2002).

The role of domestic price and marketing policy

Before examining the role of distortions at the border, it is useful to examine the relationship between the available domestic price series for farm and retail prices for the major grain crops (Appendix Figure A6, Panels A, B and C). The importance (and role) of China's domestic price and marketing policy for rice, wheat and maize (the three largest crops in China) can be seen by comparing the state-set urban retail price and the state-set rural farm-gate procurement price with the rural retail price, a free market price. As discussed above, until 1992 the urban retail price for rice was generally substantially below the price on the free market in rural areas, despite the costs associated with transferring rice to the urban area. This was a consequence of a procurement price system designed to provide urban residents with relatively inexpensive (i.e., subsidized) food. Only urban residents could buy rice at these low prices and only with ration coupons that were available in limited quantities.

In addition, the marketing and procurement system may have been the source of additional distortions. The relatively low price of the selling price of grain at the farmgate by farmers shows that China's food system in the 1980s was set up to transfer income from rural to urban. The amount that farmers received for the mandatory deliveries was far below the free market price. However, there is some question about the effects on incentives for production and consumption given the infra-marginal nature of many of these transfers (Sicular 1988a). This is because after the mid-1980s farmers were able to sell additional amounts at higher market prices once they had met their obligation to deliver a fixed quota quantity at the low purchasing price. If a farmer sold more grain than was required by his/her delivery quota, and the above quota price was determined by market forces, there may have been less of a distortion. Ultimately, however, even such policies are not fully decoupled from incentives, with seemingly infra-marginal transfers away from rural households, for instance, giving their members an incentive to move out of agriculture (Wang et al. 1999). Therefore, the distortions created by domestic

marketing and procurement systems may have distorted incentives relative to international prices.

From 1992, however, changes to China's domestic marketing and procurement system appear to have eliminated this additional layer of regulation for producers of rice, wheat and maize (Appendix Figure A6). In the early 1990s the urban price began to rise above the farm gate price, and urban and rural retail prices also came much closer together. This reflects the phasing out of the implicit taxation of farmers through the grain procurement system. The gap between urban and rural retail prices eventually disappeared, and the gap between the rural retail price and the farm price declined, possibly suggesting an improvement in marketing efficiency (Park et al. 2002). With the disappearance of the distortions from the marketing and procurement system, the remaining distortions after the mid-1990s reflect only trade policies and not trade and domestic policies.

Nominal rates of assistance for China's main agricultural commodities

In this section we focus on the distortions faced by farmers in China between 1980 and 2005. To do so, we plot NRAs on output (at the wholesale and farm level) over time for each of the 11 commodities. Because input subsidies were generally small in most of our sample period, we do not discuss these measures in this section of the paper. As discussed above, each NRA is computed at adjusted exchange rates. The resulting NRAs are summarized in Table 4 as five-year averages, and annual prices and NRAs are provided in numerous tables and figures in the Appendix.

*Distortions to the grain economy before 1995***.** The distortions to the rice economy of China in the 1980s and early 1990s are characterized by two important features. First, the NRA of rice, an exportable commodity, is negative in every year between 1981 and 1995. Ranging between around -60 and -10, the negative NRA values show that China was highly competitive in international rice markets during these years, since it was nonetheless able to export rice. Trade policy, however, kept exporters from shipping large quantities of rice onto world markets, and kept the free market price of rice in China's port cities below the world price. Clearly this demonstrates China's commitment to keeping domestic market prices low. Even if there had been no other

distortions in the rice economy, producers would have faced prices below world market prices.

The second feature demonstrates how domestic marketing and procurement placed a greater tax on farmers and insulated the domestic price of rice from the world market price even if trade policy had been liberalized. Because of China's marketing policy that lasted through the mid-1990s, the state's artificially low procurement price kept the price received by farmers systematically below the free market price of rice. Because of this the tax on rice ranged between -66 in 1981 and -33 in 1991 (Appendix Table A2 and Appendix Figure A7). Rice producers were among the most heavily taxed farmers in China, given the crop's large share of sown area and large negative rates of assistance. Importantly, our analysis shows how the state used trade and procurement policy to tax its rice farmers.

Unlike rice, the measures of NRA show that trade policy offered some protection to wheat in China between 1981 and the mid-1990s (Table 4). During this period, the free market price of wheat in China's port cities ranged between 27 and 64 percent, and averaged about 45 percent higher than the international price of wheat (cif, China's port cities). This alone would suggest that China's wheat producers—who have been shown to produce at a higher cost than producers in many other countries (Huang and Ma 2000)—received significant protection from trade policy. However, domestic marketing policies were working in the opposite direction of trade policies. The NRA results in Appendix Table A8 show how the forced deliveries of wheat quotas reduced farmers the potential benefits from the high rates of protection. Although protection averaged around 15 percent for wheat farmers in most years between 1981 and 1995, the rates were lower (all below 50 percent except in 1995) and were zero and even slightly negative in 5 of the 15 years (1981, 1982, 1990, 1992 and 1993).

The story of maize is a mix of those for rice and wheat (Table 4). In some years, trade policy provided positive protection for maize (1983 to 1987, 1989 and 1994), while in other years the domestic price of maize was lower than the world market price. On average, trade policy protected maize only marginally between 1981 and 1995. As with rice and wheat, procurement policy further depressed the price of maize in China's farmers. In fact, except for 1985 and 1994, from the 1980s to the early 1990s the net

effect of international trade and domestic marketing policy was to tax China's maize producers.

Distortions to the grain economy after 1995. After 1995 our distortions analysis shows that China's international trade and domestic marketing policies changed strikingly (Table 4). China's domestic marketing policy finally was able to eliminate the procurement policies that had been taxing rice, wheat and maize farmers (either by reducing the tax imposed by the export policy as in the case of rice, or reducing the protection as in the case of wheat). In other work, Huang et al. (2006) show that the elimination of the procurement quota contributed significantly to a reduction in the tax burden shouldered by farmers.

The liberalization of domestic markets in the mid-1990s was accompanied by a liberalization of trade policy, at least in the case of China's major food grains (Appendix Figures A7 to A9). After 1995, the taxation and subsidization of rice and wheat clearly were being phased out as the NRAs for rice steadily rose (became less negative) and the NRAs for wheat fell. Likely in part in preparation for its accession to the WTO, China's leaders liberalized trade for its main food grains to such an extent that between 1995 and 2001 most of the protection for these crops was phased out. Since 2001, the NRAs for both rice and wheat have been almost zero.

Interestingly, the case of maize is a bit different from the other crops (Apendix Figure A9). In a number of years after 2000, the NRA for maize has been positive. This indicates that at least in some years national leaders have been protecting maize producers. As discussed in Rozelle and Huang (2004), this may in part have been due to the rise of the Jilin lobby in the government that has been successful in gaining protection for the producers of its most important crop.

Edible oils and cotton. The biggest difference between the analysis of distortions of grain crops and of cash crops (at least for soybean and cotton) is that domestic marketing policy historically has played less of a role. Although in some counties in China there was a procurement delivery quota for soybean producers, it was not as widespread as for grains (in many counties soybean was not procured by the state procurement system). In addition, the implicit tax on soybean in places where soybean quotas were collected was lower than that for the staple grain crops. Therefore, there is

little difference between the NRAs on output at the wholesale and farm level. The same is true for cotton, except in the case of cotton through the mid-1990s free market procurement of cotton by private traders was not allowed. When reform finally came to the cotton industry in the mid-1990s, leaders did not move to a two-tier pricing system, but instead allowed for both private trade and commercialized government cotton procurement stations. As a result, in the case of cotton the measures of distortion for NRAs on output at the wholesale and farm-level are nearly the same. The same is true for all of the rest of the commodities (livestock, horticulture, milk and sugar). As a result, the discussion in the rest of this section—for both the 1980s, the 1990s and the post-2000 period—focuses on trade policy.

Before 1995, our analysis shows that soybean also fluctuated between being taxed and protected (Table 4 and Appendix Figure A10). Although the average level of protection was close to zero, it ranged from -20 percent to +40 percent. In a paper by Rozelle and Huang (2005) it is shown that a lot of this fluctuation was due to domestic production policy that encouraged soybean production, then discouraged it, then encouraged it while the trade regime allowed little trade.

The trends in NRAs after the late 1990s show some movement to trade liberalization for soybean (Appendix Figure A10). Beginning in the late 1990s and continuing through to 2005 the protection rate for soybean fell from around 30 percent to less than half that. This falling protection should not be a surprise given the integration of China into world soybean markets and the monotonic rise in imports (which exceeded 25 million tons in 2005). The story of soybean stands in sharp contrast to that of maize which enjoyed increasing protection. Because of the competition between maize and soybean for land and other resources, it appears that at the very time that protection for maize began to rise, soybean production was subject to sharp liberalization.

The distortion analysis for cotton, in some sense, produces results similar to those for rice. The combination of trade and monopoly procurement policy kept domestic cotton prices lower than world market prices in the 1980s and early 1990s. It appears that China's planners were taxing cotton farmers to supply its emerging textile industries with relatively inexpensive raw materials. Such high implicit taxes on cotton, and serious

insect problems, undoubtedly contributed to stagnant and even falling planted area in many regions (CNBS 2004).

After 1995, however, with the liberalization of domestic markets (mostly) and increased trade liberalization (somewhat) there clearly been a shift in the level of distortions faced by cotton producers. Although there were fluctuations (protection was high in 2000 but cotton was implicitly taxed in 1999 and 2001), the average NRA since the mid-1990s, taking into account trade status in each year, has been close to zero. In recent years, despite the fact that national leaders could impose tariff rate quotas (TRQs) on cotton after a certain amount is imported, trade officials essentially have left the level of imports in most years to be determined by the market.

Livestock, sugar and horticultural commodities. With the exception of several years in the late 1980s and early 1990s for fruit, and pre-1985 for poultry, the patterns of distortions to China's livestock and horticultural sectors are remarkably similar (Table 4). In all cases in the early reform era there was heavy implicit taxation on livestock and horticultural commodities. In part, as noted by Huang et al. (2004), this situation was created by China's grain-first policy. Although China can competitively produce livestock and horticultural products, producers were not encouraged to produce or export these commodities on a large scale. Part of this was due to China's own barriers, such as the quotas on exports into Hong Kong.

Since the late 1990s the gaps between domestic and world prices of livestock and horticultural producers have fallen. Emerging markets and a relaxation of grain-first policies (often called structural adjustment policies) allowed producers to greatly expand livestock and horticultural production in large part to meet the rising demand inside China (Rosen et al. 2004). At the same time China's accession to the WTO and the appearance of a large export-oriented segment of the livestock and horticultural industries has increased the interest in and feasibility of participating in international markets. In response, the price gap measures have risen towards zero for all commodities—pigmeat, poultry, vegetables and fruit. It should be noted, however, that the price comparisons reported in the Appendix as NRAs are all still negative. If anything, China's presence in global food markets has given rise to more stringent rules and regulations on the import of livestock and horticultural commodities from China. Since measures are not China's

own distorting policies, we have not included them in the overall NRA measures—rather, we have assumed them to be zero from 1994.

The story for milk and sugar contrasts with that for livestock and horticultural commodities. During the 1980s, the NRAs for milk and sugar were positive and large (Table 4). Those for milk ranged from 40 to 160 percent between 1980 and 1987. They fell through the early 1990s, but rose again in the late 1990s before falling back somewhat in the current decade.

The aggregate picture. Aggregating the 11 commodities in our study together and assuming that our study commodities largely reflect the distortions to all of China, there is a striking pattern (Table 4 and Figure 3). In the 1980s and through to the mid-1990s, import-competing products (such as wheat, soybean, milk and sugar) were very slightly taxed on average at the farm level, including the effect of any input subsidies. The rate of protection varied considerably and inversely with international price movements, suggesting the government sought to insulate the domestic market somewhat from world price fluctuations. Exported commodities such as rice, livestock and horticultural products were subject to substantial rates of taxation, averaging 37 percent in the period 1981-1995 with large variations from year to year, including nominal rates of taxation of over 50 percent in a number of years. Since exported agricultural products accounted for a greater part of the economy than import-competing products during the early reform era, China's agricultural distortions were negative on average. In other words, for most of the reform period China was taxing its farmers through its international trade and domestic marketing policies.

One of the main findings of this study is evident from Figure 3. After 1995, the NRAs of import-competing products fell from around 20 percent to less than 10 percent. During this period, the NRA average for exportables rose (or the implicit taxes on them fell), from about -40 percent to around -15 percent. When taken together, the distortions in China's agriculture fell to less than 10 percent. In many years the overall protection was between 0 and -5 percent. Clearly, the combination of domestic marketing reforms and international trade liberalization has generated an agricultural economy that, on average, is neither being taxed nor assisted.

This does not mean, however, that all distortions have been eliminated. For the period 2000-2005, there is still a wide dispersion in NRAs across commodities, with several still having relatively high rates of protection (Figure 4). For example, sugar and milk NRAs are still greater than 20 percent, and soybean and maize also are non-trivial at more than 10 percent, while the exportable categories of fruit, vegetables, pigmeat and poultry have close to zero NRAs. That dispersion is much less than it was in earlier decades though, as indicated in Tables 4 and 5 in the fall in the standard deviation of NRAs across the 11 commodities and also in the (anti-)trade bias index.

This elimination of distortions has not only affected farmers. A similar picture is evident when looking at consumer tariff equivalents (CTEs). In the 1980s and early 1990s, consumers were being taxed by the positive protection on import-competing farm products, but were gaining from being able to consume exportables that were implicitly subsidized by marketing and trade-restricting policies. Some consumers of rice, wheat and maize were also receiving additional consumer subsidies. The net effect of these interventions is that until the past decade or so China's consumers were enjoying a large implicit subsidy, in that the average CTE was negative in the 1980s (around 40 percent) and early 1990s (around 15 percent). But then after the mid-1990s, as the distortions against producers declined and markets became the main mechanism for food flows, those households that are net buyers of food saw their implicit subsidy fall to close to zero on average. Even so, the CTE average for import-competing products is still well above that for exportables (just as for the NRA – compare Tables 4 and 6).

Comparisons with other studies

Three recent studies provide information on protection rates to agricultural products in China that can be compared with the estimates in this study. The first two are studies by OECD (2005, 2007) and the third is by IFPRI (Orden et al. 2007). These studies use a similar methodology, although they differ from ours in covering a much shorter time period, in the specific series used for price comparisons, and in the details of the methodology including the treatment of exchange rates. The OECD studies cover 1993 to

2005, while the IFPRI study provides estimates for most commodities from 1995 to 2001, (compared with our earlier coverage from 1981).

Broadly comparable estimates[2] can be obtained from the three studies for six commodities—rice, wheat, maize, sugar, soybean and cotton—and for the period 1995 to 2001. In addition, it is possible to compare the OECD and World Bank results for milk over this period. The estimated average protection rates for 1995-2001 are shown in Figure 5. As is evident from that figure, most of the estimates are similar, and the estimates for the extremely important rice and maize commodities are very close. The estimates for wheat are noticeably different, with our study suggesting this product was protected while the other studies suggest it was taxed. Our estimates for sugar, soybean and cotton are broadly comparable with the IFPRI study, but quite different from the OECD estimates. Finally, our estimate of protection to the dairy industry is much lower than the OECD's estimate.

Careful examination of the differences between our estimates and the OECD's estimates for wheat reveals that this is entirely due to different assumptions about the quality differential between Chinese and imported wheat. While this study uses a quality adjustment coefficient of -40 percent for Chinese relative to imported wheat, based on Huang, Rozelle and Minh (2004), the OECD study uses an adjustment coefficient of -15 percent. The much lower OECD estimate for protection to soybean over this period appears to result primarily from OECD's use of a Heilongjiang price—a carefully considered decision based on the fact that producers in this region produce commercially and compete with imports—rather than a national price for soybean. We find our higher rate of protection in the 1993-2001 period more plausible given the rapid expansion in imports when protection subsequently fell. However, the two sets of estimates are reassuringly comparable in the 2003-2005 period.

Our analysis for milk uses the New Zealand price for milk as the reference price plus a transport margin, while OECD uses measures based on international trade in milk products, converted to a milk equivalent basis. Our reference price is considerably higher over the period covered, resulting in the lower estimate of the rate of protection. The

[2] We thank Andrzej Kwiecinski of OECD for very thoughtful comments that helped us to understand the differences between the two sets of estimates.

sizeable difference between the two estimates for sugar arises largely from differences in the assumed marketing and handling costs for sugar between farm and wholesale levels. Where we assumed that these costs were around 15 percent of the total, the OECD assumed costs around 60 percent of the farm gate price.

These comparisons of estimates for particular products over this specific period highlight the differences, without emphasizing the important similarities in most of the estimated values, and particularly the similarities in their trends over time. However, they do highlight the importance of examining, and continuing to reexamine, the impact of particular assumptions in estimating nominal rates of assistance.

Agricultural versus nonagricultural protection

The rate of assistance to a particular sector is an incomplete measure of the implications of the trade regime for outcomes in that sector. What also matters is the protection to other tradable sectors competing for the same mobile resources such as labor and capital. In a very simple model, with only two traded-good sectors—agriculture and non-agriculture—a broad idea of the total effect of the prevailing distortions can be obtained using only information on the magnitude of two NRA measures. The distortion to the price of agricultural goods relative to nonagricultural goods provides the signal needed to guide the transfer of resources between the two sets of activities. For any given level of world prices, this price signal is given by the ratio $(1+NRA_{ag}^{t})/(1+NRA_{nonag}^{t})$. This can be converted into a Relative Rate of Assistance (RRA) as follows:

$$RRA = 100*[(100+NRA_{ag}^{t})/(100+NRA_{nonag}^{t}) - 1].$$

The estimates of NRA_{nonag}^{t} are provided in the Appendix to this paper. Briefly, these estimates take into account the effects of the trade planning mechanism, nontariff measures such as licensing and quotas, tariffs, and the exchange rate overvaluation prior to 1994. While extremely simple, we believe that those do provide a realistic indication of the broad pattern of incentives to the non-agricultural tradables sector for our sample period.

The average rates of assistance to agriculture and to non-agriculture are presented in Table 5 and in Figure 6. The data show that the agricultural sector in China was subject

to two strong and reinforcing sets of taxation in the early years of our sample, one direct and the other indirect. The direct taxation through border measures and the procurement system resulted in a negative NRA of 45 percent in 1981–84. This negative NRA was only slightly lower, at 36 percent, in 1985-89. The indirect taxation of this sector, through support to non-agricultural activities, was similar in magnitude (42 and 28 percent) to the direct taxation in those two periods.

The first major change in the incentive environment for the agricultural sector appears to have come in the mid-1980s, when the rate of protection to the non-agricultural sector declined, with the sharp reduction in the taxation of the exportable manufacturing sector resulting from the widespread availability of duty exemptions on imported goods used in the production of exports. Protection to the nonagricultural sector appears to have risen slightly for several years in the late 1980s, with increases in tariff rates and in the exchange rate distortions outweighing reductions in the effects of trade planning and nontariff barriers. However, the protection to the non-agricultural sector began to decline steadily from 1990. The decline in the direct taxation of the agricultural sector began only later, with a sharp decline in the early 1990s arising—as previously discussed—in large part from reduction in the domestic taxation of the agricultural sector via the procurement pricing system.

The declines in both the negative protection to agriculture and the positive protection to the non-agricultural tradables sector since the 1990s have changed dramatically the distortions to agricultural incentives: instead of facing a relative rate of assistance of close to -50 percent as in the 1980s, farmers are now receiving very slightly positive assistance with an average RRA of 1 percent in 2000-05. Clearly, this phasing out of farmer disincentives has been a major achievement for China's policy of reform and opening up.

Conclusions and implications

The main finding of this study is that the nature and extent of policy intervention in China's agriculture has changed dramatically over the past 25 years, transforming the agricultural sector from one characterized by high distortions to one that is relatively liberal. In the early reform period of the 1980s and early 1990s there were distortions in both external and domestic policies that isolated domestic producers and consumers from international markets. Hence the prices that domestic farmers and consumers faced were almost independent of trade policy. Because of this, even for exportable commodities such as rice, whose free market price was close to the international price, domestic pricing and marketing policies forced farmers to sell much of their surplus to the state at an artificially lower price. Hence domestic policies levied a tax on farmers even though there was little trade taxation at the border. Similar dynamics characterized importable commodities such as wheat and soybean where, despite fairly high rates of protection from trade policies, producers were receiving much less protection than they would have had there been a free domestic market for the importable, even though consumers were being implicitly taxed.

In contrast, since the late 1980s and early 1990s the liberalization of domestic markets has reduced the distortions from domestic policies, as the market gradually has replaced the state as the primary mechanism for allocating resources and has became the basis of farmer production and marketing decisions. At the same time, especially in the case of importable commodities, trade policy has become more liberalized, with distortions from border measures falling substantially. As a result, we find that in recent years China's agriculture is much less distorted in two ways. First, the differences between international and domestic market prices have narrowed considerably for many commodities due to trade policy liberalization. Second, the elimination of domestic policy distortions mean that when trade liberalization allows for the increased import or export of agricultural commodities, prices in China's domestic market change and farmers are more directly affected by them.

Despite these major reforms, there are still plenty of distortions to agricultural incentives in China. In some cases these remaining distortions arise from tariffs on importable commodities (e.g., wheat and soybean). In the case of other importable commodities (e.g., maize), the use of implicit export subsidies (permitted under WTO

rules as domestic marketing, transport and storage subsidies) continues to keep a wedge between the domestic price in China and the international market. Thus some dispersion of NRAs among farm products remains, albeit much less than in the 1980s.

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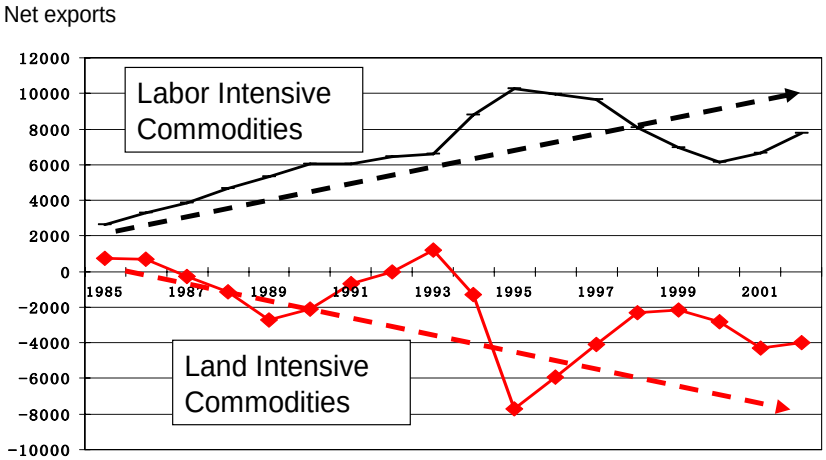
Figure 1: Agricultural trade balance by factor intensity, 1984 to 2002

(US$ million)



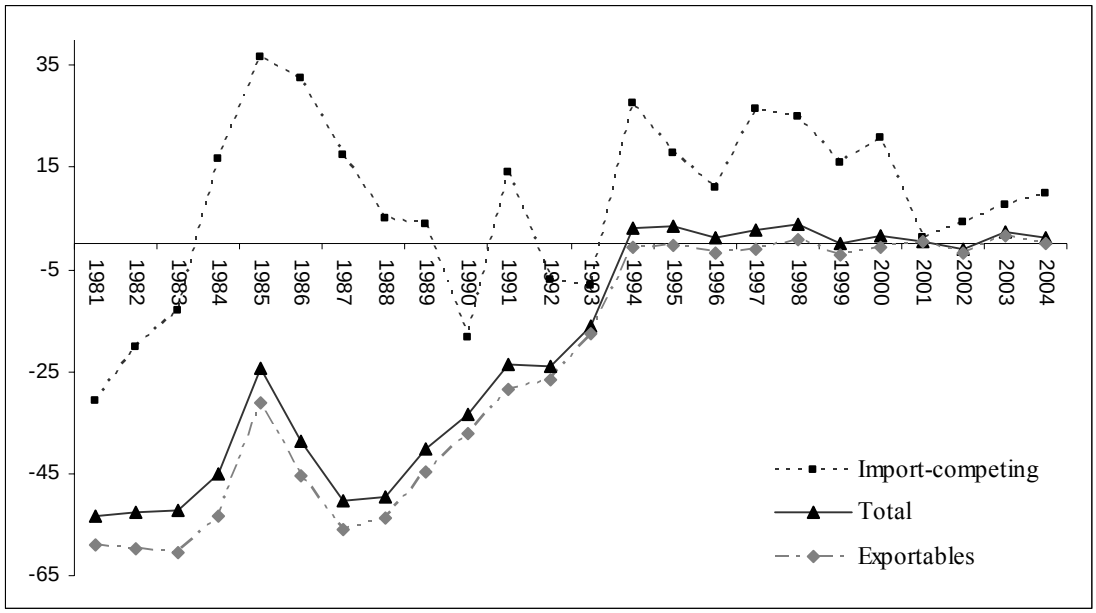
Data source: Rosen et al., Forthcoming.

Notes: Labor intensive commodities include fruits, vegetables, meat products and aquaculture products; land intensive commodities include food and feed grains, soybeans, edible oils and cotton.

Source; Rosen, Huang and Rozelle (2004)

Figure 3: Nominal rates of assistance to exportable, import-competing and all[a] agricultural products, China, 1981 to 2004

(percent)

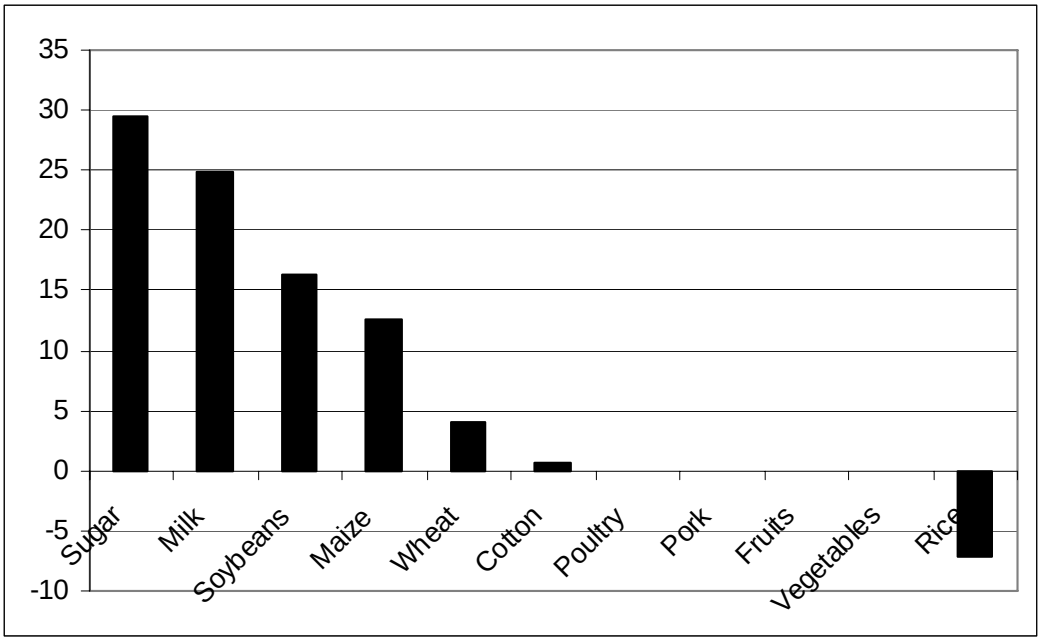


[a] The total NRA can be above or below the exportable and import-competing averages because assistance to nontradables and non-product specific assistance is also included.

Source: Authors' spreadsheet

Figure 4: Average nominal rates of assistance for producers of major commodities, China, 2000-2005

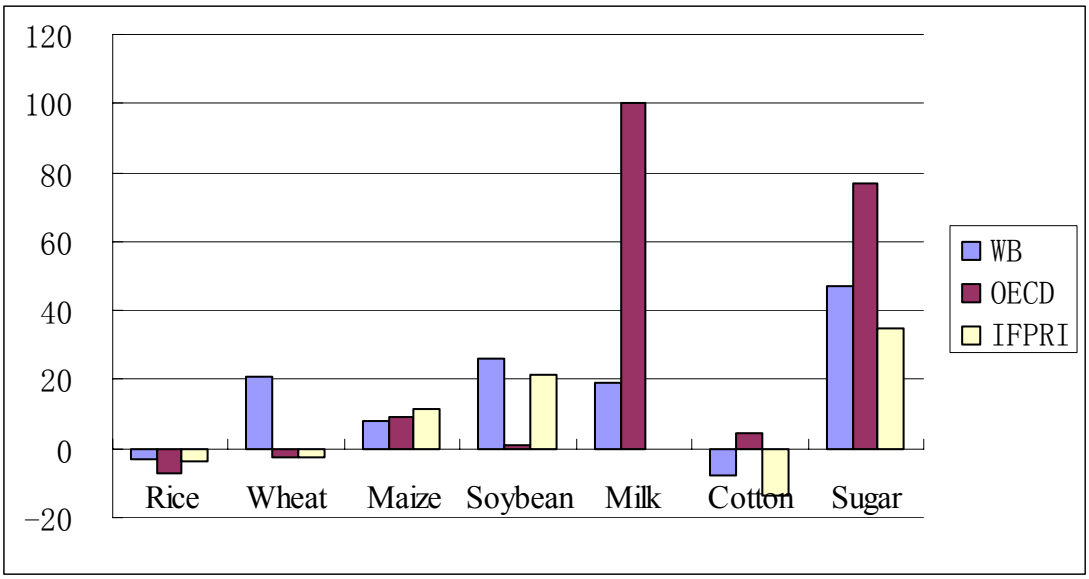
(percent)



Source: Authors' spreadsheet

Figure 5: Comparing estimates of agricultural NRAs for China, 1995-2001

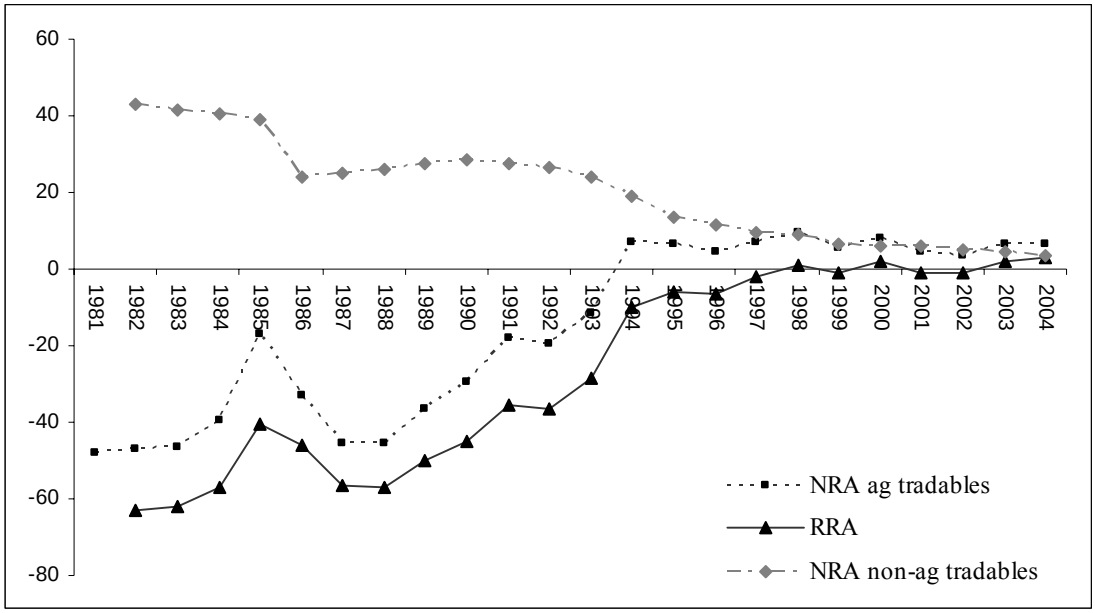
(average, percent)



Source: Authors' spreadsheet

Figure 6: Nominal rates of assistance to all agricultural tradable industries, and relative rates of assistance[a], China, 1981 to 2004

(percent)



[a] The RRA is defined as 100*[(100+NRAag^t)/(100+NRAnonag^t)-1], where NRAag^t and NRAnonag^t are the percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively.

Source: Authors' spreadsheet

Table 1: Annual real rates of growth[a] of China's economy, 1970 to 2004
(percent p.a.)

	Pre-reform	Reform period			
	1970-78	1979-84	1985-95	1996-00	2001-04
Gross domestic product	4.9	8.8	9.7	8.2	8.7
Agriculture	2.7	7.1	4.0	3.4	3.4
Industry	6.8	8.2	12.8	9.6	10.6
Service	Na	11.6	9.7	8.3	8.3
Population	1.80	1.40	1.37	0.91	0.63
Per capita GDP	3.1	7.4	8.3	7.2	8.1
Grain production	2.8	4.7	1.7	0.03	-0.2
Rice:					
Production	2.5	4.5	0.6	0.3	-0.9
Area	0.7	-0.6	-0.6	-0.5	-1.2
Yield	1.8	5.1	1.2	0.8	0.2
Wheat:					
Production	7.0	8.3	1.9	-0.4	-1.9
Area	1.7	-0.0	0.1	-1.4	-5.1
Yield	5.2	8.3	1.8	1.0	3.3
Maize:					
Production	7.4	3.7	4.7	-0.1	5.5
Area	3.1	-1.6	1.7	0.8	2.5
Yield	4.2	5.4	2.9	-0.9	2.8
Other production					
Cotton	-0.4	19.3	-0.3	-1.9	6.5
Soybean	-2.3	5.2	2.8	2.6	2.4
Other oil crops	2.1	14.9	4.4	5.6	0.6
Fruit	6.6	7.2	12.7	8.6	29.5
Meat	4.4	9.1	8.8	6.5	4.6
Fishery	5.0	7.9	13.7	10.2	3.5
Planted area:					
Vegetables	2.4	5.4	6.8	6.8	3.8
Fruits	8.1	4.5	10.4	1.5	2.2

[a] GDP (in real term) in 1970-78 is the growth rate of national income in real term. Growth rates are computed using regression method. Growth rates of individual and groups of commodities are based on production data.

Sources: NSBC, 1985-2005 and MOA, 1985-2005.

Table 2: Structure of China's agricultural economy, 1970 to 2005

(percent)

	1970	1980	1985	1990	1995	2000	2005
Share in agricultural output:							
Crop	82	80	76	65	58	56	51
Livestock	14	18	22	26	30	30	35
Fishery	2	2	3	5	8	11	10
Forestry	2	4	5	4	3	4	4

Source: NSBC, *China's Statistical Yearbook*, various issues and *China Rural Statistical Yearbook*, various issues.

Table 3: Rural income per capita in China, 1980 to 2000

(real 2000 yuan)

Income group	1980	1985	1990	1995	2000	2001	Annual Growth Rate, 1980 to 2001
Average	711	1248	1305	1702	2253	2347	6%
Bottom decile (poorest)	312	448	442	493	579	578	3%
Top decile (richest)	1530	2486	3253	4763	6805	7159	8%

Source: Compiled using data from CNBS.

Table 4: Nominal rates of assistance to covered products, China, 1981 to 2004 (percent)

	1981-84	1985-89	1990-94	1995-99	2000-05
Exportables [a, b]					
Rice	-55.7	-34.0	-30.4	-6.6	-7.2
Fruit	-28.5	-9.4	-4.0	0.0	0.0
Vegetable	-41.9	-57.5	-22.3	0.0	0.0
Poultry	25.1	-27.1	-2.7	0.0	0.0
Pigmeat	-78.6	-48.8	-14.9	0.0	0.0
Import-competing products [a, b]					
Wheat	1.9	22.3	11.3	30.2	4.0
Soybean	0.6	1.3	4.7	29.5	16.3
Sugar	43.7	44.7	11.7	26.6	29.4
Milk	128.7	58.3	-4.3	18.3	24.8
Mixed Trade Status [a]					
Maize	-35.2	-16.1	-25.1	5.3	12.6
Cotton	-33.7	-34.6	-26.2	-3.6	0.7
All covered products					
Exportables [a, b]	-58.1	-46.3	-22.0	-0.8	-0.2
Import-competing products [a, b]	-12.0	19.1	1.6	19.3	9.8
Total of all covered products [a]	**-50.8**	**-40.6**	**-18.9**	**2.3**	**0.9**
Dispersion of covered products [c]	74.3	52.3	20.7	18.4	15.5
% coverage (at undistorted prices)	85	89	85	80	66

Source: Authors' spreadsheet

a. Weighted averages, with weights based on the unassisted value of production.

b. Mixed trade status products included in exportable or Import-competing products groups depending upon their trade status in the particular year.

c. Dispersion is a simple 5-year average of the annual standard deviation around the weighted mean of NRAs of covered products.

Source: Authors' spreadsheet

Table 5: Nominal rates of assistance to agricultural relative to non-agricultural industries, China, 1981 to 2004

(percent)

	1981-84	1985-89	1990-94	1995-99	2000-05
Covered products [a]	-50.8	-40.6	-18.9	2.3	0.9
Non-covered products [b]	-29.1	-15.4	-7.3	7.8	4.2
All agricultural products [a]	-47.6	-37.9	-17.2	3.5	2.0
Non-product specific (NPS) assistance	2.4	2.4	2.9	3.1	4.0
Total agricultural NRA (incl. NPS) [c]	-45.2	-35.5	-14.3	6.6	6.0
Trade bias index [d]	-0.50	-0.55	-0.23	-0.15	-0.07
Assistance to just tradables:					
All agricultural tradables [e]	-45.2	-35.5	-14.3	6.6	6.0
All non-agricultural tradables	41.6	28.3	24.9	9.9	4.7
Relative rate of assistance, RRA [f]	-60.6	-49.9	-31.1	-3.0	1.3
MEMO, ignoring exchange rate distortions[g] :					
NRA, all agric. products	-34.9	-27.1	-11.6	3.5	2.0
Trade bias index, all agric.	-32.7	-38.0	-12.6	-15.1	-7.4
RRA (relative rate of assistance)	-52.2	-41.0	-26.5	-3.0	1.3

Source: Authors' spreadsheet

a. NRAs including product-specific input subsidies.

b. Non-covered products import-competing products are assumed to be protected at 75 percent of the rate applied on covered products. Non-covered products exportables are assumed to be protected or taxed at 80 percent of the rate applying to covered products.

c. NRAs including product-specific input subsidies and non-product-specific (NPS) assistance. Total of assistance to primary factors and intermediate inputs divided to total value of primary agriculture production at undistorted prices (%).

d. Trade bias index is TBI = $(1+NRAag_x/100)/(1+NRAag_m/100) - 1$, where $NRAag_m$ and $NRAag_x$ are the average percentage NRAs for the import-competing and exportable parts of the agricultural sector.

e. Assuming all agricultural production is tradable and including product and non-product specific subsidies.

f. The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

g. These memo items show what the average NRAag, trade bias index and RRA would be if the distortions in the market for foreign currency, as captured by the methodology outlined in Anderson et al. (2008), are ignored.

Source: Authors' spreadsheet

Table 6: Consumer tax equivalents, agricultural products, China, 1981 to 2005

(percent)

	1981-84	1985-89	1990-94	1995-99	2000-05
Exportables [a, b]					
Rice	-35.7	-28.8	-22.3	-4.2	0.1
Fruit	-29.8	-11.8	-6.3	0.0	0.0
Vegetable	-42.4	-57.9	-22.5	0.0	0.0
Poultry	26.7	-26.1	-1.9	0.0	0.0
Pigmeat	-75.1	-46.8	-14.9	0.0	0.0
Import-competing products [a, b]					
Wheat	27.5	49.1	43.3	29.0	1.2
Soybean	4.5	10.3	10.2	26.3	19.2
Sugar	89.1	36.2	32.6	43.0	60.4
Milk	127.2	57.5	-4.8	17.7	22.3
Mixed Trade Status [a]					
Maize	-13.2	10.9	-13.4	8.4	14.9
Cotton	-36.4	-37.5	-29.0	-8.6	-6.6
All covered products					
Exportables [a, b]	-52.0	-47.7	-19.2	-0.6	0.1
Import-competing products [a, b]	16.5	43.6	32.9	25.7	7.4
Total of all covered products [a]	**-44.5**	**-41.7**	**-15.8**	**1.7**	**0.7**

a. Weighted averages, with weights based on the unassisted value of consumption.
b. Mixed trade status products included in exportable or Import-competing products groups depending upon their trade status in the particular year.

Source: Authors' spreadsheet.

Appendix: Protection to Non-Agricultural Sectors in China

At the beginning of the reform era, non-agricultural protection in China was provided through four main mechanisms: trade planning; nontariff measures such as quotas, licenses, state trading and designated trading; tariffs; and exchange rate overvaluation. In this appendix, we focus on the first three measures, which provide protection (or taxation) that is specific to the non-agricultural sector. The effects of each of these forms of protection are examined in turn as a basis for attempting some assessment of their overall effects. Then, we attempt to provide estimates of the extent of protection provided to the non-agricultural sector.

The trade planning system

Decisions under the planning system focused on the quantities of goods needed to meet development objectives, such as promoting industrialization, and social needs such as food. For commodities subject to state monopoly trading, planners made decisions about the quantities of imports needed. Then, they decided on the quantities of goods needed to generate the foreign exchange required to obtain these imports. State trading firms were instructed to sell the quantities of exports required to generate the foreign exchange needed to purchase the quantities of imports included in the plan. The general view is that the planning system was quite restrictive of trade, with a strong preference for domestic production and self-sufficiency except in cases where goods simply could not be produced domestically. However, there seems little possibility of fully assessing their consequences in the absence of meaningful prices. Perhaps the best that can be done is to assess their impacts very broadly by examining their implications for overall openness of the economy. Even these measures must be treated with great caution because of the pervasive overvaluation of the exchange rate under planning, which increases the measured size of the nontraded sector relative to the traded goods sector.

The move away from trade planning was an extremely important part of the reform process. A key element of this reform was the move from mandatory planning under which the planners determined quite specifically the mix of products to guidance planning, which involved much broader indicators of performance (World Bank 1994). While mandatory state planning covered 50-60 percent of exports and 40 percent of imports in 1986 (World Bank 1988, p 22), this share had fallen to about 20 percent of imports (and no exports) by 1992 (World Bank 1994).

The move from planning was a complex task, since domestic prices were initially very seriously out of line with world prices. This created problems in the initial round of decentralization away from trade planning and contributed to a recentralization in 1981-83 (Shan 1989). The share of goods sold at fixed prices was close to 100 percent in 1978, but fell to 10 percent for retail sales and 20 percent for capital and industrial goods by 1992. To make exports profitable, the exchange rate also needed to be devalued, and this was undertaken during the reforms in the 1986-88 period.

Appendix Figure A1 shows that the shares of imports and exports were extremely small relative to GDP in the early 1970s, and grew only marginally until 1978. After the initiation of reforms, however, exports and imports began to grow quite rapidly relative

to GDP, reflecting a combination of events, including; a reduction in the emphasis on self-sufficiency amongst planners, who sought to generate exports needed to pay for imports of technology, and a reduction in the importance of planning in the total trade regime. The special economic zones (SEZs) were important sources of additional exports from the early 1980s, and export processing regime began to be applied extensively outside the SEZs from the mid 1980s.

Nontariff measures

Nontariff measures became more important as China moved away from the pure monopoly trading regime. As more and more trading firms were introduced, control over the volumes of imports needed indirect instruments such as quotas and licenses. The number of these measures increased as the trade regime moved away from state trading (Lardy 1992, p. 44).

It is clear that some of the nontariff barriers applying in the early post-reform period were quite restrictive. By 1997, the World Bank (1997, p. 15) estimated that the tariff equivalent of the remaining nontariff barriers was around 9.3 percent in 1996. At that point, the coverage of NTBs was an estimated 32.5 percent of imports, down from 39 percent in 1988 (UNCTAD 1994). However, interviews in 1996 suggested that the restrictive effects of NTBs were considerably less than in the 1980s. As a very rough guesstimate, it seems reasonable to assume that the restrictive impact of NTBs was at least 20 percent in the late 1980s.

Tariffs

Tariffs became increasingly important as a means of managing trade over the reform period. This move to price-based measures was associated with increasing liberalization of prices within China, which enabled price-based measures to help perform their function of guiding decisions on the supply and demand for products. Changes in average tariffs on manufactures in China are presented in Appendix Table A15.

From Appendix Table A15, it appears that tariff rates on manufactures remained very high—or even increased in weighted average terms—between the early 1980s and 1992. At that point, it appears that there was a substantial amount of "water" in many tariffs, with the domestic price being considerably below the world price plus the tariff for many products. After 1992, however, tariffs began to decline. After 1994, the decline became very rapid, with tariffs falling by more than half between 1994 and 1997. A great deal of the decline in applied tariffs in the late 1990s appears to have been part of the process of establishing China's *bona fides* as a candidate for WTO accession. By 2001, applied tariff rates were around a third of their level in 1992. While still important, the reductions in tariffs required after accession at the end of 2001 were much smaller than those undertaken in the lead-up to accession.

An important element of the tariff regime—and one which makes it difficult to evaluate its restrictiveness—was the exceptions provided for particular purposes. Duty exemptions on imports used in the production of exports were a particularly important element of this regime. Other duty exemptions were provided for investment goods. Many of these exemptions were initially given to Special Economic Zones (SEZs), but

the key exemptions for intermediate inputs used in the production of exports were made much more widely available from the mid 1990s. By 1990-1, only 18 (13) percent of processed (total) exports from China were from SEZs (World Bank 1994, pages 12 and 135). In 1984, 14 coastal cities were opened up; in 1985, the Pearl River Delta and the Yangtze Delta were opened; in 1988, Hainan became an SEZ. By 1990, SEZs and open coastal cities accounted for 66 percent of exports.

In addition to these formal exemption policies, there were substantial losses of tariff revenues due to avoidance and evasion of tariffs (Fisman and Wei 2004). This leakage of tariff revenues may have quite different implications from the formal exemption arrangements for intermediate inputs used in the production of exports. On one hand, it may allow additional imports to enter at low effective tariffs. On the other, it may merely result in some tariff revenue being transferred from the treasury into corrupt, private hands. Some of the leakage due to customs duty evasion shows up as a decline in the duty collection rate, and some as omission of both imports and customs duties.

The duty exemptions and duty leakages have resulted in customs duty collection rates that are and order of magnitude lower than the statutory tariffs reported in Appendix Table A16, or in Ianchovichina and Martin (2004). This table presents estimates of these collection rates for the years they are available. These estimates show that tariff collections have been an order of magnitude below the statutory rates. Part of this can be explained by duty exemptions, which applied to 34.8 percent of total imports in 1988 and 50.4 percent in 1991.

One indicator of the extent of liberalization of the trade regime affecting manufactures, and tariffs in particular, is the importance of exports of manufactures. Exports of manufactures tend to be much more intensive in their use of imported intermediates than are exports of basic agricultural or resource-intensive products (World Bank 2004). Appendix Figure A2 shows the contributions of agriculture, manufactures and other exports to total exports.

Perhaps the most striking feature of Appendix Figure A2 is the dramatic increase in the importance of manufactures exports after 1986, and particularly between 1986 and 1992. While tariffs continued to be high in the 1986-1992 period, the rapid expansion of SEZ-type privileges, and especially the right to import intermediate inputs free of duties and NTBs, appears to have had a major liberalizing effect on manufactures trade.

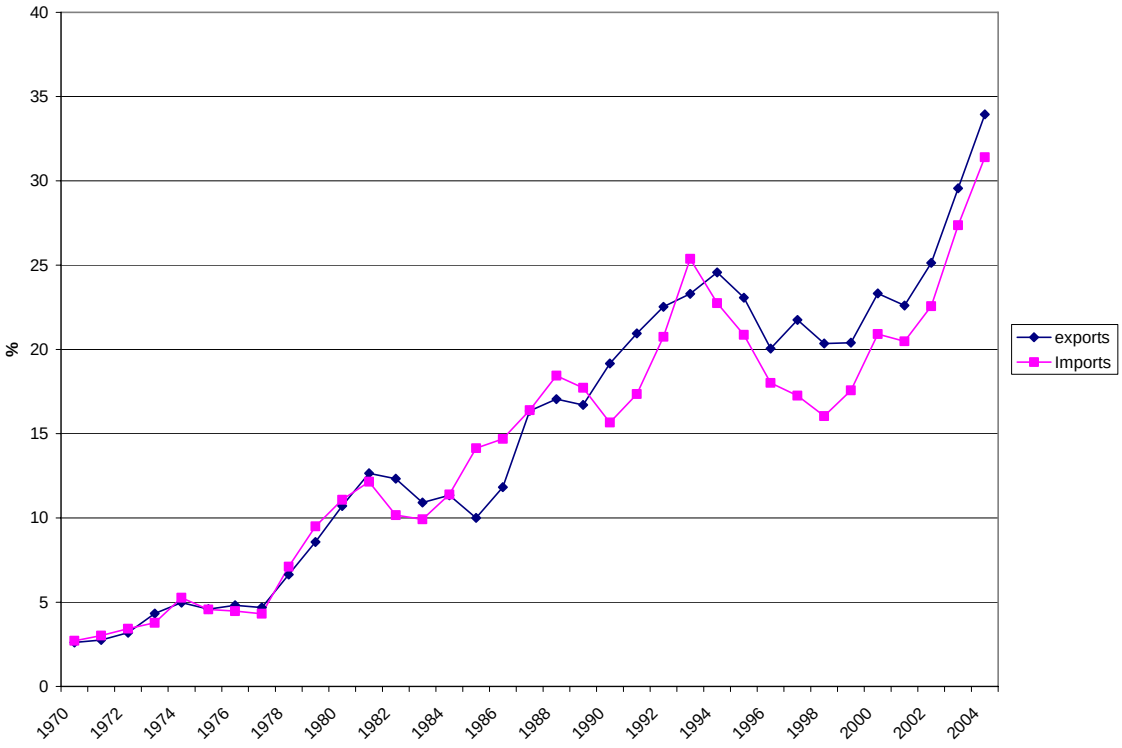
Estimated protection to the non-agricultural sector

Bringing together the various estimates of protection to the nonagricultural sector allows us to provide a summary measure of protection to the nonagricultural sector. This is done by multiplying together the estimated protective effects of three different sources of protection to manufactures—tariffs (allowing for the reduction in protection due to the duty exemption arrangements after 1986); nontariff barriers; and an estimated trade restricting impact of the trade planning system. The three estimated elements of this system of protection are given in Appendix Table A17, together with the total of these measures. The final column of the table shows the measure including the protective effect of the exchange rate regime.

The protection to the non-agricultural sector as a whole is estimated by applying the total protection rate in Appendix Table A17 by the share of the manufacturing sector

in total non-agriculture—that is by excluding the mining sector from this calculation. This made a relatively small difference to the results, since the mining sector accounted for between six and 11 percent of the nonagricultural sector. For want of better information, and because of its small size, protection to the mining sector was assumed to be zero. We also assumed that the exportable sector of the manufacturing sector made up one half of the manufacturing sector, and that this sector received zero protection or taxation. This seems a reasonable presumption for most important exportable subsectors given the widespread availability of duty exemptions on intermediate goods used in the production of exports. Finally, the protective impact of the exchange rate regime on importable non-agriculture, and on exportable non-agriculture were added back to obtain a complete measure of protection. This calculation provided an estimate comparable with the average protection applying to the agricultural sector.

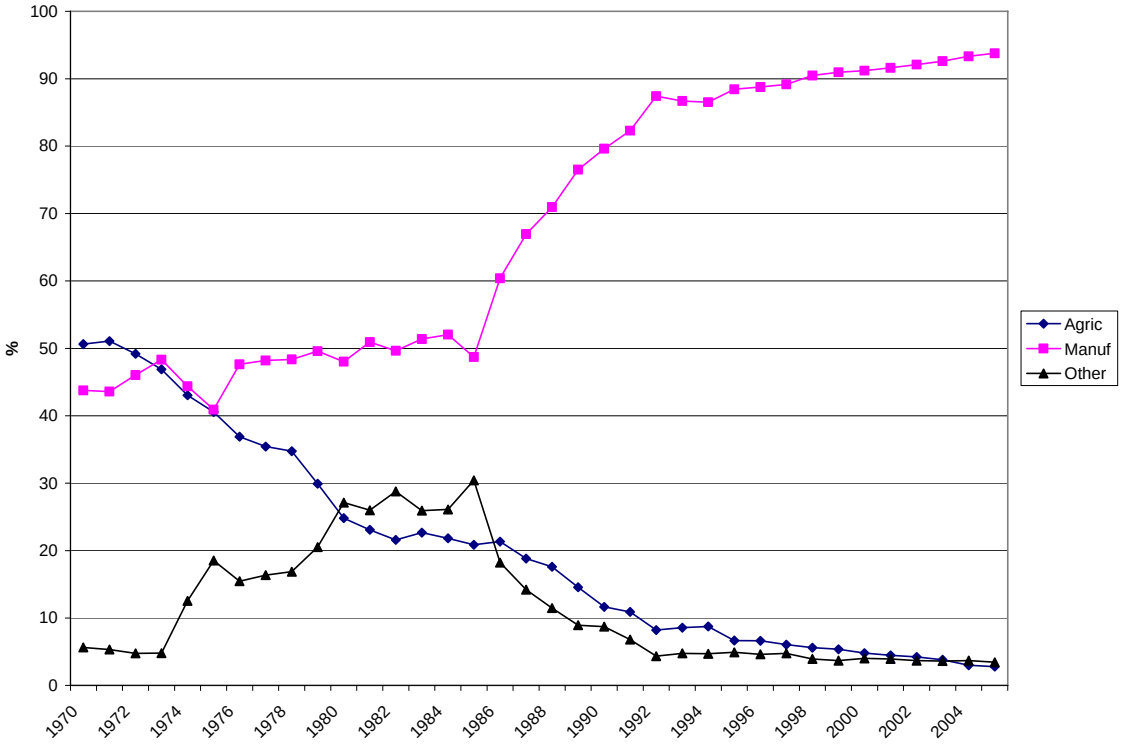
Appendix Figure A1: China's imports and exports relative to GDP, 1970 to 2004 (percent)



Source: NSBC

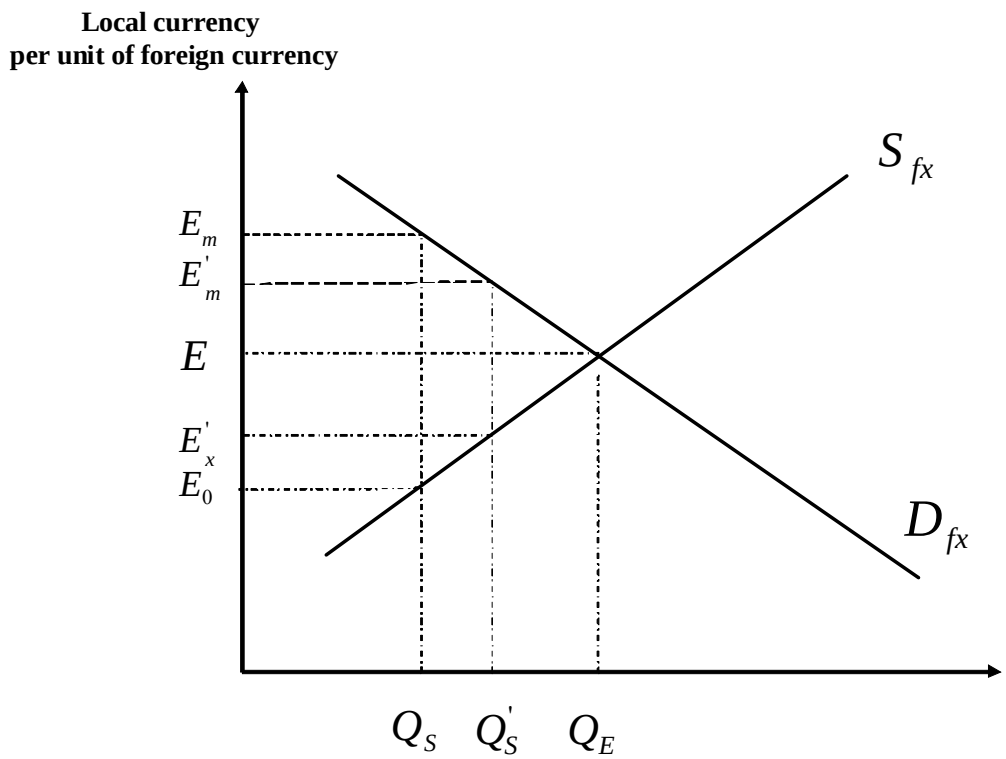
Appendix Figure A2: Shares of agriculture, manufactures and other merchandise in China's exports, 1970 to 2004

(percent)



Source: NSBC

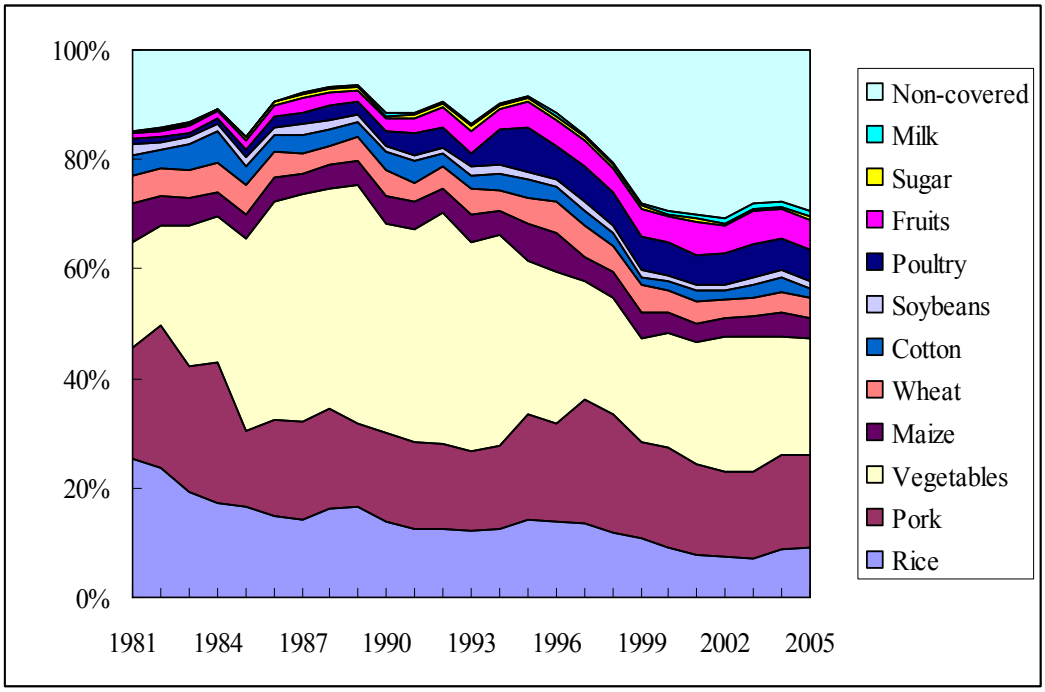
Appendix Figure A3: The domestic market for foreign currency



Source: see Anderson et al. (2008).

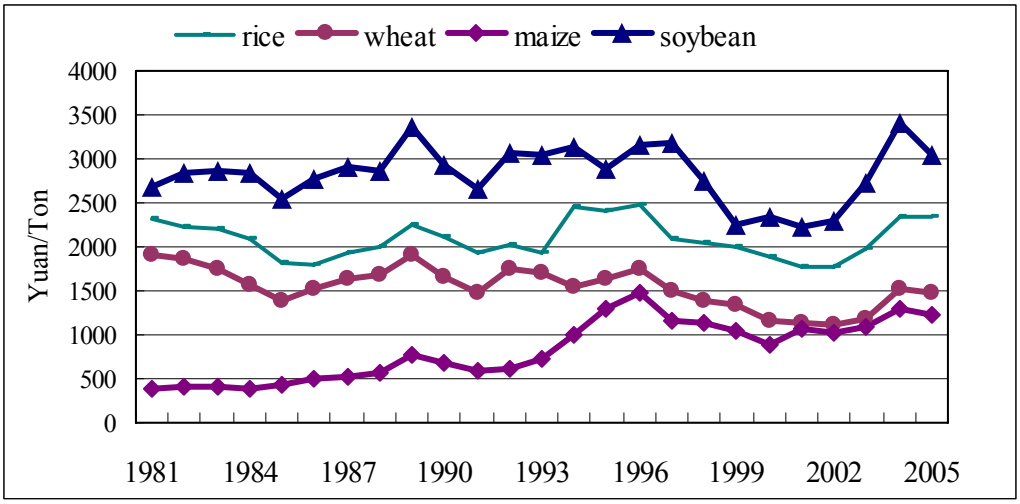
Appendix Figure A4: Agricultural production value shares by commodity, at undistorted prices, China, 1981 to 2005

(percent)



Source: Authors' calculations

Appendix Figure A5: Real prices of rice, wheat, maize and soybean in China, 1981 to 2005

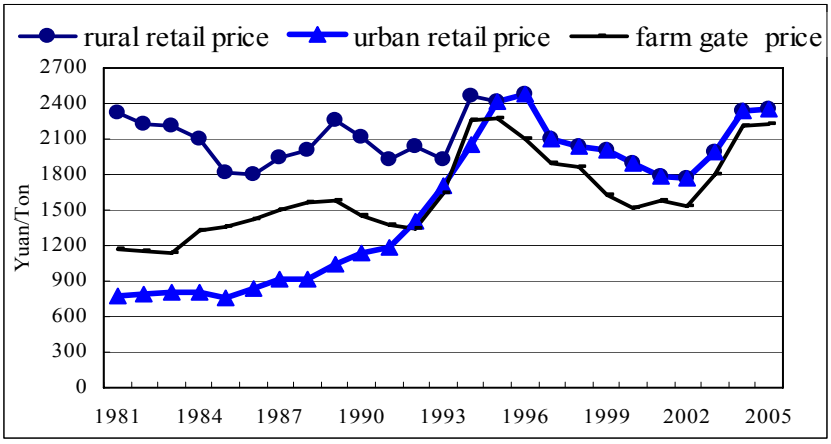


Source: Compiled from data in *China Price Yearbook*, 2005. Deflator: China Statistical Yearbook, 2006.

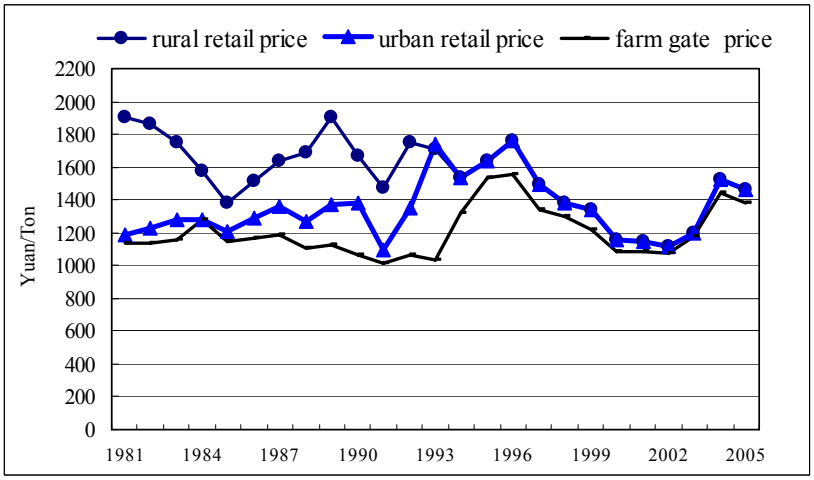
Appendix Figure A6: Rural Retail Price (free market price), Urban Retail Price and Farm-gate Sales Price in China, 1981 to 2005

(Real 2005 Yuan)

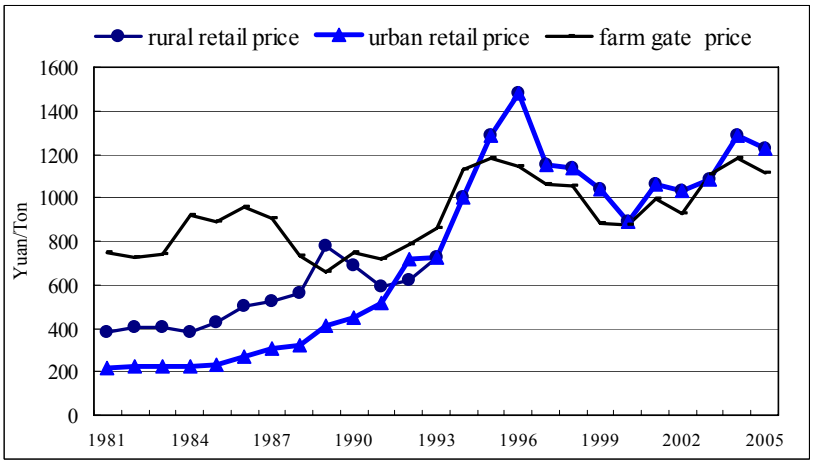
Panel A. Rice



Panel B. Wheat

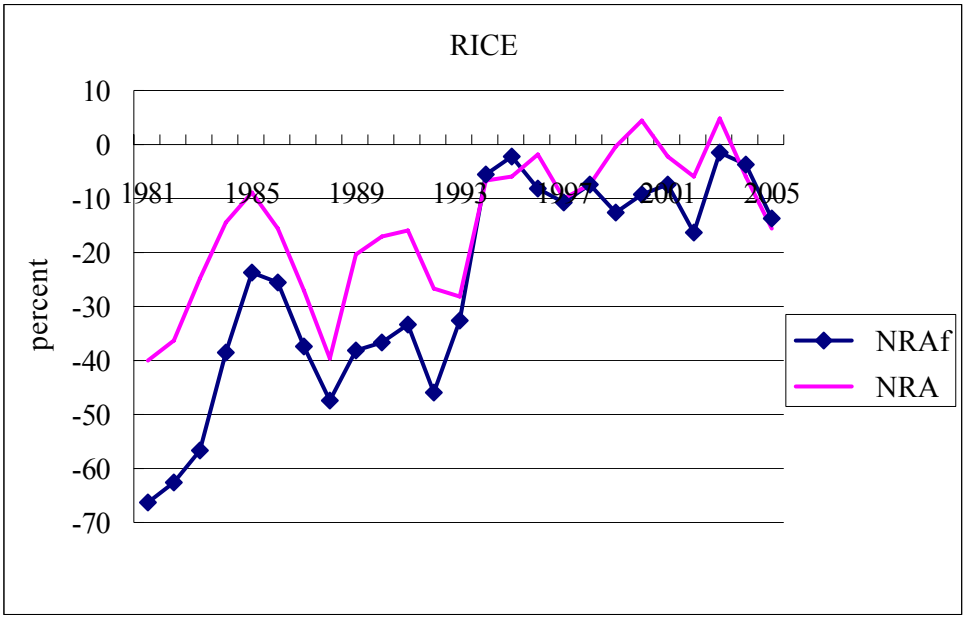


Panel C. Maize



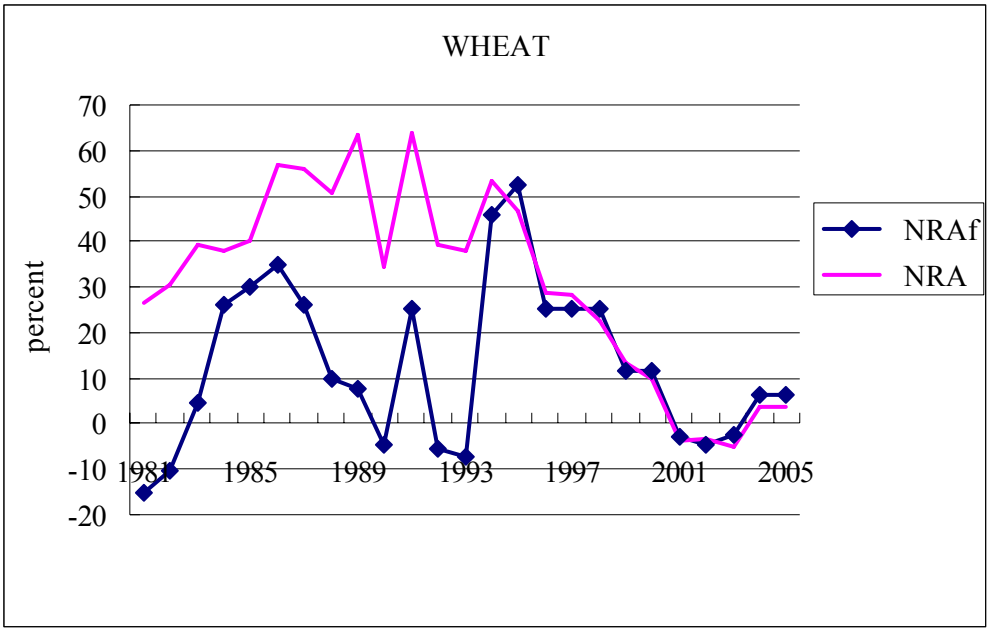
Source: Compiled from data in *China Price Yearbook*, 2005.

Appendix Figure A7: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for rice in China, 1981-2005



Source: Authors' spreadsheet

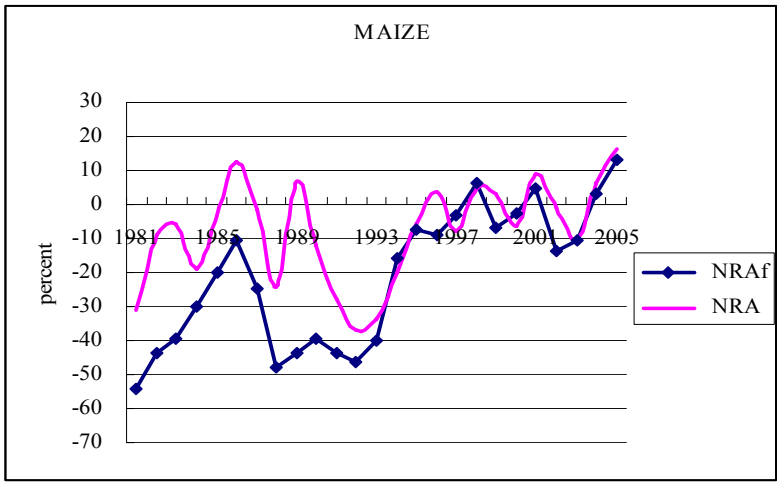
Appendix Figure A8: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for wheat in China, 1981-2005



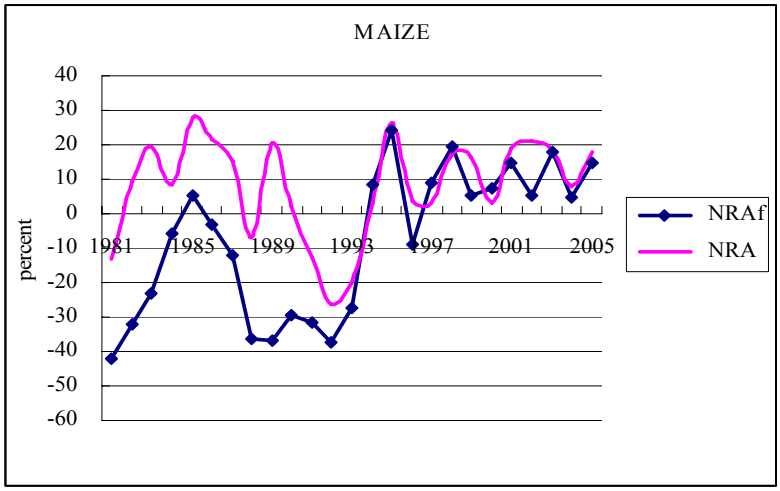
Source: Authors' spreadsheet

Appendix Figure A9: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for maize in China, 1981-2005

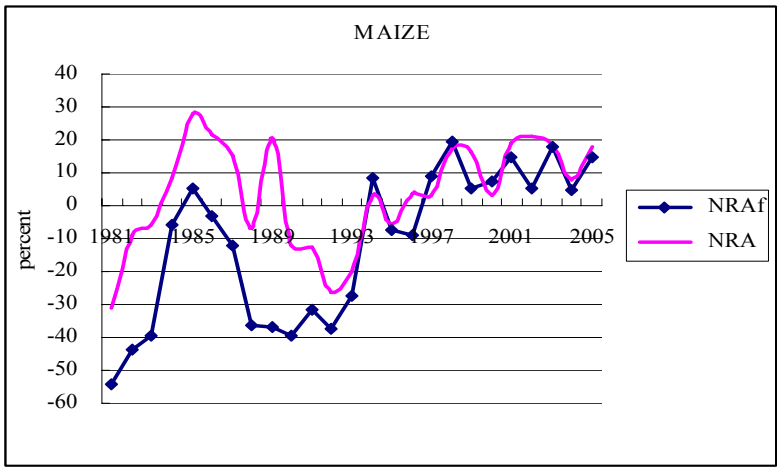
Panel A. Protection measures for maize (import), 1981-2005



Panel B. Protection measures for maize (export), 1981-2005

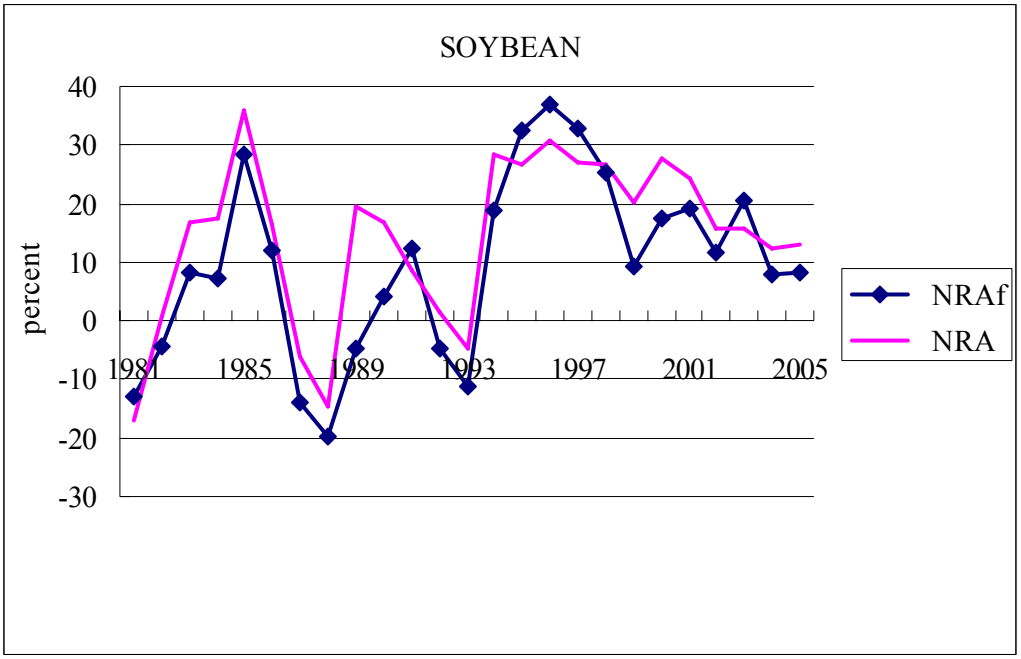


Panel C. Protection measures for maize based on trade status, 1981-2005



Source: Authors' spreadsheet

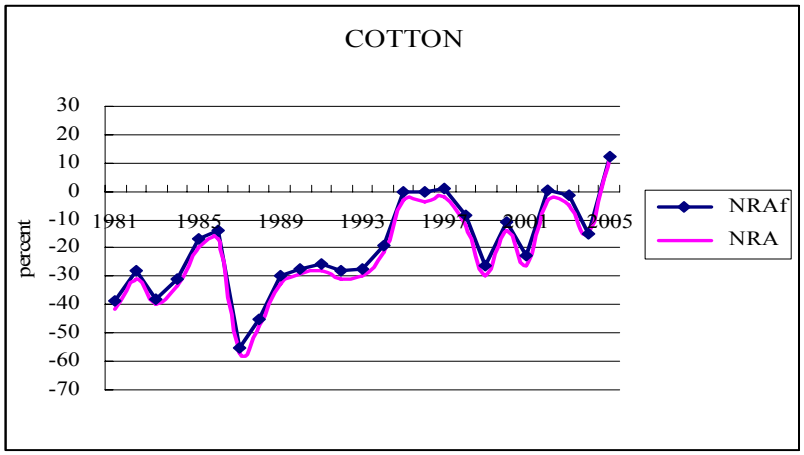
Appendix Figure A10: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for Soybean in China, 1981-2005



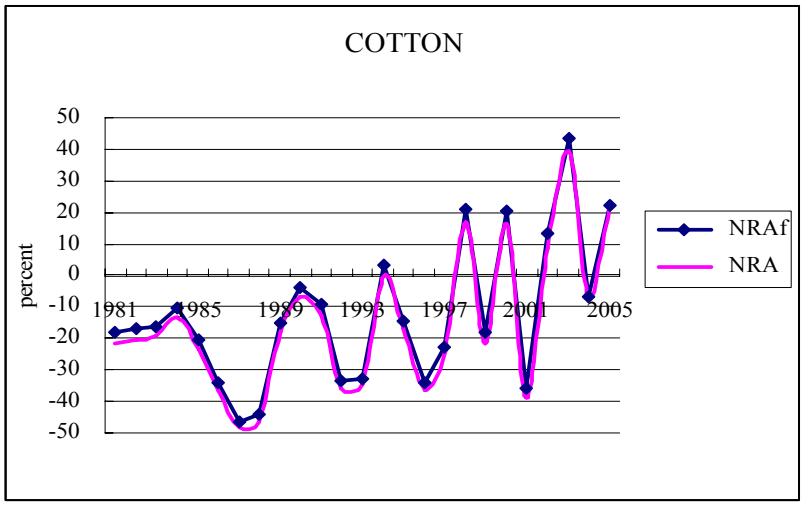
Source: Authors' spreadsheet

Appendix Figure A11: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for cotton in China, 1981-2005

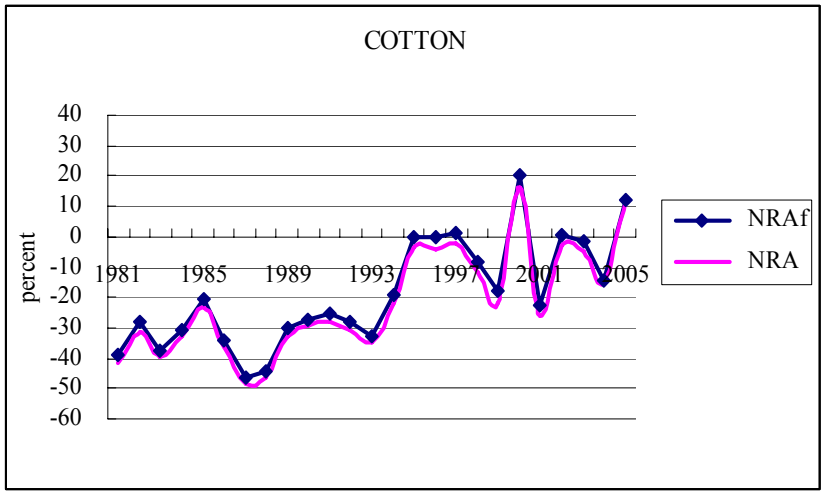
Panel A. Protection measures for cotton (import), 1981-2005



Panel B. Protection measures for cotton (export), 1981-2005



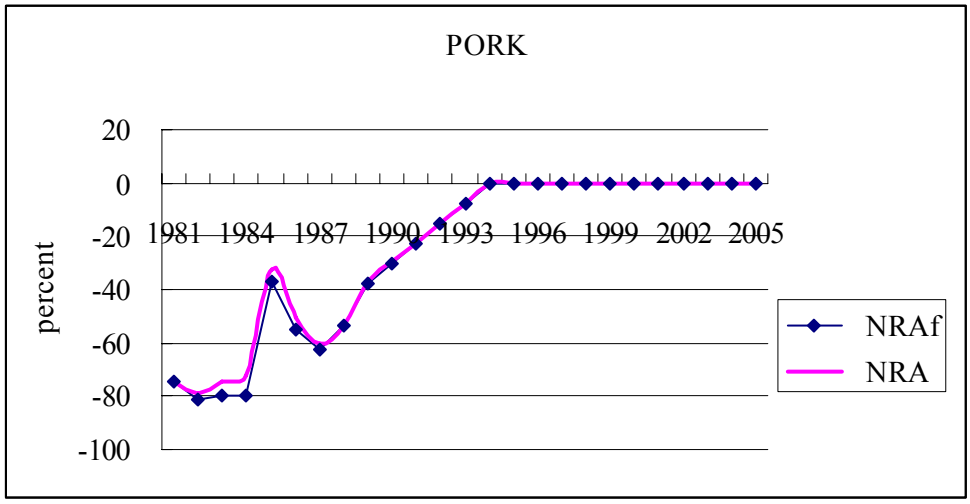
Panel C. Protection measures for cotton based on trade status, 1981-2005



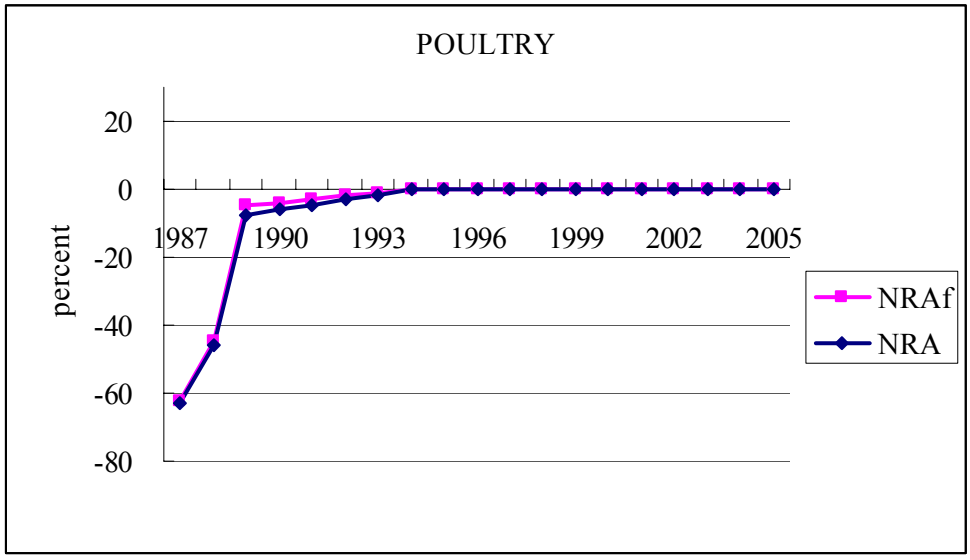
Source: Authors' spreadsheet

Appendix Figure A12: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for pigmeat and poultry in China, 1981-2005

Panel A. Protection measures for pigmeat



Panel B. Protection measures for poultry

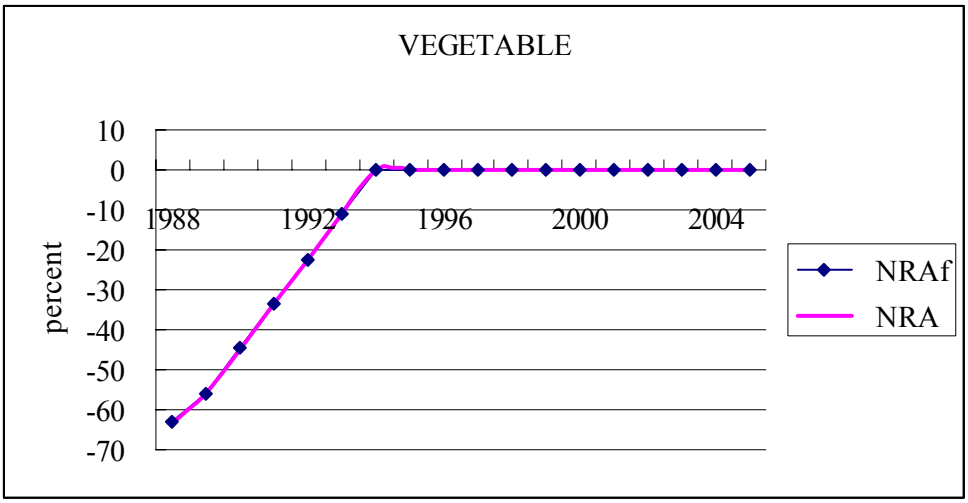


Source: Authors' spreadsheet

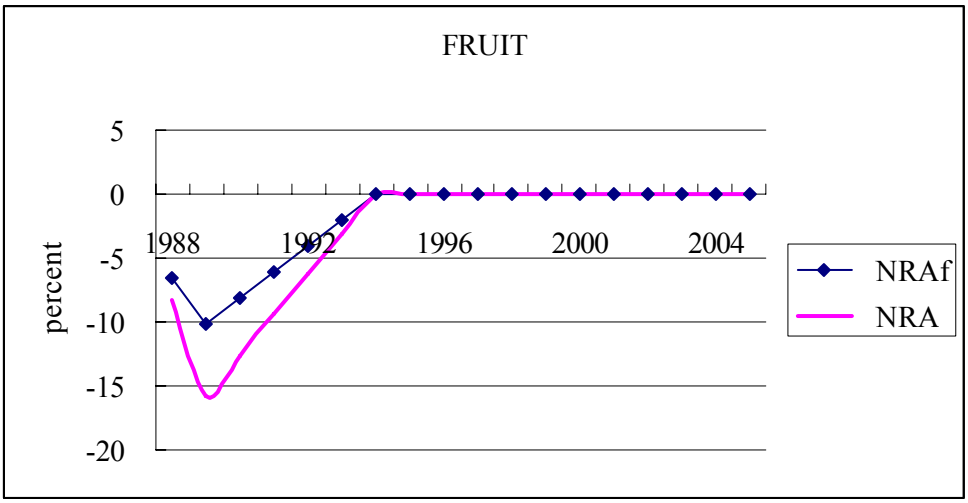
Note: These measures are calculated in the same way as NRAs and NRA_fs reported for other commodities. However, the true NRAs for these commodities become zero after 1994 because China has no policies holding their prices below world levels.

Appendix Figure A13: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for vegetables and fruit in China, 1988-2005

Panel A. Protection Measures for Vegetables



Panel B. Protection measures for fruit

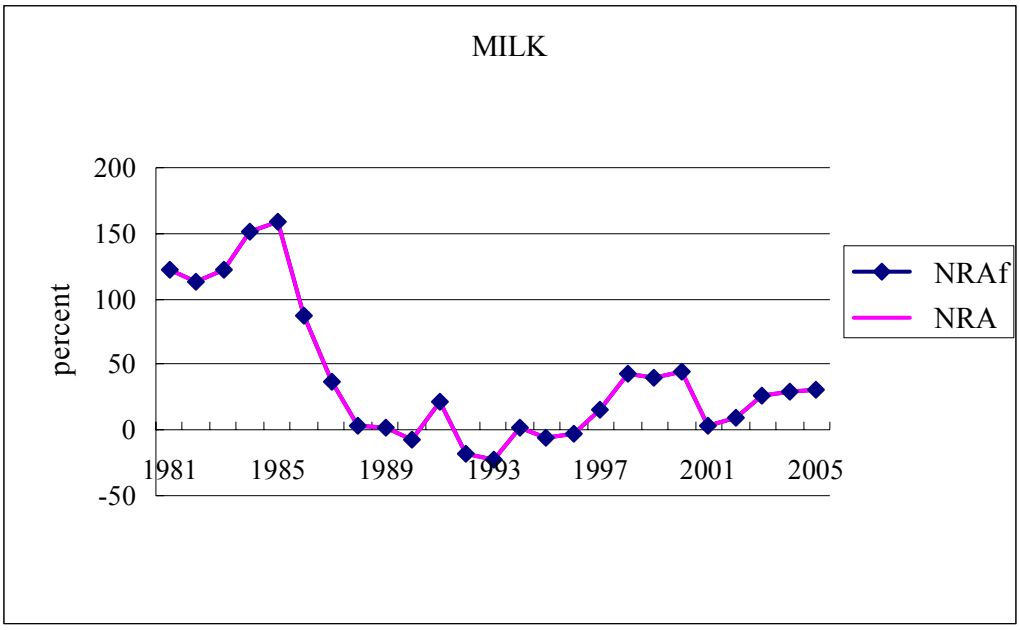


Source: Authors' spreadsheet

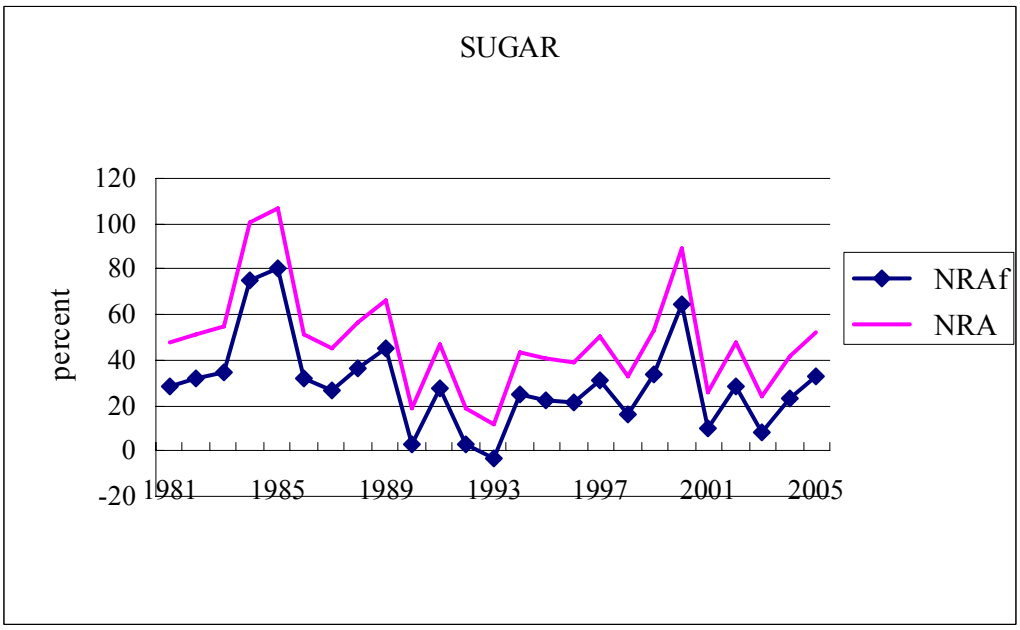
Note: These measures are calculated in the same way as NRAs and NRA_fs reported for other commodities. However, the true NRAs for these commodities become zero after 1994 because China has no policies holding their prices below world levels. The reported price comparisons therefore provide a measure of the extent of taxation resulting from barriers faced in other countries.

Appendix Figure A14: Nominal Rates of Assistance at the wholesale level (NRAs) and Nominal Rates of Assistance for farmers (NRA_fs) for milk and sugar in China, 1981-2005

A. Protection measures for milk



B. Protection measures for sugar



Source: Authors' spreadsheet

Appendix Table A1: Exchange rates and related measures for China, 1980 to 2005

(relative to the US dollar)

	Official[a]	Secondary[b]	Internal settlement	FEAC[e] average	Retention rate[c]	Exporter exchange rate	Importer exchange rate		Implied equilibrium exchange rate
1980	1.498	1.948				1.498	1.498		1.498
1981	1.705	2.045	2.8		0.2	2.800	2.800		2.800
1982	1.893	2.271	2.8		0.2	2.800	2.800		2.800
1983	1.976	2.392	2.8		0.2	2.800	2.800	Internal settlement	2.800
1984	2.327	2.688	2.8		0.2	2.800	2.800		2.800
1985	2.937	3.045	2.8		0.25	2.861	3.045	Secondary rate	2.953
1986	3.453	4.025			0.25	3.596	4.025		3.811
1987	3.722	4.401		5.9	0.44	4.680	5.900		5.290
1988	3.722	6.500		6.6	0.44	4.988	6.600		5.794
1989	3.766	6.600		5.4	0.44	4.485	5.400		4.942
1990	4.784	6.600		5.7	0.44	5.187	5.700	FEAC[e] rates	5.444
1991	5.323	6.603		5.9	0.8	5.785	5.900		5.842
1992	5.515	6.925		7.3	0.8	6.943	7.300		7.122
1993	5.762	8.282		8.7	0.8	8.112	8.700		8.406
1994	8.619	8.700		8.7	0.8	8.684	8.700		8.692
1995	8.351					8.351	8.351		8.351
1996	8.314					8.314	8.314		8.314
1997	8.290					8.290	8.290		8.290
1998	8.279					8.279	8.279		8.279
1999	8.280					8.280	8.280		8.280
2000	8.280					8.280	8.280	Official	8.280
2001	8.277					8.277	8.277		8.277
2002	8.278					8.278	8.278		8.278
2003	8.278					8.278	8.278		8.278
2004	8.277					8.277	8.277		8.277
2005	8.190								8.190

Source: See notes below

[a] NBSC; [b] Huang and David (1995); [c] The proportion of foreign currency actually sold by all exporters at the parallel market rate; [d] See Anderson et al. (2008) on the exchange rate methodology used in this study; [e]FEAC = foreign exchange adjustment center.

Appendix Table A2: Prices and NRAs and NRA_f for rice (export), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	377	1115	-0.66	667	1115	-0.40
1982	381	1020	-0.63	650	1020	-0.36
1983	382	878	-0.57	659	878	-0.25
1984	461	751	-0.39	642	751	-0.15
1985	507	663	-0.24	605	663	-0.09
1986	562	756	-0.26	638	756	-0.16
1987	635	1013	-0.37	737	1013	-0.27
1988	788	1498	-0.47	906	1498	-0.40
1989	935	1509	-0.38	1200	1509	-0.20
1990	879	1388	-0.37	1150	1388	-0.17
1991	856	1286	-0.33	1080	1286	-0.16
1992	883	1633	-0.46	1200	1633	-0.27
1993	1216	1800	-0.32	1293	1800	-0.28
1994	2034	2152	-0.05	2005	2152	-0.07
1995	2352	2403	-0.02	2258	2403	-0.06
1996	2298	2507	-0.08	2459	2507	-0.02
1997	2079	2329	-0.11	2101	2329	-0.10
1998	1989	2150	-0.07	1993	2150	-0.07
1999	1674	1913	-0.12	1907	1913	0.00
2000	1540	1695	-0.09	1774	1695	0.05
2001	1569	1695	-0.07	1658	1695	-0.02
2002	1446	1729	-0.16	1628	1729	-0.06
2003	1713	1738	-0.01	1822	1738	0.05
2004	2264	2348	-0.04	2210	2348	-0.06
2005	2316	2679	-0.14	2261	2679	-0.16

Source: Authors' spreadsheet

Appendix Table A3: Prices and NRAs and NRA_f for wheat (import), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	367	433	-0.15	548	433	0.27
1982	373	416	-0.11	544	416	0.31
1983	390	373	0.05	520	373	0.39
1984	441	349	0.26	482	349	0.38
1985	428	329	0.30	462	329	0.40
1986	462	343	0.35	537	343	0.57
1987	502	398	0.26	621	398	0.56
1988	556	506	0.10	763	506	0.51
1989	666	618	0.08	1011	618	0.63
1990	644	674	-0.04	906	674	0.34
1991	631	504	0.25	826	504	0.64
1992	698	740	-0.06	1031	740	0.39
1993	768	827	-0.07	1142	827	0.38
1994	1190	817	0.46	1254	817	0.53
1995	1592	1043	0.53	1530	1043	0.47
1996	1701	1359	0.25	1750	1359	0.29
1997	1470	1172	0.25	1502	1172	0.28
1998	1385	1106	0.25	1356	1106	0.23
1999	1254	1126	0.11	1277	1126	0.13
2000	1102	988	0.12	1084	988	0.10
2001	1074	1106	-0.03	1066	1106	-0.04
2002	1010	1058	-0.05	1023	1058	-0.03
2003	1127	1153	-0.02	1095	1153	-0.05
2004	1478	1389	0.06	1442	1389	0.04
2005	1442	1357	0.06	1410	1357	0.04

Source: Authors' spreadsheet

Appendix Table A4: Prices and NRAs and NRA_f for maize, China, 1981 to 2005
(a) Export

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	241	417	-0.42	362	417	-0.13
1982	238	351	-0.32	384	351	0.10
1983	248	324	-0.23	387	324	0.19
1984	318	338	-0.06	367	338	0.08
1985	332	316	0.05	405	316	0.28
1986	381	394	-0.03	480	394	0.22
1987	385	437	-0.12	503	437	0.15
1988	370	582	-0.36	541	582	-0.07
1989	391	619	-0.37	746	619	0.20
1990	455	645	-0.30	660	645	0.02
1991	444	649	-0.32	567	649	-0.13
1992	512	818	-0.37	601	818	-0.26
1993	636	874	-0.27	700	874	-0.20
1994	1016	939	0.08	967	939	0.03
1995	1221	983	0.24	1242	983	0.26
1996	1255	1379	-0.09	1430	1379	0.04
1997	1172	1076	0.09	1111	1076	0.03
1998	1120	939	0.19	1100	939	0.17
1999	909	865	0.05	1005	865	0.16
2000	893	832	0.07	859	832	0.03
2001	990	864	0.15	1026	864	0.19
2002	872	828	0.05	1001	828	0.21
2003	1054	892	0.18	1055	892	0.18
2004	1214	1160	0.05	1249	1160	0.08
2005	1160	1010	0.15	1192	1010	0.18

Source: Authors' spreadsheet

Appendix Table A4 (cont.): Prices and NRAs and NRA_f for maize, China, 1981 to 2005
(b) Import

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f= FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	241	527	-0.54	362	527	-0.31
1982	238	421	-0.43	384	421	-0.09
1983	248	410	-0.39	387	410	-0.06
1984	318	454	-0.30	367	454	-0.19
1985	332	415	-0.20	405	415	-0.02
1986	381	426	-0.11	480	426	0.13
1987	385	511	-0.25	503	511	-0.02
1988	370	713	-0.48	541	713	-0.24
1989	391	697	-0.44	746	697	0.07
1990	455	752	-0.40	660	752	-0.12
1991	444	786	-0.44	567	786	-0.28
1992	512	953	-0.46	601	953	-0.37
1993	636	1055	-0.40	700	1055	-0.34
1994	1016	1208	-0.16	967	1208	-0.20
1995	1221	1315	-0.07	1242	1315	-0.06
1996	1255	1380	-0.09	1430	1380	0.04
1997	1172	1208	-0.03	1111	1208	-0.08
1998	1120	1052	0.06	1100	1052	0.05
1999	909	976	-0.07	1005	976	0.03
2000	893	919	-0.03	859	919	-0.07
2001	990	944	0.05	1026	944	0.09
2002	872	1010	-0.14	1001	1010	-0.01
2003	1054	1175	-0.10	1055	1175	-0.10
2004	1214	1175	0.03	1249	1175	0.06
2005	1160	1024	0.13	1192	1024	0.16

Source: Authors' spreadsheet

Appendix Table 4 (cont.): Prices and NRAs and NRA_f for maize, China, 1981 to 2005
(c) changing trade status

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	241	527	-0.54	362	527	-0.31
1982	238	421	-0.43	384	421	-0.09
1983	248	324	-0.23	387	324	0.19
1984	318	338	-0.06	367	338	0.08
1985	332	316	0.05	405	316	0.28
1986	381	394	-0.03	480	394	0.22
1987	385	437	-0.12	503	437	0.15
1988	370	582	-0.36	541	582	-0.07
1989	391	619	-0.37	746	619	0.20
1990	455	752	-0.40	660	752	-0.12
1991	444	649	-0.32	567	649	-0.13
1992	512	818	-0.37	601	818	-0.26
1993	636	874	-0.27	700	874	-0.20
1994	1016	939	0.08	967	939	0.03
1995	1221	1315	-0.07	1242	1315	-0.06
1996	1255	1380	-0.09	1430	1380	0.04
1997	1172	1076	0.09	1111	1076	0.03
1998	1120	939	0.19	1100	939	0.17
1999	909	865	0.05	1005	865	0.16
2000	893	832	0.07	859	832	0.03
2001	990	864	0.15	1026	864	0.19
2002	872	828	0.05	1001	828	0.21
2003	1054	892	0.18	1055	892	0.18
2004	1214	1160	0.05	1249	1160	0.08
2005	1160	1010	0.15	1192	1010	0.18

Source: Authors' spreadsheet

Appendix Table A5: Prices and NRAs and NRA_f for soybean, China, 1981 to 2005
(a) import

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	804	964	-0.17	767	964	-0.20
1982	791	860	-0.08	833	860	-0.03
1983	791	760	0.04	853	760	0.12
1984	796	773	0.03	871	773	0.13
1985	804	652	0.23	851	652	0.30
1986	939	874	0.07	978	874	0.12
1987	1011	1222	-0.17	1102	1222	-0.10
1988	1220	1582	-0.23	1296	1582	-0.18
1989	1420	1555	-0.09	1785	1555	0.15
1990	1415	1418	0.00	1591	1418	0.12
1991	1543	1430	0.08	1493	1430	0.04
1992	1699	1855	-0.08	1807	1855	-0.03
1993	1902	2229	-0.15	2040	2229	-0.08
1994	2369	2074	0.14	2559	2074	0.23
1995	2843	2234	0.27	2714	2234	0.21
1996	3296	2505	0.32	3144	2505	0.26
1997	3339	2617	0.28	3192	2617	0.22
1998	2671	2218	0.20	2698	2218	0.22
1999	1935	1845	0.05	2131	1845	0.16
2000	2022	1794	0.13	2200	1794	0.23
2001	1990	1738	0.14	2074	1738	0.19
2002	2028	1892	0.07	2100	1892	0.11
2003	2609	2252	0.16	2500	2252	0.11
2004	3079	2972	0.04	3210	2972	0.08
2005	2793	2688	0.04	2920	2688	0.09

Source: Authors' spreadsheet

Appendix Table A5 (cont.): Prices and NRAs and NRA_f for cotton, China, 1981 to 2005 (b) export

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	3155	3858	-0.18	3014	3858	-0.22
1982	3203	3858	-0.17	3075	3858	-0.20
1983	3224	3858	-0.16	3115	3858	-0.19
1984	3447	3858	-0.11	3340	3858	-0.13
1985	3242	4069	-0.20	3113	4069	-0.23
1986	3471	5251	-0.34	3338	5251	-0.36
1987	3921	7290	-0.46	3767	7290	-0.48
1988	4449	7984	-0.44	4272	7984	-0.46
1989	5782	6811	-0.15	5577	6811	-0.18
1990	7197	7501	-0.04	6993	7501	-0.07
1991	7290	8051	-0.09	7043	8051	-0.13
1992	6539	9813	-0.33	6274	9813	-0.36
1993	7811	11584	-0.33	7549	11584	-0.35
1994	12355	11983	0.03	11975	11983	0.00
1995	15489	18078	-0.14	15031	18078	-0.17
1996	15235	23093	-0.34	14704	23093	-0.36
1997	14896	19232	-0.23	14395	19232	-0.25
1998	12554	10351	0.21	12119	10351	0.17
1999	8161	9932	-0.18	7784	9932	-0.22
2000	10967	9108	0.20	10566	9108	0.16
2001	8094	12648	-0.36	7727	12648	-0.39
2002	10153	8978	0.13	9764	8978	0.09
2003	13642	9489	0.44	13200	9489	0.39
2004	11514	12378	-0.07	11500	12378	-0.07
2005	13795	11270	0.22	13778	11270	0.22

Source: Authors' spreadsheet

Appendix Table A6: Prices and NRAs and NRA_f for cotton, China, 1981 to 2005
(a) import

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	3155	5159	-0.39	3014	5159	-0.42
1982	3203	4465	-0.28	3075	4465	-0.31
1983	3224	5184	-0.38	3115	5184	-0.40
1984	3447	4991	-0.31	3340	4991	-0.33
1985	3242	3887	-0.17	3113	3887	-0.20
1986	3471	4018	-0.14	3338	4018	-0.17
1987	3921	8708	-0.55	3767	8708	-0.57
1988	4449	8097	-0.45	4272	8097	-0.47
1989	5782	8263	-0.30	5577	8263	-0.33
1990	7197	9888	-0.27	6993	9888	-0.29
1991	7290	9784	-0.25	7043	9784	-0.28
1992	6539	9088	-0.28	6274	9088	-0.31
1993	7811	10747	-0.27	7549	10747	-0.30
1994	12355	15300	-0.19	11975	15300	-0.22
1995	15489	15549	0.00	15031	15549	-0.03
1996	15235	15301	0.00	14704	15301	-0.04
1997	14896	14710	0.01	14395	14710	-0.02
1998	12554	13737	-0.09	12119	13737	-0.12
1999	8161	11082	-0.26	7784	11082	-0.30
2000	10967	12273	-0.11	10566	12273	-0.14
2001	8094	10465	-0.23	7727	10465	-0.26
2002	10153	10082	0.01	9764	10082	-0.03
2003	13642	13840	-0.01	13200	13840	-0.05
2004	11514	13507	-0.15	11500	13507	-0.15
2005	13795	12299	0.12	13778	12299	0.12

Source: Authors' spreadsheet

Appendix Table A6 (cont.): Prices and NRAs and NRA_f for cotton, China, 1981 to 2005

(b) changing trade status

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	3155	5159	-0.39	3014	5159	-0.42
1982	3203	4465	-0.28	3075	4465	-0.31
1983	3224	5184	-0.38	3115	5184	-0.40
1984	3447	4991	-0.31	3340	4991	-0.33
1985	3242	4069	-0.20	3113	4069	-0.23
1986	3471	5251	-0.34	3338	5251	-0.36
1987	3921	7290	-0.46	3767	7290	-0.48
1988	4449	7984	-0.44	4272	7984	-0.46
1989	5782	8263	-0.30	5577	8263	-0.33
1990	7197	9888	-0.27	6993	9888	-0.29
1991	7290	9784	-0.25	7043	9784	-0.28
1992	6539	9088	-0.28	6274	9088	-0.31
1993	7811	10747	-0.27	7549	10747	-0.30
1994	12355	15300	-0.19	11975	15300	-0.22
1995	15489	15549	0.00	15031	15549	-0.03
1996	15235	15301	0.00	14704	15301	-0.04
1997	14896	14710	0.01	14395	14710	-0.02
1998	12554	13737	-0.09	12119	13737	-0.12
1999	8161	9932	-0.18	7784	9932	-0.22
2000	10967	9108	0.20	10566	9108	0.16
2001	8094	10465	-0.23	7727	10465	-0.26
2002	10153	10082	0.01	9764	10082	-0.03
2003	13642	13840	-0.01	13200	13840	-0.05
2004	11514	13507	-0.15	11500	13507	-0.15
2005	13795	12299	0.12	13778	12299	0.12

Source: Authors' spreadsheet

Appendix Table A7: Prices and NRAs and NRA_f for pigmeat (export), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	1894	7479	-0.75	1933	7479	-0.74
1982	1895	10041	-0.81	2141	10041	-0.79
1983	1897	9428	-0.80	2372	9428	-0.75
1984	1910	9568	-0.80	2628	9568	-0.73
1985	2542	4041	-0.37	2733	4041	-0.32
1986	2705	6054	-0.55	3002	6054	-0.50
1987	3219	8651	-0.63	3454	8651	-0.60
1988	4685	10042	-0.53	4642	10042	-0.54
1989	5277	8459	-0.38	5304	8459	-0.37
1990	4985	9286	-0.46	5193	9286	-0.44
1991	4857	8587	-0.43	5090	8587	-0.41
1992	5186	10340	-0.50	5348	10340	-0.48
1993	6040	9079	-0.33	6143	9079	-0.32
1994	8430	10601	-0.20	8611	10601	-0.19
1995	11122	12976	-0.14	10654	12976	-0.18
1996	11057	13054	-0.15	9972	13054	-0.24
1997	12827	15335	-0.16	11150	15335	-0.27
1998	9948	14222	-0.30	9678	14222	-0.32
1999	8470	10610	-0.20	7508	10610	-0.29
2000	8689	10795	-0.20	8486	10795	-0.21
2001	9010	10677	-0.16	9138	10677	-0.14
2002	8653	10295	-0.16	8400	10295	-0.18
2003	9636	10079	-0.04	9278	10079	-0.08
2004	12514	12461	0.00	12189	12461	-0.02
2005	11004	12642	-0.13	11440	12642	-0.10

Source: Authors' spreadsheet

Appendix Table A8: Prices and NRAs and NRA_f for poultry (export), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	4051	3328	0.22	4163	3328	0.25
1982	4087	3116	0.31	4202	3116	0.35
1983	4122	3201	0.29	4241	3201	0.32
1984	4159	3748	0.11	4280	3748	0.14
1985	5145	3954	0.30	5298	3954	0.34
1986	2615	5668	-0.54	2679	5668	-0.53
1987	3266	8829	-0.63	3338	8829	-0.62
1988	5973	11073	-0.46	6132	11073	-0.45
1989	8676	9376	-0.07	8922	9376	-0.05
1990	8882	11402	-0.22	9134	11402	-0.20
1991	8547	12714	-0.33	8795	12714	-0.31
1992	8480	14083	-0.40	8734	14083	-0.38
1993	8675	15747	-0.45	8933	15747	-0.43
1994	8301	18295	-0.55	8545	18295	-0.53
1995	12552	18560	-0.32	12923	18560	-0.30
1996	12830	18011	-0.29	13200	18011	-0.27
1997	11769	15690	-0.25	12114	15690	-0.23
1998	11390	14422	-0.21	11731	14422	-0.19
1999	10712	13834	-0.23	10954	13834	-0.21
2000	9834	12057	-0.18	10126	12057	-0.16
2001	10065	12391	-0.19	10353	12391	-0.16
2002	10351	12839	-0.19	10648	12839	-0.17
2003	10566	13245	-0.20	10872	13245	-0.18
2004	11930	14484	-0.18	12281	14484	-0.15
2005	12174	14788	-0.18	12532	14788	-0.15

Source: Authors' spreadsheet

Appendix Table A9: Prices and NRAs and NRA_f for vegetable (export), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	185	296	-0.37	184	296	-0.38
1982	211	296	-0.29	210	296	-0.29
1983	212	425	-0.50	209	425	-0.51
1984	227	467	-0.51	224	467	-0.52
1985	305	536	-0.43	301	536	-0.44
1986	314	749	-0.58	310	749	-0.59
1987	369	1120	-0.67	365	1120	-0.67
1988	483	1313	-0.63	479	1313	-0.64
1989	634	1437	-0.56	629	1437	-0.56
1990	674	1409	-0.52	669	1409	-0.53
1991	667	1463	-0.54	661	1463	-0.55
1992	929	2031	-0.54	922	2031	-0.55
1993	792	2095	-0.62	786	2095	-0.63
1994	1119	2346	-0.52	1112	2346	-0.53
1995	1424	1749	-0.19	1417	1749	-0.19
1996	1330	1855	-0.28	1322	1855	-0.29
1997	1099	1394	-0.21	1091	1394	-0.22
1998	1086	1349	-0.19	1077	1349	-0.20
1999	981	1108	-0.12	973	1108	-0.12
2000	1048	1126	-0.07	1040	1126	-0.08
2001	1063	1294	-0.18	1056	1294	-0.18
2002	1008	1404	-0.28	995	1404	-0.29
2003	1015	1325	-0.23	1005	1325	-0.24
2004	1057	1338	-0.21	1055	1338	-0.21
2005	1138	1389	-0.18	1136	1389	-0.18

Source: Authors' spreadsheet

Appendix Table A10: Prices and NRAs and NRA_f for fruit (export), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	439	696	-0.37	433	696	-0.38
1982	472	696	-0.32	465	696	-0.33
1983	516	786	-0.34	509	786	-0.35
1984	697	792	-0.12	688	792	-0.13
1985	794	843	-0.06	791	843	-0.06
1986	1092	1096	0.00	1069	1096	-0.02
1987	1152	1535	-0.25	1128	1535	-0.27
1988	1583	1695	-0.07	1556	1695	-0.08
1989	1347	1499	-0.10	1263	1499	-0.16
1990	1438	1677	-0.14	1337	1677	-0.20
1991	1925	1839	0.05	1802	1839	-0.02
1992	1605	2693	-0.40	1527	2693	-0.43
1993	1545	2589	-0.40	1450	2589	-0.44
1994	2145	2350	-0.09	2014	2350	-0.14
1995	2565	2604	-0.01	2465	2604	-0.05
1996	1959	2683	-0.27	1816	2683	-0.32
1997	1512	2387	-0.37	1428	2387	-0.40
1998	1418	2197	-0.35	1323	2197	-0.40
1999	1213	2008	-0.40	1143	2008	-0.43
2000	1208	1880	-0.36	1138	1880	-0.39
2001	1374	2567	-0.46	1297	2567	-0.49
2002	1316	1973	-0.33	1259	1973	-0.36
2003	1395	1996	-0.30	1348	1996	-0.32
2004	1525	2054	-0.26	1515	2054	-0.26
2005	1678	2131	-0.21	1666	2131	-0.22

Source: Authors' spreadsheet

Appendix Table A11: Prices and NRAs and NRA_f for milk (import), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	846	378	1.24	846	378	1.24
1982	854	403	1.12	854	403	1.12
1983	862	386	1.23	862	386	1.23
1984	870	337	1.58	870	337	1.58
1985	878	325	1.70	878	325	1.70
1986	886	460	0.93	886	460	0.93
1987	894	632	0.41	894	632	0.41
1988	902	887	0.02	902	887	0.02
1989	911	938	-0.03	911	938	-0.03
1990	919	1030	-0.11	919	1030	-0.11
1991	928	752	0.23	928	752	0.23
1992	936	1172	-0.20	936	1172	-0.20
1993	1146	1523	-0.25	1145	1523	-0.25
1994	1539	1569	-0.02	1539	1569	-0.02
1995	1530	1702	-0.10	1530	1702	-0.10
1996	1872	2089	-0.10	1871	2089	-0.10
1997	1981	1833	0.08	1980	1833	0.08
1998	1935	1385	0.40	1934	1385	0.40
1999	1934	1429	0.35	1933	1429	0.35
2000	1860	1314	0.42	1860	1314	0.42
2001	1575	1601	-0.02	1571	1601	-0.02
2002	1938	1873	0.03	1936	1873	0.03
2003	1927	1602	0.20	1926	1602	0.20
2004	1943	1568	0.24	1943	1568	0.24
2005	1944	1552	0.25	1944	1552	0.25

Source: Authors' spreadsheet

Appendix Table A12: Prices and NRAs and NRA_f for sugar (import), China, 1981 to 2005

	At Farm Gate			At Wholesale		
	Farm gate price plus subsidy RMB/MT	Border price per MT RMB/MT	NRA_f = FP/BP-1 Ratio	Wholesale price per MT RMB/MT	Border price per MT RMB/MT	NRAs = WP/BP-1 Ratio
1981	594	469	28.69	622	469	0.48
1982	597	462	31.53	626	462	0.51
1983	637	481	34.75	667	481	0.55
1984	797	464	74.99	835	464	1.01
1985	822	464	80.44	862	464	1.07
1986	844	652	31.83	884	652	0.51
1987	1229	992	26.24	1288	992	0.45
1988	1544	1154	36.48	1619	1154	0.57
1989	1621	1142	44.81	1699	1142	0.66
1990	1650	1635	3.09	1730	1635	0.18
1991	1565	1249	27.98	1641	1249	0.47
1992	1414	1403	3.05	1482	1403	0.18
1993	1668	1757	-2.91	1748	1757	0.11
1994	2370	1942	24.87	2484	1942	0.43
1995	3017	2526	22.32	3163	2526	0.40
1996	3057	2583	21.26	3204	2583	0.39
1997	2995	2349	30.71	3138	2349	0.50
1998	2597	2299	15.82	2722	2299	0.33
1999	2058	1584	33.30	2155	1584	0.53
2000	2178	1359	64.61	2282	1359	0.89
2001	2241	2096	9.80	2347	2096	0.26
2002	1986	1586	28.72	2080	1586	0.48
2003	1865	1770	8.36	1954	1770	0.24
2004	2170	1815	22.98	2275	1815	0.41
2005	2837	2205	32.40	2974	2205	0.52

Source: Authors' spreadsheet

Appendix Table A13: Prices and NRA for processed sugar (import) in China, 1981 to 2005

	wholesale price processed	border price per MT	NRAp=FP/BP-1
	RMB/MT	RMB/MT	Ratio
1981	885	469	0.89
1982	877	462	0.90
1983	884	481	0.84
1984	900	464	0.94
1985	907	464	0.96
1986	899	652	0.38
1987	1089	992	0.10
1988	1254	1154	0.09
1989	1480	1142	0.30
1990	1561	1635	-0.04
1991	2031	1249	0.63
1992	1890	1403	0.35
1993	2013	1757	0.15
1994	3024	1942	0.56
1995	3603	2526	0.43
1996	3332	2583	0.29
1997	3282	2349	0.40
1998	3139	2299	0.37
1999	2648	1584	0.67
2000	2806	1359	1.07
2001	2887	2096	0.38
2002	2559	1586	0.61
2003	2406	1770	0.36
2004	2912	1815	0.60
2005	3389	2205	0.54

Source: Authors' spreadsheet

Appendix Table A14: Annual distortion estimates, **China**, 1981 to 2005

(a) Nominal rates of assistance to covered products
(percent)

	Cotton	Fruits	Maize	Milk	Pigmeat	Poultry	Rice	Soybean	Sugar	Vegetables	Wheat	All covered
1981	-38	-37	-54	124	-74	24	-66	-12	30	-37	-15	-53
1982	-28	-32	-43	114	-81	33	-62	-3	33	-29	-10	-53
1983	-38	-34	-39	124	-80	31	-56	10	36	-50	5	-52
1984	-31	-12	-5	152	-80	13	-38	9	76	-51	27	-45
1985	-20	-5	6	160	-36	32	-23	30	82	-43	31	-24
1986	-33	0	-3	88	-55	-53	-25	13	33	-58	36	-39
1987	-46	-25	-11	38	-62	-62	-37	-13	27	-67	27	-50
1988	-44	-7	-36	4	-53	-46	-47	-19	37	-63	10	-49
1989	-30	-10	-36	2	-37	-7	-38	-4	45	-56	8	-40
1990	-27	-8	-39	-6	-30	-5	-36	5	3	-45	-4	-34
1991	-25	-6	-31	22	-22	-4	-33	14	29	-34	26	-24
1992	-28	-4	-37	-18	-15	-3	-46	-4	3	-22	-5	-24
1993	-32	-2	-27	-22	-7	-1	-32	-11	-3	-11	-7	-16
1994	-19	0	9	2	0	0	-5	19	25	0	46	3
1995	0	0	-7	-5	0	0	-2	33	23	0	53	3
1996	2	0	-7	-3	0	0	-6	40	24	0	28	1
1997	3	0	11	15	0	0	-9	35	33	0	28	3
1998	-6	0	23	44	0	0	-5	28	18	0	29	4
1999	-17	0	7	40	0	0	-11	11	35	0	13	0
2000	22	0	9	45	0	0	-8	20	67	0	13	2
2001	-21	0	16	4	0	0	-6	21	11	0	-1	0
2002	2	0	7	11	0	0	-15	14	30	0	-3	-1
2003	0	0	20	27	0	0	0	23	10	0	-1	2
2004	-13	0	6	30	0	0	-2	10	25	0	8	1
2005	14	0	17	32	0	0	-12	10	34	0	8	1

Appendix Table A14 (continued): Annual distortion estimates, **China**, 1955 to 2005
(b) Nominal and relative rates of assistance to all[a] agricultural products, to exportable[b] and import-competing [b] agricultural industries, and relative[c] to non-agricultural industries (percent)

	Total ag NRA				Ag tradables NRA				
	Covered products		Non-covered products	All products (incl NPS)	Export-ables	Import-competing	All	Non-ag tradables NRA	RRA
	Inputs	Outputs							
1955-1980[d]	na	na	na	-40	na	na	na	na	-54
1981	0	-54	-35	-48	-58	-28	-48	na	-54
1982	0	-53	-32	-47	-58	-19	-47	43	-63
1983	0	-52	-31	-46	-59	-12	-46	42	-62
1984	0	-45	-19	-39	-52	15	-39	40	-57
1985	0	-25	-1	-17	-31	34	-17	39	-40
1986	0	-39	-11	-33	-45	32	-33	24	-46
1987	0	-50	-23	-45	-56	20	-45	25	-56
1988	0	-50	-24	-46	-54	9	-46	26	-57
1989	0	-41	-18	-36	-45	6	-36	27	-50
1990	0	-34	-21	-29	-37	-16	-29	28	-45
1991	0	-24	-6	-18	-28	13	-18	27	-36
1992	0	-24	-12	-20	-26	-6	-20	26	-36
1993	0	-16	-9	-12	-17	-5	-12	24	-29
1994	0	3	11	7	0	25	7	19	-10
1995	0	3	7	6	0	17	6	13	-6
1996	1	0	4	4	-2	10	4	12	-7
1997	1	2	11	7	-1	23	7	9	-2
1998	1	3	11	10	1	21	10	9	1
1999	1	0	6	5	-2	13	5	7	-1
2000	1	1	9	8	0	17	8	6	2
2001	1	0	1	4	0	1	4	6	-1
2002	1	-2	1	4	-2	4	4	5	-1
2003	1	2	4	7	2	6	7	4	2
2004	0	1	4	7	0	8	7	3	3
2005	0	0	6	7	-1	12	7	3	3

a. NRAs including assistance to nontradables and non-product specific assistance.
b. NRAs including products specific input subsidies.
c. The Relative Rate of Assistance (RRA) is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.
d. Estimates for China pre-1981 are based on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for for 1981-89.

Appendix Table A14 (continued): Annual distortion estimates, **China**, 1981 to 2005
(c) Value shares of primary production of covered[a] and non-covered products, (percent)

	Cotton	Fruits	Maize	Milk	Pigmeat	Poultry	Rice	Soybean	Sugar	Vegetables	Wheat	Non-covered
1981	1	1	7	0	20	1	27	2	0	18	6	16
1982	1	1	5	0	26	1	25	2	0	16	6	16
1983	2	1	6	0	23	1	21	1	0	24	6	15
1984	2	1	5	0	26	1	19	1	0	25	6	12
1985	1	2	5	0	14	1	18	1	0	32	6	18
1986	1	2	5	0	18	2	16	2	1	37	5	11
1987	1	2	4	0	19	2	15	2	1	39	4	9
1988	1	2	4	0	19	3	18	2	1	38	4	8
1989	1	2	5	0	16	2	18	1	1	40	5	8
1990	1	2	6	0	14	3	17	1	1	34	6	14
1991	2	3	7	0	15	4	17	1	1	30	5	15
1992	1	3	7	1	14	3	19	2	1	32	7	13
1993	1	3	8	1	15	2	19	3	1	21	7	19
1994	2	4	7	1	18	4	19	2	1	24	6	13
1995	1	5	8	1	19	6	17	2	1	23	6	11
1996	1	3	9	1	18	5	17	1	1	21	7	15
1997	1	3	6	1	22	6	16	2	1	18	7	19
1998	1	3	6	0	18	6	15	1	1	18	6	25
1999	1	3	5	1	16	6	13	1	1	16	6	33
2000	1	3	4	1	16	6	11	1	1	19	5	34
2001	1	3	4	1	16	5	9	1	1	18	5	35
2002	1	3	4	1	15	5	9	1	1	18	4	37
2003	1	4	4	1	18	6	9	1	1	19	4	33
2004	1	4	5	1	19	5	10	2	1	17	4	32
2005	1	4	4	1	17	5	11	1	1	17	4	34

Source: Authors' spreadsheet
a. At farmgate undistorted prices, US$

Appendix Table A15: China's tariffs on manufactures, 1980 to 2005

	Manufactures	
	Simple	Weighted
	%	%
1980-83	50.5	36.6
1984-87	41.9	33.2
1992	44.9	46.5
1993	41.8	44.0
1994	37.6	40.6
1996	23.1	23.2
1997	17.5	17.8
1998	17.4	18.5
1999	16.8	13.4
2000	16.6	13.3
2001	16.2	13.0
Post-Accession	9.5	6.9

Source: Ianchovichina and Martin (2004); UNCTAD (1994).

Appendix Table A16: Import tariff collection rates, China, 1986 to 2002

	Collection rate
	%
1986	9.7
1987	9.4
1988	7.6
1989	8.4
1990	6.3
1991	5.6
1995	2.6
1996	2.6
1997	2.7
1998	2.7
1999	4.1
2002	2.9

Source: World Bank (1994, p. 60) to 1991. World Bank Data for 1995-2002

Appendix Table A17: Elements of protection to the non-agricultural sector, China, 1981 to 2005

	Tariff %	Interpolated Tariff %	Tariff with DE %	NTBs %	Planning %	Total Importing %	Non Agric %	Non Agric-ER
1981								
1982	36.6	36.6	36.6	22.0	15.0	91.6	42.9	
1983		35.8	35.8	21.0	15.0	88.9	41.6	
1984		34.9	34.9	20.0	15.0	86.2	40.3	
1985		34.1	34.1	19.0	15.0	94.8	39.1	
1986	33.2	33.2	22.1	18.0	5.0	68.4	24.0	
1987		35.4	23.6	17.0	5.0	86.9	25.0	
1988		37.6	25.1	16.0	5.0	94.7	25.8	
1989		39.9	26.6	15.0	5.0	81.1	27.4	
1990		42.1	28.0	14.2	5.0	67.9	28.3	
1991		44.3	29.5	13.4	5.0	57.3	27.3	
1992	46.5	46.5	31.0	12.6	5.0	62.6	26.3	
1993	44	44.0	29.3	11.7	5.0	62.4	23.8	
1994	40.6	40.6	27.1	10.9	0.0	41.2	18.9	
1995	25.3	25.3	16.9	10.1		28.7	13.3	
1996	23.2	23.2	15.5	9.3		26.2	11.7	
1997	17.8	17.8	11.9	8.3		21.1	9.3	
1998	18.5	18.5	12.3	6.9		20.1	8.8	
1999	13.4	13.4	8.9	5.7		15.2	6.7	
2000	13.3	13.3	8.9	4.8		14.1	6.2	
2001	13	13	8.7	4.0		13.0	5.8	
Post-Accession	6.9	6.9	4.6	3.0		7.7	4.9	

Note: The Total Importing estimate in this table is computed by multiplying the power of the entries under Tariff plus DE; NTB; and Planning.