Food Policy 34 (2009) 407–416

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Changes in trade and domestic distortions affecting China's agriculture

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ARTICLE INFO

Article history:
Received 11 April 2008
Received in revised form 30 October 2008
Accepted 1 April 2009

Keywords:
China
Agriculture
Trade distortions
Incentives
Prices

ABSTRACT

This paper assesses the implications of China's trade and domestic policies for incentives to producers in China. It uses a price comparison methodology (nominal rates of assistance—at the border and the farmgate), with adjustments for exchange rate distortions in the first part of the sample period (1981–1994). On average, distortions to agricultural incentives have been reduced. In the early 1980s, on average, China's domestic prices were far below international prices. There were substantial variations, however, between imported (which were being protected) and exported goods. During the 1980s and 1990s the gap between domestic and international prices for both imports and exports narrowed initially mainly due to the elimination of domestic policy distortions. Between the mid-1990s and 2004, trade liberalization policy furthered narrowed the gap between world and China farmgate prices. By the mid-2000s, China's agriculture was operating with only small price distortions.

Introduction

China now accounts for over 18% of global agricultural production, substantially more than traditional agricultural production and trade heavyweights such as the European Union, the United States, India and Brazil (see Table 1). Despite this importance in terms of production, China has historically played a relatively minor role in global agricultural trade. Given the substantial reforms undertaken in China's agricultural trade policies and reductions in domestic taxes on China's agriculture, this seems likely to change in the future, with important implications for the rest of the world. In this paper, we examine and seek to quantify the nature and extent of these reforms as a basis for understanding the changing role of China's agriculture and its potential future engagement in international trade.

Much research has been done on the micro-economics of China's agricultural economy (e.g., Lardy, 1983; Sicular, 1988; Lin, 1992; Rosen et al., 2004), but less attention has focused on the environment from an incentive perspective in which the changes in China's agriculture have occurred. In particular, there has not been a complete study of the trade policy environment creating the incentives for producers (as well as affecting the welfare of consumers). In the past, there has been considerable work on the nature of the distortions of China's agricultural economy (for example, Huang et al., 2004; OECD, 2005, 2007; Orden et al., 2007). Unfortunately, previous studies have not provided the long time series of data needed to identify changes in the stance of agricultural protection. Huang et al. (2004) only examined distortions in a single year; Orden et al. (2007) examined a small set of commodities for six years between 1995 and 2001, while the comprehensive OECD (2005, 2007) studies covered from 1993 to 2005.

The main purpose of this paper is to document the changes in the policy and pricing environment in which China's agricultural sector has operated during the past quarter-century. The main part of our analysis examines the differences in prices between international prices and domestic prices at the border (nominal rates of assistance or NRAs). We also consider distortions in the domestic economy by examining the differences between farmgate and border prices (NRA_f's). Because input-related interventions have generally been much smaller and less volatile than measures affecting output prices (Huang et al., 2007a,b), we focus on output-related distortions. The measures that we report summarize the impact of a wide range of policy instruments used in China on domestic prices, and hence on production, consumption and trade outcomes.

The wide scope of our objectives imposes certain limitations on the scope of the study. First, the absence of data precluded us from examining the entire agricultural sector. Instead, we sought to include commodities that account for two-thirds or more of the gross value of agricultural throughout the study period. Second, although we are able to judge from the price trends and an understanding of domestic marketing and pricing and trade policy reforms the broad

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doi:10.1016/j.foodpol.2009.04.001

Table 1
Shares (%) in global agricultural value added at domestic prices.

	1980	1990	2000	2001	2002	2003	2004	2005	2006
China	7.3	8.5	15.6	16.7	17.2	16.1	17.4	18.3	18.4
EU	19.3	20.8	15.9	16.4	16.5	17.5	17.8	15.8	14.7
India	7.8	7.4	8.6	9.1	8.6	9.1	8.4	9.1	9.1
United States	9.6	9.8	9.8	9.8	8.7	9.7	10.1	8.9	na
Brazil	3.0	2.8	2.7	2.5	2.5	2.8	2.7	2.8	2.8
Australia	1.4	1.2	1.1	1.2	1.4	1.1	1.3	1.3	1.2
Canada	1.4	1.4	1.3	1.3	1.3	1.3	na	na	na
Thailand	1.0	0.9	1.0	0.9	1.1	1.2	1.1	1.2	1.3
World	100	100	100	100	100	100	100	100	

Source: World Bank data. National account statistics in current US $ at market prices.

sources of the shifts in the distortions of the agricultural economy, we can not identify the exact sources of these changes–disentangling the effects of the quotas, licenses and state trading that simultaneously affected many agricultural products poses particular difficulties. Finally, we do not examine the effects of complementary policies such as investments in rural infrastructure, research and development, education and health, where government policies have a potentially important role to play in overcoming problems of market failure (World Bank, 2008).

Methodology and data sources

In this paper, we have utilized an approach suggested by Anderson et al. (2008). The approach is based largely on comparisons between domestic and international prices. During the reform era these price comparisons provide indicators of the incentives for production, consumption and trade, and of the income transfers associated with the interventions.

Our approach essentially creates two measures of distortions for each major commodity in the agricultural economy. The most basic measure in our analysis is the Nominal Rate of Assistance (NRA). NRAs are used to compare the prices of commodities in the domestic economy (at the port) with the international prices of commodities at the border (that is, cif in the port for importable goods; fob in the port for exportable ones). Conceptually, with the NRAs we are trying to measure the extent of the distortions due to tariffs, export taxes and subsidies, exchange rate distortions and the many non-tariff barriers, such as state trading, quotas and licenses that have affected China's agricultural trade.[1]

Our approach to exchange rate distortions differs from that in Orden et al. (2007) and Krueger et al. (1988) in that we consider only exchange rate distortions, such as two-tier exchange rate systems, that change the relative prices of imported and exported goods. We take this approach because policies, such as the two-tier exchange rate system, define the main trade distortions (see Appendix A and Appendix Table A1 for a complete discussion of the exchange rate system and the way the we have model it; the Appendix also contains the exchange rate series itself). While exchange rate devaluation or revaluation with unified exchange rates may temporarily change the relative prices of all traded goods relative to nontraded goods (Dornbusch, 1976), it does not change the price of importable goods relative to exportables except through possible terms-of-trade effects. Similarly, real exchange rate under/overvaluation associated with national expenditure being below/above national income need not change the price of importables relative to exportables. Since such under/over valuation is needed to maintain internal balance (Salter, 1959), it need not even be a distortion. While we accept that real exchange rate changes may have important effects on incentives, and hence be of considerable interest in their own right, we focus on measures which change the relative prices of traded goods, and hence clearly distort trade and production.

Because of barriers within the domestic economy, the extent of protection (or dis-protection) that is afforded by trade policies may not be the same as the real rate of protection to farmers. Since we have independent observations on the prices obtained by farmers we are able to estimate the *nominal rate of assistance at the farm level* taking into account *both* border distortions and domestic distortions—and particularly the procurement system prevailing prior to the mid-1990s—affecting farmer returns (NRA_f's). Differences between NRAs and NRA_f's arise from subsidy or transfer payments that cause the prices received by farmers to differ from what they would receive under competitive internal market conditions.

In China, the most important source of this difference was historically the procurement pricing system, which provided ration allocations to urban consumers at below-market prices, with this transfer funded in part by a requirement for farmers to deliver output quotas at a below-market procurement price (Sicular, 1988). This definitely generated an income transfer away from China's farmers but, as Sicular has shown, the effects on incentives to produce are somewhat less clear, since the market price received by farmers for their over-quota production was conceptually the marginal price incentive for production. In the early reform era, when farmers were limited in their ability to move out of agriculture, it was probably reasonable to ignore these transfers when focusing on incentives for production. However, as farmers became more mobile, these transfers probably began to have a negative impact on production by increasing the incentives for farmers to leave agriculture. The safest course of action seemed to us to be to provide both the NRA and NRA_f measures.

In compiling our data on agricultural prices we necessarily had to make choices on the coverage of the commodities included in the study. We included 11 commodities: rice, wheat, maize,

[1] Distortion estimates derived in this paper follow Anderson et al. (2008) and are used because they serve four purposes. One is to provide stand-alone single-indicator measures for monitoring purposes, of direct and indirect assistance to (or taxation of) the farm sector as a whole as well as for individual industries, and also of food consumer prices (since many of the absolute poor are net buyers of food – McCulloch et al., 2001). The second is to provide comparable estimates of trade costs, which also contribute to price gaps between different points in the value chain. The third is to use the direct distortion measures as inputs into various types of partial and general equilibrium economic models for estimating their market, income and welfare effects. And the fourth, which is assisted by the previous ones, is to provide information useful in international trade negotiations. For these purposes the distortions need to be expressed as ad valorem equivalents by policy instrument (consumption, production and trade taxes and subsidies on outputs and intermediate inputs), but they also need to distinguish the shares of the trade measures due to tariffs versus non-tariff governmental barriers (since the former are more amenable to trade negotiations). Ideally we need also to separate out those government interventions that serve a positive social purpose (e.g., in overcoming an externality or market failure) from those that are welfare-reducing distortions. In practice the distinction is often blurred, as in the case of using trade taxes to raise government revenue when other ways of doing so involve possibly higher costs (Corden, 1997). Effective rate of protection (ERP) measures are rarely calculated for agricultural sectors and, for consistency with OECD (2007) and Orden et al. (2007), we present measures based primarily on nominal, rather than effective, rates of assistance.

soybeans, cotton, pork, 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 accounted for between 75% (in the late 1980s) and 60% (during the early 2000s) of the total value of agricultural output in China. Because decisions on production and consumption 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 this 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 the Center for Chinese Agricultural Policy (CCAP) CAPSiM database, which are mainly from the Ministry of Agriculture for production data (MOA, various years-a), National Bureau of Statistics for consumption and other data (NBS, 1978–2007) and Ministry of Commerce for trade data (MOC, various years). Domestic prices are from several different ministries. Specifically, farmgate output prices come from the cost of production surveys conducted by National Development and Reform Commission (NDRC, various years-a). Wholesale and retail prices of most products are from Center for Price Monitoring, National Development and Reform Commission (NDRC, various years-b), Ministry of Agriculture (MOA, various years-b), and the Department of Rural Surveys under NBS (NBS, 2007). When wholesale and retail prices for some commodities in some years are not available, average price margins from farmgate to wholesale and retail are estimated. Many of the estimates of margins, transportation costs and other transaction costs were based on Rozelle et al. (2000) and Huang et al. (2004), which provided information on substantial quality differences between some imported and domestic commodities and resulting biases in price comparisons as a measure of protection. To verify and update these comparisons, we interviewed traders in ten cities around China in 2006.

The international price data (fob and cif) for all commodities, except milk, are the unit values of the exports or imports with adjustments for quality. These data are from the Ministry of Commerce (MOC, various years) and China's Customs Administration (2006). For the border price of milk, because no import prices for milk are available, we use the farmgate 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, taxes and subsidies. Tariff rates are from the Office of Tariff Regulation (Import and Export Tariff Regulation and Import Tariff and Export Tariff Rebate Compilation) (Office of Tariff Regulation, 1996–1998, 2005). Agricultural tax data come from cost of production surveys conducted by National Development and Reform Commission (NDRC, various years-a).

Results

Before turning to our investigation of China's agricultural trade reforms, we first place China's agriculture in international perspective by comparing the value of agricultural output in China with world output value, and the value of output in other major producing and trading countries. These shares are presented in Table 1 for China and a number of important agricultural producing and trading countries. Because these numbers are at domestic market prices, they do not measure the volume of output, but rather the share of resources devoted to agricultural production. A striking feature of the table is the increase in China's share of global agricultural value added, which increased over two and a half times between 1980 and 2006, vaulting it over India, the United States and the 27 member European Union as an agricultural producer. Part of this change was likely due to higher productivity growth in China than in other countries. Another influence may have been the changes in price incentives on which we focus.

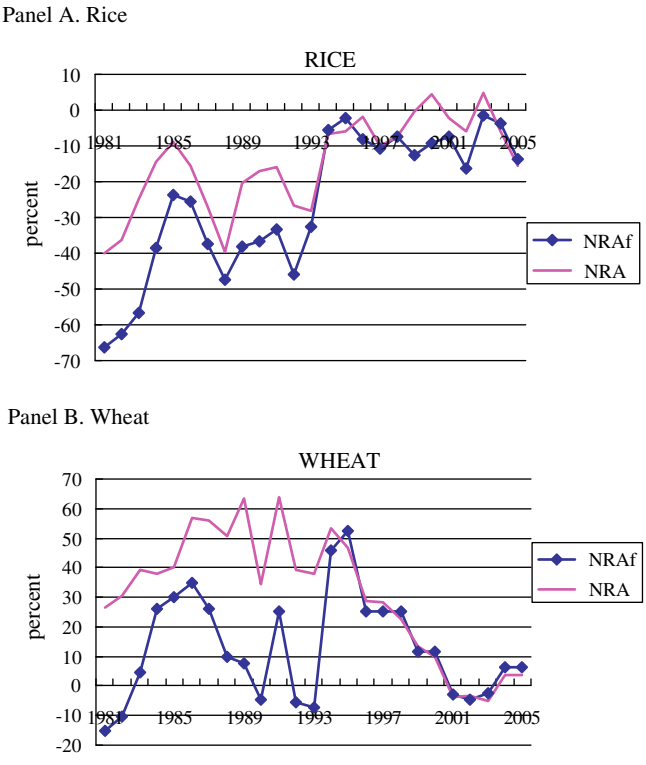
Nominal rates of assistance for China's main agricultural commodities

In this section we focus on the distortions faced by farmers in China between 1980 and 2005. To do so, we plot NRAs and NRA_f's over time for each of the 11 commodities we consider. As discussed above, all NRAs and NRA_f's are computed using estimated equilibrium exchange rates in the period prior to 1994—removing the effects of overvaluation of the official exchange rate under the dual-exchange rate system prevailing at that time.

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 (Fig. 1, Panel A). First, the NRA of rice, an exportable commodity, is negative in every year between 1981 and 1995. Ranging between −40 and −10, the negative NRAs show that China was highly competitive in international rice markets during these years. Trade policy, however, kept exporters from shipping large quantities of rice onto world markets and kept the free-market price of rice in China's port cities below the world price. Clearly this demonstrated China's commitment to keeping domestic prices low. Even after China's accession to the WTO in 2001, the domestic price of rice could be held below comparable world prices because state trading was able to continue.

The second feature is the way domestic marketing and procurement policies taxed farmers relative to the domestic market price (Fig. 1, Panel A). Through the mid-1990s, the state's artificially low procurement price kept the prices received by farmers below



Note : Negative NRAs and NRA_fs mean that this sector is being taxed; positive NRAs and NRA_fs mean agriculture is being protected.

Fig. 1. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers (NRA_fs) for rice and wheat in China, 1981–2005.

the domestic market price of rice as seen by the NRA_f's. Because of this, the tax on rice ranged between −70 in the early 1980s and −30 in the early 1990s. Rice producers were among the most heavily taxed farmers in China—given the large share of the crop's sown area and large negative rates of protection. Importantly, our analysis shows how the state used both trade and procurement policy to tax its rice farmers.

Unlike rice, the NRA measures show that trade policy offered high rates of protection to domestic wheat markets in China between 1981 and the mid-1990s (Fig. 1, Panel B). After 1980, during most years, the market price of wheat in China's port cities was about 60% higher than the international price of wheat (cif, China's port cities), ranging between 50% and 70%. Unlike rice, which China produced competitively during the 1980s, wheat producers—who have been shown to have higher costs than producers in many other countries (Huang and Ma, 2000)—received strong incentives from trade policy through higher market prices. This policy on its own, unlike that for rice, would not have been consistent with providing inexpensive food for consumers. It was, however, consistent with a policy of food self-sufficiency since it encouraged greater production by keeping out imports and keeping domestic prices high.

Domestic marketing policies, however, were working in the opposite direction to trade policies in terms of their effects on farm incomes. The trends in the NRA_f's show how the forced deliveries of wheat quotas lowered the average prices that farmers received (Fig. 1, Panel B). Although there was still positive protection for wheat farmers in most years between 1980 and 1995, the rates were lower (all below 50% except for in 1994 and 1995) and were zero and even slightly negative in 5 of the 16 years (1981; 1982; 1990; 1992; 1993).

The case of maize lies between rice and wheat (Fig. 2). By contrast with rice and wheat, the trade status of maize has varied from year to year. In Panel A, we examine the distortions to maize as if it were always an imported commodity; in Panel B, we examine the distortion for maize as an exported commodity; in Panel C, the calculations were done taking into account whether maize was a net import or a net export in that year. This panel suggests that the market price in China has varied around the world price, with negative protection for a few years in the early 1980s, followed by positive protection until 1988, then around five years of negative protection. As was the case with rice and wheat, procurement policy further lowered the average prices received by China's farmers for maize. In fact, except for 1985 and 1994, from the 1980s to 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 (Figs. 1 and 2—right hand sides of graphs). It is apparent from the way the differences in the estimates of NRAs and NRA_f's narrow that China's reformers were able to eliminate the procurement policies that had been taxing rice, wheat and maize farmers.

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. 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 eliminated. Since 2001, the NRAs for both rice and wheat have averaged close to zero. However, the introduction of minimum prices for grains in 2004 (OECD, 2005, p. 88) creates the potential for support to be triggered without explicit policy decisions, should prices fall.

The case of maize is a bit different than for other crops (Fig. 2). In a number of years after 2000, the NRA for maize was positive. This indicates that at least in some years national leaders have been protecting maize producers. This may in part be due to the rise of the Jilin lobby that has been successful in gaining protection for the producers of its most important crop, as argued by Rozelle and Huang (2004).

Edible oils and cotton

Over the entire sample period, the biggest difference between the analysis of distortions of grain crops and for cash crops (at least for soybeans and cotton) is that domestic marketing policy has historically played less of a role. Although some counties had procurement delivery quotas for soybeans, this was not as widespread as for grain (in many counties soybeans were not procured by the state procurement system). In addition, the implicit tax on soybeans where soybean quotas were collected was lower than for the staple grain crops. As a result, there is little difference between the NRAs and NRA_f's. The same is true for cotton—except that free market procurement of cotton by private traders was not allowed through the mid-1990s. When reform finally came in the mid-1990s, leaders did not move to a two-tier pricing system, but instead allowed both private trade and commercialized government cotton procurement stations. As a result, the NRAs and NRA_fs for cotton are nearly the same. In fact, the same is true for all of the rest of the commodities (livestock; horticulture and milk and sugar). As a result, the discussion in the rest of this section focuses on trade policy.

Before 1995, while not perfectly correlated with the trends of maize, our analysis shows that soybeans also fluctuated between being taxed and protected (Fig. 3). Although the average level of protection was almost zero, in some years soybeans received protection of up to nearly 30% while in other years they were being taxed by 20%. A recent paper by Rozelle and Huang (2005)

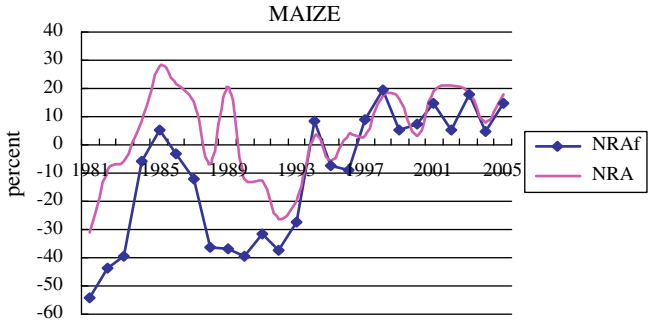


Fig. 2. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers' (NRA_fs) for maize in China, 1981–2005. Protection measures for maize based on trade status, 1981–2005.

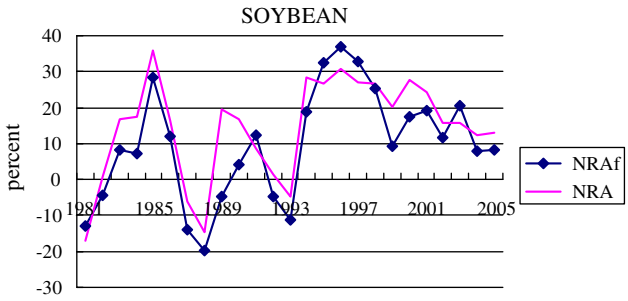


Fig. 3. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers' (NRA_fs) for soybean in China, 1981–2005.

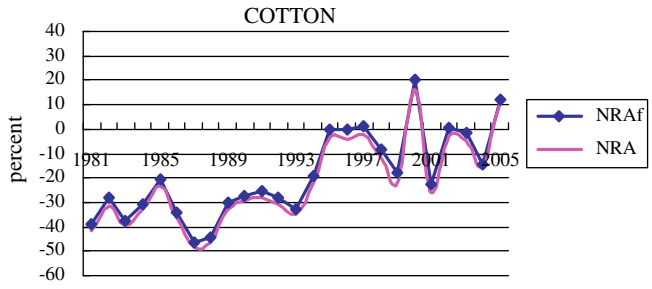


Fig. 4. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers' (NRA_fs) for cotton in China, 1981–2005. Protection measures for cotton based on trade status, 1981–2005.

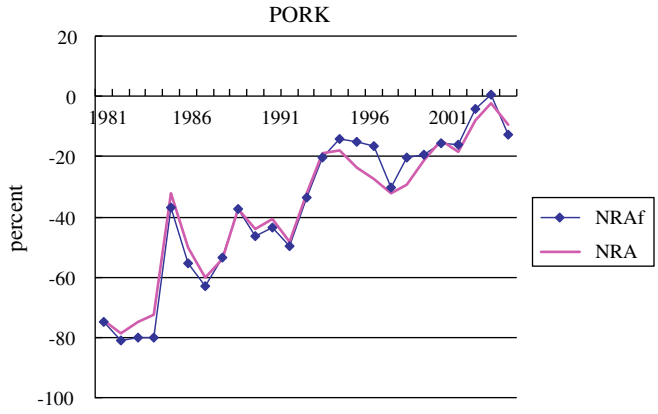
concludes that a lot of this fluctuation was due to domestic production policies that would encourage soybeans, then discourage them, then encourage them, while national planners allowed little trade.

The trends in the NRAs after 1995 show the strong commitment to trade liberalization for soybeans. Beginning in the late 1990s and continuing through to 2005 the protection for soybeans fell from around 30% to almost zero. This falling protection, in fact, should not be a surprise given the integration of China into world soybean markets and the monotonic rise in imports (which exceeded 25 million tons in 2005). The story of soybeans—and the fall in protection and almost full liberalization—stands in sharp contrast to that of maize, which enjoyed increasing protection.

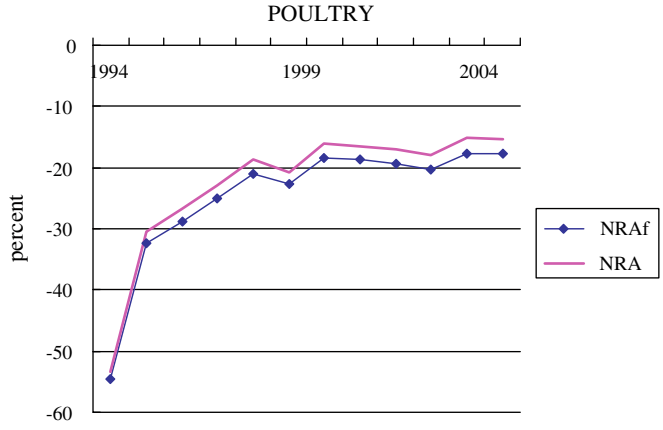
The distortion analysis for cotton, in some sense, produces results similar to those for rice (Fig. 4). The combination of trade and monopoly procurement policies kept domestic cotton prices lower than world market prices in the 1980s and early 1990s. It appears that China's planners were taxing cotton farmers to supply its emerging textile industries with relatively inexpensive raw materials. It is no wonder that such high implicit taxes on cotton (and serious insect problems) led to stagnant and even falling cotton area in many regions (NBS, 2004).

After 1995, however, with the liberalization of domestic markets (mostly) and increased trade liberalization (somewhat) there has clearly been a shift in the level of distortions faced by cotton producers. Although protection has fluctuated (it was high in 2000; and cotton was implicitly taxed in 1999 and 2001), since the mid-1990s the NRA has been nearly zero. In recent years, China's imports have been four times the tariff-rate-quota and China could have levied a tariff of up to 40% on over-quota imports, but has chosen to provide much more limited protection.

Panel A. Protection measures for pork



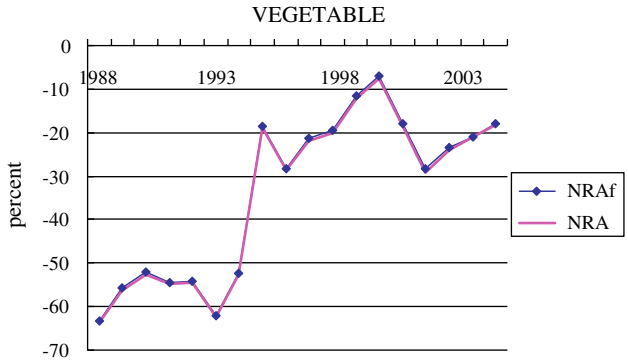
Panel B. Protection measures for poultry



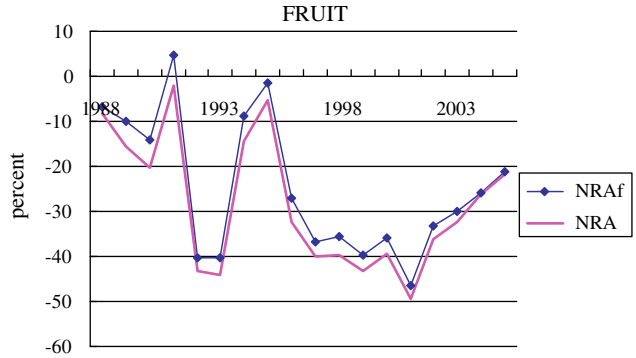
Note: These measures are calculated in the same way as NRAs and NRA_fs reported for other commodities. However, the true NRAs for these commodities become zero after 1994 because China has no policies holding their prices below world levels. The reported price comparisons therefore provide a measure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

Fig. 5. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers' (NRA_fs) for livestock commodities (pork and poultry) in China, 1981–2005.

Panel A. Protection measures for vegetable



Panel B. Protection measures for fruit



Note: These measures are calculated in the same way as NRAs and NRA$_f$s 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 burden resulting from the uncertainty resulting from barriers faced in other countries.

Fig. 6. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers (NRA$_f$s) for vegetable and fruit in China, 1981–2005.

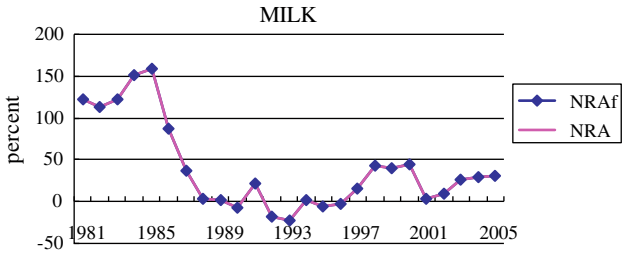
Livestock and horticultural commodities

With the exception of several years in the late 1980s and early 1990s for fruit, the patterns of distortions to China's livestock and horticultural sectors show remarkably similar patterns (Figs. 5 and 6, Panels A and B). 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, farmers were encouraged neither to produce nor export these commodities on a large scale. China had some visible barriers to exports, such as quotas on exports to Hong Kong, and others arising from restrictions on the enterprises permitted to undertake exports.

Since the late 1990s the gap between domestic and world prices of livestock and horticultural producers has fallen (Figs. 5 and 6). Emerging markets and relaxation of grain-first policies (often called agricultural structural adjustment policies inside China) allowed producers to greatly expand livestock and horticultural production to meet rising demand (Rosen et al., 2004). At the same time China's accession to the WTO and the appearance of an export-oriented segment of the livestock and horticultural industries has increased the interest in and feasibility of participating in international markets.

In response, the price gap measures have moved closer to zero for all of these commodities—pork, poultry, vegetables and fruit. Even now, however, it appears that prices paid for exports are below the prices obtained in export markets because of the perceived risk that shipments of these perishable goods will be delayed by disputes about phytosanitary standards. Since the measured price

Panel A. Protection measures for milk



Panel B. Protection measures for sugar

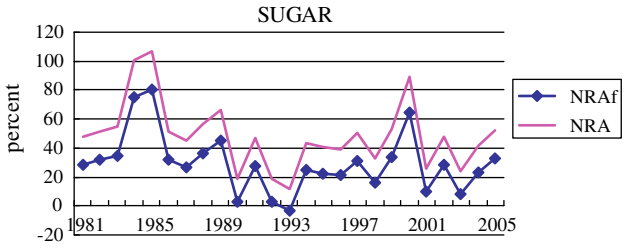
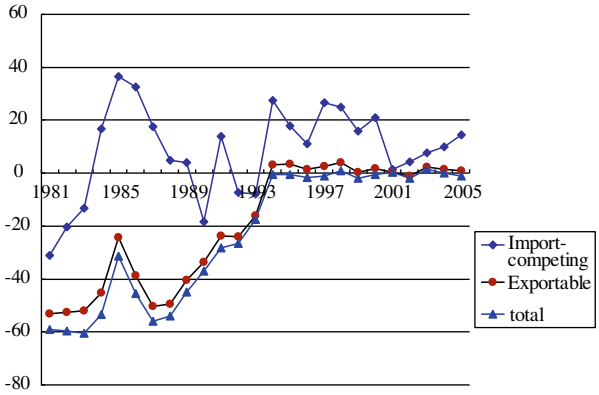


Fig. 7. Nominal rates of assistance (NRAs) and nominal rates of assistance for farmers (NRA$_f$s) for milk and sugar in China, 1981–2005.



Source: Authors' spreadsheet using methodology from Anderson et al. (2006)
Note: Negative NRAs mean that agriculture is being taxed; positive NRAs mean agriculture is being protected. Since the distortions to inputs are small, the graphs for NRA_fs are essentially the same.

Fig. 8. Rates of assistance for farmers that produce importable commodities, exportable commodities and for all of agriculture (11 commodities) in China, 1981–2005.

gaps do not reflect China's own distortings, we have not included them in the overall NRA measures presented later—we believe that the China's own distortions have been effectively zero since 1994. We report price comparisons for the full period in Figs. 5 and 6 because of the information they provide on the impacts of uncertainty about access to foreign markets.

Milk and sugar

The story for milk and sugar is in some sense the opposite of that for livestock and horticultural commodities. During the 1980s the NRAs for milk and sugar were positive and large (Fig. 7, Panels A and B). Those for milk ranged from 50% to more than 200% between 1981 and 1987. Those for sugar were above 40% through the late 1990s. Although beginning earlier and falling further, by the late 1990s and after 2000 (in the early 1990s for milk), NRAs for milk and sugar were falling (to around 20% by 2003) and for milk were near zero. In other words, the patterns for import-competing milk and sugar are nearly the mirror image of those for livestock and horticultural commodities.

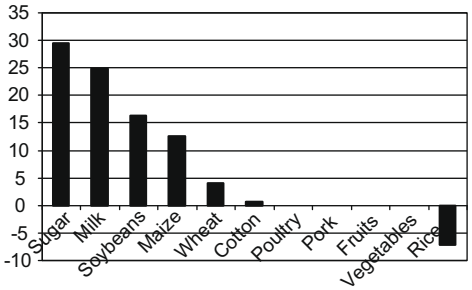
The picture for agriculture as a whole

Aggregating the 11 commodities in our study together (and by importables and exportables) and assuming that our study commodities largely reflect the distortions to all of China's agriculture, there is a striking pattern (Fig. 8—left hand side of figure). In the 1980s and through the mid-1990s, importables (such as wheat, soybeans, milk and sugar) were protected. On average, the protection rates were between 15% and 35%. The converse was true for exportables such as rice, livestock commodities and horticultural commodities, which were implicitly taxed between 40% and 50% in the 1980s. Overall, since the value of exportable agricultural products accounted for a greater part of the economy than importables throughout the early reform era, China's agricultural was highly distorted and on average the distortions were negative. In other words, China was taxing its agriculture—with both its international trade and domestic marketing policies.

One of the main findings of this study is evident from the right hand side of Fig. 8. After 1995, the NRAs of importables fall from around 20% to less than 10%. During this period, the NRAs of exportables rose, or the implicit taxes on them fell, from about 40% to around 15%. When taken together, the distortions in China's agriculture fell to less than 10%. In many years the overall protection was between 0% and −5%. Clearly, the combination of domestic marketing reforms and international trade liberalization has generated an agricultural sector that, on average, is one of the least distorted in the world. These results run strongly counter to the frequently-raised argument that accession to the WTO in 2001 caused dramatic reductions in protection to China's agriculture. In fact, they show that China's policies had actually taxed agriculture as a whole for most of the two decades prior to accession. The fact that protection to some import-competing sectors fell after accession is evident from the fact that protection to import-competing agriculture in 2001 was well below its average level in the 1990s, but this rate of protection rose slightly in the four years after accession.

Not all distortions have been eliminated. When aggregating over 2000–2005, there are still some commodities that have relatively high rates of protection (Fig. 9). For example, sugar and milk are still around 20% or greater. Maize and soybeans are around 10%. In the exportable categories, fruit, vegetables, pork and poultry have essentially zero protection, while rice appears to have been slightly negatively protected.

The summary statistics presented in Table 2 provide a valuable overall summary of the key findings of the study. They show that exportables were, on average, taxed by about 50% in the early 1980s, including both the taxation through depressed domestic prices resulting from border measures, and the further depression of farm prices through the procurement price system. High overall rates of taxation persisted into the early 1990s, but declined sharply in the late 1990s, to essentially zero by 2000–2005. Import-competing commodities were taxed at a much lower rate in the early 1980s, and the rate of assistance for these products became



Source: Authors' spreadsheet using methodology from Anderson et al. (2007)

Fig. 9. Average rates of assistance for producers of major commodities in China, 2000–2005.

Table 2
Nominal rates of assistance to agricultural industries, China, 1981–2005.

Crop	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005
Exportables	−52.7	−47.4	−14.6	−0.9	−0.2
Rice	−49.1	−36.6	−23.5	−7.8	−7.1
Fruits	−23.9	−9.9	−2.4	0.0	0.0
Vegetables	−42.1	−57.8	−13.4	0.0	0.0
Poultry	26.4	−34.6	−1.6	0.0	0.0
Pork	−70.2	−47.5	−8.9	0.0	0.0
Import-competing	−2.2	8.1	8.8	19.9	7.6
Wheat	7.7	15.4	22.7	22.2	2.1
Soybeans	6.4	−3.6	10.4	26.8	15.6
Sugar	51.3	29.1	15.5	35.4	21.9
Milk	134.9	25.1	−4.1	28.3	20.7
Mixed trade status					
Maize	−27.0	−25.1	−18.6	8.5	13.3
Cotton	−30.9	−36.0	−20.8	0.8	−3.5
Weighted average of above products	−45.5	−42.4	−11.5	2.0	0.8
Standard deviation	74.4	42.3	19.8	19.7	13.2
Coverage, % of value of total agric production (at undistorted prices)	84.5	90.1	85.9	75.1	65.9

positive, on average in the late 1980s. It was over 20% in the late 1990s, and the average rate of support fell to 7.5% in the early 2000s.[2]

Conclusions and implications

The main finding of our paper is that the nature of policy intervention in China's agriculture has changed dramatically over the past 25 years, transforming the agricultural sector from one characterized by high distortions to one that is relatively liberal. In the 1980s and early 1990s (or the *early reform period*) there were distortions in both external and domestic policies that isolated domestic producers and consumers from international markets. Importantly during the early reform period domestic marketing and pricing policies actually served to make the prices that domestic producers and consumers faced almost independent from the effects of trade policy. Because of this even in the case of a exportable commodity (e.g., rice), a commodity that enjoyed little protection at the border from tariffs (meaning that the international price of rice and the free-market price of rice were nearly identical), domestic pricing and marketing policies did not allow producers to reap the profits from international-level prices and instead forced farmers to sell much of their surplus to the state at artificially low prices. Hence, domestic policies levied a tax on farmers even though there was little protection at the border. Similar dynamics characterized importable commodities such as wheat and soybeans where, despite fairly high rates of protection from trade policies, producers were receiving much less protection than they would have had their been a free domestic market for the importable, while consumers were being implicitly taxed.

In contrast, since the late 1980s and early 1990s (the *late reform period*), 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 directly affected by them.

Despite the finding that considerable liberalization has occurred due to policy reforms in both domestic and external policies, there are still distortions to agriculture in the mid-2000s, nearly 30 years after the beginning of reforms. In some cases, these remaining distortions arise from tariffs on importable commodities and non-tariff trade barriers of other countries on China's exportable commodities. While low by international standards, China's tariffs are still providing a degree of protection for a number of importable commodities (e.g., wheat and soybeans). For at least one exportable commodity (maize), the use of export subsidies (which in fact are mostly configured as domestic marketing, transport and storage subsidies) continues to keep a wedge between the domestic price in China and the international market. Further, the presence of minimum prices for grain means that this wedge could expand automatically should prices decline.

Our analysis suggests that China's agricultural economy has become one of the least distorted in the world. Clearly, the combination of domestic marketing reforms and international trade liberalization has greatly freed up the decision making environment for producers. In this environment phenomena such as rapid structural change from grain to more labor intensive commodities and the rise of a horticulture and livestock-based export economy become more understandable. When farmers face smaller

[2] When comparing our estimated levels of protection with those generated by the OECD (OECD, 2005), we find that, in general, the average rates of protection are similar for the years of their study (1995–2001). Specifically, for the 10 or so comparable sets of commodities for which both research teams generated levels of protection, the estimates are quite close (within 10 percent or so for 7 of the commodities). It should be noted, however, that in some of these cases the trends over the OECD study period differed somewhat.
Only in the cases of wheat, sugar, soybeans and dairy do the series differ significantly. The reasons for the differences – to the best of our knowledge – are different for each of these commodities. In the case of wheat the two studies differ in the price series of China's domestic wheat because they make different assumptions on the quality of wheat being traded. In the case of sugar we differ from the OECD study on the basis of the assumed processing margins. In the case of soybeans, our study used a weighted average of soybean prices from all provinces and the OECD study used only the price series from Heilongjiang. In the case of dairy, we used the New Zealand milk price (which we consider to reflect the true global price of sugar) while the OECD study used an average of prices for different dairy products.
One other methodological difference is that the OECD (2007) includes subsidies paid to manufacturers of fertilizer and other key inputs as providing assistance to farmers that rises to around one percent of output value in 2005. We do not include this input support as we are concerned about whether it provides a benefit to farmers, as opposed to manufacturers. In any event, it remains small relative to the value of output.

distortions they tend to move into those commodities in which they have a comparative advantage. Another important consequence has been dramatic growth in imports of land and water-intensive commodities such as soybeans and cotton, in which China's comparative advantage appears to be declining, and for which there is rapidly-growing demand from downstream users.

However, this is far from implying that all rural development problems have been overcome. Markets only provide signals for private production and consumption signals. Much remains to be done to improve the efficiency of agricultural production, to reduce the barriers to migration out of agriculture, and to improve the provision of infrastructure, health and education services in rural areas. Such investments in public goods typically have very high returns both in terms of efficiency and in the mitigation of rural poverty (World Bank, 2008). A combination of investments in these critically important public goods and the liberal trade policy regime that now characterizes China's agriculture would allow China's agriculture to realize its potential contribution both to domestic goals of poverty reduction and income growth, and to the development of world markets for agricultural products.

Acknowledgements

The authors gratefully acknowledge the financial support of the Chinese Academy of Sciences (KSCX2-YW-N-039), the British Department for International Development and the World Bank, and The European Community (044255, SSPE-CATSEI). Extremely valuable comments and inputs were obtained from Kym Anderson, Ernesto Valenzuela and Marianne Kurzweil of the World Bank and from Andrzej Kwiecinski of the OECD. The views expressed in this paper are those of the authors alone and not necessarily those of any individual or organization with which they might be associated.

Appendix A. The foreign exchange regime: description and creation of measures accounting for distortions

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, 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.[3] The introduction of the Internal Settlement Rate, at 2.8 Yuan per dollar for trade transactions in 1981, represented a near-50% devaluation relative to the official exchange rate, which remained in use 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, the Chinese system 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 its value was diminished by restrictions on its tradability between enterprises, whose needs for foreign exchange inevitably varied considerably.

Under this system, the official exchange rate was overvalued, and a higher (more depreciated) secondary market exchange rate. Exporters were required to surrender at least part of their foreign exchange earnings at the official exchange rate, and permitted to retain the remainder either for their own use, or for sale on a network of increasingly-integrated and well-regulated secondary markets for foreign exchange. 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 or an export tax. The exchange rate received by exporters differed from that paid, at the margin, by importers.

To analyze the effects of the exchange rate system (or to get the analysis of nominal rates of assistance correct), we construct an exporter exchange rate series using the retention ratio to calculate a weighed 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. In this paper, the difference between the importer exchange rate and the equilibrium exchange rate is used as a measure of the exchange rate distortion component of import protection.

When China used this arrangement, 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% between 1981 and 1984, 25% in 1985 and 1986, 44 pct between 1987 and 1990 and 80% between 1991 and 1994.

In this paper, then, we generally use the average of the exporters' exchange rate and the importers' exchange rate to get an estimate of the equilibrium rate (this assumes equal elasticities of demand and supply for foreign exchange) but the final result doesn't matter as we just use this to divide the total wedge between taxes on imports and taxes on exports (by Lerner Symmetry they have the same effect).

Using these principles, we obtain the results in Appendix Table A1. Over time, we used 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 was to take into account the information on the average exchange rates applying in Foreign Exchange Adjustment Centres when they operated (1987–94).

[3] Of course, the average cost of earning foreign exchange is a flawed measure, and provided flawed incentives, since the marginal cost of earning foreign exchange is the conceptually relevant measure. Only in the cases of wheat, sugar, soybeans and dairy do the series differ significantly. The reasons for the differences – to the best of our knowledge – are different for each of these commodities. In the case of wheat the two studies differ in the price series of China's domestic wheat because they make different assumptions on the quality of wheat being traded. In the case of sugar we differ from the OECD study on the basis of the assumed processing margins. In the case of soybeans, our study used a weighted average of soybean prices from all provinces and the OECD study used only the price series from Heilongjiang. In the case of dairy, we used the New Zealand milk price (which we consider to reflect the true global price of sugar) while the OECD study used an average of prices for different dairy products. One other methodological difference is that the OECD (2007) includes subsidies paid to manufacturers of fertilizer and other key inputs as providing assistance to farmers that rises to around one percent of output value in 2005. We do not include this input support as we are concerned about whether it provides a benefit to farmers, as opposed to manufacturers. In any event, it remains small relative to the value of output.

Table A1
Exchange rates and related measures for China, 1980–2004.

	Official	Secondary	Internal settlement	FEAC average	Retention rate	Exporter ER	Importer ER		Implied equilibrium ER
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 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	8.681				8.351	8.351		8.351
1996	8.314	8.069				8.314	8.314		8.314
1997	8.290	7.720				8.290	8.290		8.290
1998	8.279	7.710				8.279	8.279		8.279
1999	8.280	7.479				8.280	8.280		8.280
2000	8.280	7.488				8.280	8.280	Official	8.280
2001	8.277	7.497				8.277	8.277		8.277
2002	8.278	7.506				8.278	8.278		8.278
2003	8.278	7.515				8.278	8.278		8.278
2004	8.277	7.524				8.277	8.277		8.277

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 "equilibrium" rate calculated assuming that the elasticities of supply and demand for foreign exchange are equal. This assumption is highly conjectural. While it will influence the allocation of the estimated protection between import protection and export taxation, this attribution does not, by Lerner Symmetry, influence the estimated total cost of protection.

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