

Asia's Role in Stabilizing Food and Agricultural Prices

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Abstract

Every decade or so, food becomes newsworthy globally because of a price spike, either upwards (hurting consumers, as in 1973 and 2008) or downwards (hurting farmers in open economies, as in 1986). Most such price spikes are a consequence of major policy shifts, since local weather-induced supply shocks in a multi-country trading world tend to offset each other. Fluctuations in international food prices are exacerbated by trade restrictions that vary with those prices, and are worst for the most-insulated markets such as rice. Asian rice policies thus contribute to world food price instability. More broadly, however, the gradual reduction in anti-agricultural and anti-trade policies in many Asian emerging economies in the past quarter-century has contributed very substantially to global economic development and poverty alleviation. After examining how large the fluctuations in real international prices for food are relative to those for other primary products, this paper examines the extent of opening up of agricultural markets in Asia relative to other developing economies. It then examines what could be done by governments in Asia and elsewhere to achieve more efficient and equitable outcomes for food markets in the future that are both growth enhancing and poverty alleviating.

Keywords: Food price stabilization, distorted agricultural incentives, farm trade policy reforms, biofuels, Asian agricultural development

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1. Introduction

The theme of the Asian Development Bank Institute's (ADBI) annual conference, on Asia's contributions to global economic development and stability, was timely for several reasons, including the rapid rise of food, petroleum, and other primary product prices in 2007–2008 in response to high growth in Asia's large emerging economies; the sudden deceleration of the world economy in the second half of 2008; and the widespread recession that followed. The focus of this paper is on the region's contributions via policies affecting the agricultural sector, and, in particular, on the role of Asian governments in stabilizing the prices of food and other agricultural products.

Food price gyrations worry the poor even in high-income countries, but are especially important in low-income countries where poorer households spend most of their income on food. Upward spikes clearly hurt buyers of food, but downward spikes in the prices of farm products can also negatively affect a large proportion of households in developing countries, for which agriculture is a major source of employment and gross domestic product (GDP). National policies that reduce the amplitude of domestic agricultural price fluctuations over time therefore help domestic consumers at the expense of the country's farm households, or vice versa.

The policy instruments used for this purpose are typically the same as those used to alter the trend level of domestic agricultural prices, namely trade policy measures.¹ When many national governments intervene with variable trade taxes or quantitative restrictions, the share of global production that is traded shrinks, making the international market "thinner" than it otherwise would be. This erodes the international public good that open national economies generate through trade, not only because the normal economic gains from trade are diminished, but also because an international market that is thinner for this reason is

¹ These are occasionally supplemented with government storage initiatives, which are largely ineffective or too expensive, and so tend to be short-lived. Managing public food stockholdings is difficult because of uncertainty regarding the quantity of stocks needed and how much to release at any time. Stock mismanagement can even be destabilizing, as appears to have been the case in 2008, with some attempts to create or expand stocks when food prices were at their peak. Stocks are a large drain on the treasury, particularly when displacement of private stocks is taken into account. Their interaction with trade policies also needs to be carefully considered. If, for instance, farm output falls for a product protected only by an import tariff, sales from stocks will reduce imports but do nothing for the farmers whose output has fallen.

more volatile. This greater volatility entices even more governments to intervene to stabilize their domestic food markets, further increasing international price volatility. This is especially bad for the development of open agricultural-exporting economies, as history has shown that volatility in a country's long-run trend terms of trade slows its economic growth (Williamson 2008). Such a beggar-thy-neighbor unilateral policy action generates an international public "bad," suggesting there is scope for collaborative action.

Section 2 of this chapter looks at how large the fluctuations in real international food prices are, both absolutely and relative to those for other primary products, and how the price spike of 2008 compares with earlier spikes. Section 3 examines how much agriculture has lagged behind other sectors in expanding the extent to which its products are traded internationally in the latest wave of globalization, and how Asia compares with other regions in this respect. In section 4, new evidence is presented on the impacts government policies have had on farmer incentives in Asia as compared with elsewhere, in terms of both long-term trends and fluctuations from year to year. The final section examines what can be done by governments in Asia and elsewhere, both unilaterally and collaboratively, to achieve more efficient and equitable outcomes in the future, while improving stability and growth and alleviating poverty.

2. The 2008 Commodity Price Hike in Historical Perspective

The international price of rice nearly trebled in the first few months of 2008, sending politicians, bureaucrats, and consumers into a panic. Some governments responded with restrictions on their exports of rice, which exacerbated the situation for rice-importing countries. Prices of other grains and oilseeds also rose rapidly, though none as much as for rice. As a result, the World Bank's food price index in the second quarter of 2008 was 55% above its 2007 level in nominal United States (US) dollar terms. Figure 2.1 shows quarterly grain prices for the decade to mid-2008. In the second half of 2008, however, they—and most other primary commodity prices—roughly halved, again in nominal US dollars.

2.1 Drivers of the Recent Food Price Rise

Causes of this latest food price spike have been much debated (International Food Policy Research Institute [IFPRI] 2007; Mitchell 2008; Organisation for Economic Co-operation and Development [OECD] and Food and Agriculture Organization of the United Nations [FAO] 2008; Stoeckel 2008; Meyers and Meyer 2008). On the supply side, grain reserves had been run down over the first half of this decade in response to low prices so that, when crop failures occurred in some grain-exporting countries in 2006–2007, supplies could not be replenished until the following harvest.² Meanwhile, the steady rise in petroleum prices—due in large part to the rapid growth of Asia's emerging economies—and hence, also in urea fertilizer prices (Figure 2.2), added substantially to farmers' costs, which dampened their incentive to expand output.

On the demand side, two sets of changes coincided. One was the impact of rapid income growth in Asia on the demand for high-protein foods, including meat and milk. This demand drove up the prices of these products, but also those of feed grains and oilseeds.³ The other was an unanticipated government response to rising petroleum prices and concerns about carbon emissions from both the US and the European Union (EU), namely, the imposition of policies to subsidize domestic biofuel production through tax credits and the introduction of mandates on biofuel use. Those actions led to sudden increases in the demand for maize in

² In 2006, global grain reserves comprised less than one-quarter of annual consumption, compared with more than one-third during 1997–2001 (Stoeckel 2008). By 2007–2008, they accounted for only one-sixth (Meyers and Meyer 2008).

³ The volume of oilseed use in the People's Republic of China (PRC) doubled in the decade to 2007–2008 (Meyers and Meyer 2008).

the US and for rapeseed in the EU. Farmers in affected countries responded by growing those crops at the expense of others, thereby adding to the shortage of grains and oilseeds for food and animal feed demand (OECD 2008c). The weakening of the US dollar against the euro and other currencies also contributed to the rise in the nominal US-dollar price of commodities. Also, there was an increase in speculative holdings of commodities because the excess demand for assets from emerging economies (whose own financial sectors are underdeveloped) could not be met by financial assets in the US in the 12 months to mid-2008 (Caballero, Farhi, and Gourinchas 2008). That excess demand had driven down US interest rates, making it less unprofitable to hold commodities (Frankel 2008). Panic buying and hoarding by Asian rice consumers increased the magnitude of the rice price spike in the second quarter of 2008.

A consensus on the relative contributions to the food price hike of these various factors—and of the food export restrictions instituted by many food-surplus developing countries during 2008—has yet to emerge. According to Mitchell (2008), higher energy prices and related increases in farm production costs, combined with the weakening of the US dollar, may have contributed about one-quarter of the rise in food prices between 2002 and early 2008. In addition, biofuel subsidies (themselves partly a response to high petroleum prices and growing concerns about energy security) may be responsible for much of the rest. In the case of rice, export restrictions are reported to have caused its price rise by as much as one-quarter (Meyers and Meyer 2008).

Mitchell's analysis implies that the dramatic fall—by more than two-thirds—of the US-dollar price of oil in the four months to early December 2008 was a contributor to the halving of the prices of numerous agricultural products over that period, as was the easing/removal of temporary food export restrictions. Whether those food prices will return to and remain at the relatively low levels of earlier this decade, however, depends heavily on whether biofuel tax credits and mandates persist in the US and EU. Projections published before mid-2008 by IFPRI (2007) suggest that by 2050, real international food prices will be 30–80% higher than in 1999–2001 unless farm productivity growth accelerates substantially. The OECD and FAO (2008) projections are not quite as dramatic, but they suggest nominal food prices will rise and real prices will fall much less than in previous decades. The agencies stress, however, that their price projections would be much less positive if biofuel subsidies (via tax credits) and mandates were to be reduced or abandoned (OECD 2008c; FAO 2008).

2.2 Relative Magnitude of the Recent Food Price Rise

Large and sudden as the latest food price shock has been, it was not unprecedented. Using the price of manufactured exports to developing countries from the largest five high-income countries as a deflator, the World Bank has compiled an index of real international prices since 1900 for food products important for developing countries (Grilli and Yang 1988, updated by Pfaffenzeller, Newbolt, and Rayner 2007). During the 20th century, the real food price index fell at 0.75% per year. Most of the decline, however, was in the second half of the century, and for the 60 years since 1948 the annual rate of decline was twice as rapid, at 1.5%. During that post-World War II period the index spiked above trend six times, or an average of once per decade. It is clear from Figure 2.3 that the 1973–1974 spike was much larger than the estimate depicted for 2008, but nonetheless, the price rise in 2008 was the next largest in proportional terms. The 1973–1974 event was partly associated with the four-fold rise in the price of oil that resulted when the Organization of Petroleum Exporting Countries (OPEC) unilaterally imposed production quotas. However, it was mostly due to the Soviet Union departing from its policy of self-reliance and entering the international grain market in a significant and unanticipated way to offset a domestic shortfall (Johnson 1975; Morgan 1979).

The other point to note from Figure 2.3 is that in each of the six previous cases, the price rise was followed very shortly by an equally sharp fall. The fall in food prices in the second

half of 2008 was thus also not unprecedented, although its suddenness and severity may have been exacerbated by the cessation of economic growth brought on by the global financial crisis of 2008.

In Figure 2.4, the annual movements in food prices since 1960 are shown alongside those for energy, minerals and metals, and other primary products, all of them deflated by the same price index for manufactures. Energy price rises since the early 1970s have been driven largely by the OPEC cartel's production quotas, which have not expanded as fast as global demand. Fluctuations in the prices of minerals and metals have primarily been demand-driven, as has the price of timber, which is weighted at 44% in the index for other primary products (the rest being non-food agricultural and so also subject to farm policy interventions).

It is conceivable that weather-related supply shocks could contribute to price fluctuations for food and other agricultural products, but vast differences in unseasonable weather around the world mean its influence on international prices would be minor if each national market was fully integrated with the rest of the world. Indeed, Johnson (1975) estimated that had free trade in grain been in place in the mid-1970s, prices would have been so much less variable—because trade would mitigate local supply variability—that only negligible quantities of carryover/storage would have been profitable. A subsequent study of global food trade provided complementary results. Using a stochastic model of world markets for grains, livestock products, and sugar, Tyers and Anderson (1992) found that the instability of international food prices in the early 1980s was three times greater than it would have been had there been free trade in those products. This suggests that the relatively high volatility in international food markets is caused by the thinness of those markets, which, in turn, is due to the use of variable trade policy instruments to insulate domestic food markets from fluctuations abroad.

Market thinness is also linked to another common characteristic of agricultural trade policies: their use to alter the trend level of domestic prices of farm products. Should these policies have an anti-trade bias, they would also contribute to making the international market thinner, and hence, more volatile. As discussed below, the stronger a country's agricultural comparative advantage (disadvantage), the more its government tends to keep domestic prices below (above) the trend level in the international market, and, within the farm sector, to bias assistance toward import-competing farm industries at the expense of export industries.

Before addressing recent evidence for intra- and inter-country anti-trade bias in government intervention in agricultural markets, this paper will review trends in the international tradability of agricultural versus other products.

3. Trends in Tradability of Agricultural Products

Globalization forces have greatly lowered the cost of doing business across national borders. During the past quarter century, these forces have included the information and communications technology revolutions, as well as technical changes in transport, such as bulk carriers and the containerization of ocean shipping. Policy changes, such as the deregulation of airline and other services, and the phasing down of manufacturing tariffs, have also significantly lowered trade costs, for example, by allowing ever-greater fragmentation of production of goods and services, and outsourcing abroad. As a result, international trade has expanded much faster than global production. Between 1974 and 2007, real GDP grew at 2.9%, while the real value of international trade grew at 5.0% (World Trade Organization [WTO] 2008).

In agriculture, by contrast, there has been relatively little growth in the propensity to trade. For developing countries, the share of farm production traded has remained approximately 8% since the early 1960s, and for high-income countries it has grown, mainly within the EU

and within North American Free Trade Agreement (NAFTA) countries. Even including that intra-bloc trade, the share of farm production exported globally has risen only modestly over the past five decades, from 11% to 16%, and has remained at 4% or 5% in Asia (Table 2.1).

It is certainly more difficult to break up the production process into component parts in agriculture than it is in manufacturing, but that is likely only a small part of the explanation for relatively low farm trade growth. A more likely explanation is the persistence of government intervention in agricultural markets, especially when such intervention includes an insulating component or an anti-trade bias. To explore that possibility, the next section summarizes the findings of a new set of estimates of distortions to agricultural incentives over the past half-century.

4. Estimates of Distortions to Agricultural Incentives

A study completed two decades ago showed that developing economies had been heavily taxing their agricultural sectors, both directly and indirectly, by protecting manufacturing from import competition and overvalued exchange rates (Krueger, Schiff, and Valdés 1988, 1991). The main exceptions seemed to be the Republic of Korea and Taipei, China, which, like Japan some decades earlier, had switched from taxing to providing financial assistance to their farmers, and were steadily raising that assistance as per capita income and agricultural comparative disadvantage rose in the course of their rapid economic growth (Anderson and Hayami 1986). Since the mid-1980s, however, great progress has been made by many developing countries in reducing their earlier anti-farm policy bias. Indeed, these changes have been transformational in the People's Republic of China (PRC) and, to a lesser extent, in India.

To better understand the nature and extent of this reform process, a new World Bank research project has revisited this issue, extending the earlier estimates of distortions to the present decade, and expanding the sample to examine similar trends in other parts of Asia, as well as in Africa, the Americas, and Europe. In all, estimates are now available for 75 countries—comprising 90% of global agriculture (and 95% of Asia's economy)—and for as many years as possible over the past five decades (Anderson and Valenzuela 2008).

A key driver of the rapid growth and industrialization of Asia has been the decision by many countries in the region to become more open and to transition from import-substituting development strategies to those that are export oriented. With export-led growth has come a dramatic restructuring of Asia's economies away from agriculture and toward manufacturing and service activities. For developing Asia as a whole, agriculture now accounts for less than one-eighth of GDP (down from more than one-third in the late 1960s), industry has risen from 27% to 38%, and services from 35% to 49%. The apparent decline in agricultural comparative advantage in developing Asia is evident in the self-sufficiency data for primary farm products. Until 30 years ago the region was nearly 100% self-sufficient in farm products, but since then that indicator has declined to less than 85%. The share of farm production exported has not changed significantly, averaging in the 4–6% range (although there have been substantial changes in some individual countries, with declines in Malaysia; Philippines; Sri Lanka; and Taipei, China offset by increases in countries such as Viet Nam, Thailand, and PRC). By contrast, since the late 1970s, the share of imports in domestic consumption of farm products has quadrupled, to roughly 20% (Table 2.1).

The increasing dependence on imports of farm products in Asia has occurred despite lower taxes on agricultural exports and greater incentives provided to farmers via government policy reforms. Before presenting those results, it is necessary to briefly summarize the methodology used to generate these new indicators of distortions (details of which are available in Anderson et al. 2008).

4.1 Methodology for Measuring Price Distortions

The nominal rate of assistance (NRA) is the key indicator used. It is defined as the percentage by which government policies have raised gross returns to farmers above what they would be without the government's intervention (or lowered them, if $NRA < 0$).⁴ If a trade measure is the sole source of government intervention, then the measured NRA will also be the consumer tax equivalent (CTE) rate at that same point in the value chain. When domestic producer or consumer taxes or subsidies also exist, however, the NRA and CTE will not be equal, and at least one of them will differ from the price distortion at the border due to trade measures. Both are expressed as a percentage of the undistorted price (unlike the producer and consumer support estimates computed by the OECD [2008a], which are expressed as a percentage of the distorted price).

Each industry is classified as import-competing, as a producer of exportables, or as producing a nontradable (with its status sometimes changing over the years), so as to generate for each year the weighted average NRAs for the two different groups of tradables. Those NRAs are used to generate a trade bias index (TBI), defined as:

$$(1) \quad TBI = (1 + NRA_{ag_x}/100)/(1 + NRA_{ag_m}/100) - 1,$$

where NRA_{ag_m} and NRA_{ag_x} are the average percentage NRAs for the import-competing and exportables parts of the agricultural sector. The TBI indicates in a single number the extent to which the typically anti-trade bias (negative TBI) in agricultural policies changes over time.

The coverage of products for NRA estimates averages between two-thirds and three-quarters of the gross value of Asian farm production at undistorted prices. Authors of the country case studies also provide "guesstimates" of the NRAs for non-covered farm products. Weighted averages for all agricultural products are then generated, using the gross values of production at unassisted prices as weights. For countries that also provide non-product-specific agricultural subsidies or taxes (assumed to be shared on a pro-rata basis between tradables and nontradables), such net assistance is then added to product-specific assistance to calculate an NRA for total agriculture (and also for tradable agricultural products).

Farmers are not only affected by the prices of their own outputs, but also by the incentives non-agricultural producers face. That is, it is *relative* prices, and hence, *relative* rates of government assistance that affect producer incentives. More than seventy years ago Lerner (1936) published his symmetry theorem that proved that in a two-sector economy, an import tax has the same effect as an export tax. This also applies to a model that includes a third sector producing only nontradables, or to a model with imperfect competition, and applies regardless of the economy's size (Vousden 1990). If one assumes there are no distortions in the market for nontradables and that the value shares of agricultural and non-agricultural, non-tradable products remain constant, then the economy-wide effect of distortions to agricultural incentives can be captured by the extent to which the tradable parts of agricultural production are assisted or taxed relative to producers of non-farm tradables. By generating estimates of the average NRA for non-agricultural tradables, it is then possible to calculate a relative rate of assistance (RRA), defined in percentage terms as:

$$(2) \quad RRA = 100[(1 + NRA_{ag^t}/100)/(1 + NRA_{nonag^t}/100) - 1],$$

where NRA_{ag^t} and NRA_{nonag^t} are the weighted average percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively. Since the NRA cannot be

⁴ In most countries, distortions to farm inputs are very small compared with distortions to farm output prices. Where there are significant product-specific distortions to input costs, however, they are captured by estimating their equivalence in terms of a higher output price. This figure is then included in the NRA for individual agricultural industries wherever data allow. Any non-product-specific distortions, including distortions to farm input prices, are also added into the estimate for the overall sectoral NRA for agriculture as a whole.

less than -100% if producers are to earn anything, neither can the RRA (assuming NRA_{nonag}^t is positive). If both of those sectors are equally assisted, the RRA is zero. This measure is useful in that if it is below (above) zero, it provides an internationally comparable indication of the extent to which a country's policy regime has an anti- (pro-) agricultural bias.

In calculating the NRA for producers of agricultural and non-agricultural tradables, our approach sought to include distortions generated by dual or multiple exchange rates. Such direct interventions in the market for foreign currency were common in some Asian countries in the 1970s and 1980s, including the PRC. However, as the authors of some of the focus country studies had difficulty finding an appropriate estimate of the extent of that distortion, its impact on NRAs has not been included in all cases. Its exclusion from the figures for some countries (e.g., India) means their estimated (typically) positive NRAs for importables and (typically) negative NRAs for exportables are smaller than they should be. This may also have led to an underestimation of the (anti-)TBI. Moreover, in cases where the NRA for importables dominated that for exportables, this omission may have led to an underestimation of the average (positive) NRA for such tradables.

NRAs and CTEs are useful as distortion measures in national or global economy-wide computable general equilibrium models to estimate the trade, economic welfare, and other effects of government interventions. They are not ideal as trade or welfare indicators on their own, however, because of possible offsets. For example, if a country has positive NRAs for its import-competing farm industries but negative NRAs for its export industries, the weighted-average NRA for the sector might be close to zero, whereas the trade and welfare effects of those two subsectors' distortions are additive. That is, their total effect on trade or welfare is greater than the two individual sets of effects, not less than, as implied when their NRAs are averaged. The same is true when averaging NRAs across countries if the sample includes countries with both positive and negative average NRAs. To overcome this averaging problem, Lloyd, Croser, and Anderson (2009) devised more-satisfactory indexes for capturing distortions to agricultural incentives, drawing on the trade restrictiveness index literature developed by Anderson and Neary (summarized in their 2005 book) and the theoretical simplifications made by Feenstra (1995) and Lloyd (2007, 2008).

To capture specifically the distortions imposed by each country's border and domestic policies on its economic welfare and trade volume, Lloyd, Croser, and Anderson defined measures they called the Welfare Reduction Index (WRI) and the Trade Reduction Index (TRI). The WRI (or TRI) has the advantage of providing a theoretically sound indicator of the welfare (or trade) effect of a single sectoral measure that is comparable across time and place. That measure provides an estimate of the common trade tax across all agricultural products that would generate the same welfare cost (or same reduction in trade) as that generated by the actual structure of NRAs and CTEs in a country. In this way, the WRI and TRI are better able to approximate what a computable general equilibrium model can provide in the way of estimates of the trade and welfare (and other) effects of the price distortions captured by the NRA and CTE estimates for a given product—and have the advantage of being able to indicate trends over time.

4.2 Estimates of NRAs, RRAs, CTEs, WRIs, and TRIs

First, estimates of NRAs to agriculture will be compared with nominal rates for non-agricultural tradables in Asia and with similar rates for other regions. Then, estimates from the WRI and TRI will be provided, again reporting those for other regions for comparison.

4.2.1 Nominal Rates of Assistance to Agriculture

From the mid-1950s to the early 1980s, agricultural price and trade policies reduced the earnings of farmers in developing Asia—on average by more than 20%. Implicit taxation declined from the early 1980s, however, and from the mid-1990s, the NRA switched sign and became increasingly positive. That average NRA hides considerable diversity within the

region, however. Nominal assistance to farmers in the Republic of Korea and Taipei, China was positive from the early 1960s (although very small initially, compared with the 40+% in Japan at that time). Indonesia's NRA was only slightly above zero in some years in the 1970s and 1980s (as was Pakistan's prior to Bangladesh becoming an independent country in 1971). Average NRAs in India and the Philippines were positive from the 1980s (Table 2.2).⁵

This trend also holds for the vast majority of commodity NRAs in the region, with meat and milk the only products to have seen their assistance rates cut over that period. As is true for other regions of the world, assistance is among the highest for "rice pudding" products: sugar, milk, and rice. Even for those three products, however, there is great diversity in NRAs across countries, with five-year averages ranging from almost zero to as much as 400% for rice and 140% for milk in the Republic of Korea, and to 230% for sugar in Bangladesh. There is also a great deal of NRA diversity across commodities within each Asian economy's farm sector, and the range (as measured by the standard deviation) has grown rather than diminished over the past five decades, from a regional average of less than 40% in the early years of the period being studied, to more than 55% in recent years. This suggests that there is still much that could be gained from improved resource reallocation, both between Asian economies and within the agricultural sector of individual Asian economies, if differences in rates of assistance were reduced.

A striking feature of the distortion pattern within the farm sector is its strong anti-trade bias. This is evident from Figure 2.5, which depicts the average NRAs for agriculture's import-competing and export subsectors for the region. The former's average is always positive and its trend is upward-sloping, whereas the average NRA for exportables is negative and did not diminish until the 1980s, after which it gradually approached zero. Since the 1980s, the gap between the NRAs for those two subsectors has diminished somewhat for the region as a whole, with several countries (Malaysia, Thailand, Pakistan, and Sri Lanka) contributing to that trend.

4.2.2 Assistance to Non-farm Sectors and Relative Rates of Assistance

The anti-agricultural policy biases of the past were not solely due to agricultural policies. Also important to changes in incentives affecting intersectorally mobile resources has been the significant reduction in border protection for the manufacturing sector (which has been the dominant intervention for non-agricultural tradables). Reduced assistance to producers of non-farm tradables has had a greater positive impact on farmer incentives than has reduced direct taxation of agricultural industries.

It has not been possible to quantify the distortions to non-farm tradable sectors as carefully as for agriculture. Authors of the country case studies typically relied on applied trade taxes (for exports as well as imports) rather than being able to undertake price comparisons, and hence most of the studies do not capture the quantitative restrictions on trade that were important in earlier decades, but have become decreasingly so in recent times. The case studies were also unable to capture distortions in the services sectors, some of which now produce tradables (or would in the absence of interventions preventing their emergence). As a result, the estimated NRAs for non-farm importables are smaller and decline less rapidly than in fact was the case—this also holds true for non-farm exportables, with the exception that in some cases their NRAs would have been negative, bearing in mind the anti-trade bias in the dual exchange rate systems that operated in the PRC and elsewhere. Of these two elements of underestimation, the former bias dominates, so the authors' estimates of the

⁵ Note that in the tables and figures to follow, it has been assumed that NRAs for the PRC pre-1981 and for India pre-1965 are the same as the average NRA estimates for those economies for 1981–1984 and 1965–1969, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981–1984 and 1965–1969, respectively. This NRA assumption is conservative, in the sense that for both countries the average NRA was probably even lower (more negative) in earlier years.

overall NRA for non-agricultural tradables should be considered to be on the conservative end. The underestimation becomes greater further back in time, such that the NRA's decline appears to be less rapid than it is in actuality.

Despite the likely underestimation, NRA estimates for non-farm tradables prior to the 1990s are very sizeable. For Asia as a whole, the average NRA value has declined steadily throughout the past four or five decades as policy reforms have spread. This has contributed to a decline in the estimated negative RRA for farmers. The weighted average RRA was less than -50% up to the early 1970s but improved to an average of -32% in the 1980s, -9% in the 1990s, and is now positive, averaging 7% in 2000–2004. Five-decade trends in RRAs and their two component NRAs for each economy are reported in Table 2.3. It is even clearer from Figure 2.6 that falling positive NRAs for non-farm producers have contributed even more to the rise of the RRA in Asia than has the gradual reduction in negative NRAs for farmers due to agricultural policy reforms.

Has the location of production of farm products within and between Asian countries become more or less efficient as a result of policy changes over the past five decades? A global computable general equilibrium model with a time series of databases is needed to fully answer this question. In the absence of such a model, one crude method of addressing the question involves examining the standard deviation in RRAs across the economies of the region over time. This suggests that distortions have become more dispersed across countries over time. The dispersion averaged 35% in 1960–1974, 50% in 1975–1989, and 55% in 1990–2004 (Table 2.3, bottom row).

Of the striking changes in the RRAs in individual economies over the past two decades, it is the move from negative to positive RRAs in the PRC and India that matter most for the region and, indeed, for the world. The extent of the decline in non-agricultural NRAs since the early 1980s is very similar in these two key countries. However, their agricultural NRAs have differed. In the PRC, the five-year averages have risen steadily from -45% to 6%. In India, they have remained close to zero, with the exception of an upward spike when international food prices collapsed in the mid-1980s and a rise in the present decade (Figure 2.7).

This dramatic rise in the RRAs for the world's two most populous countries is significant for those studying the causes of the recent international food price increases. One of the contributors to these increases is said to be the growing appetite for food imports in these two countries as they industrialize and their per capita incomes rise. Yet, as Table 2.1 shows, both countries have remained close to self-sufficient in agricultural products over the past four decades. The steady rise in their RRAs has undoubtedly contributed to this capacity to remain self sufficient. The rise in RRAs may also have helped ensure that in the PRC, the trend in the ratio of urban to rural mean incomes (adjusted for cost of living differences) has remained flat since 1980 (Ravallion and Chen 2007). At the same time, rising RRAs in India have meant that the Gini coefficient has changed very little between 1984 and 2004 (World Bank 2008). A major issue, which will be addressed at the end of the paper, is: Will their RRAs remain at the current neutral level of close to zero, or will they continue to rise in the same way as observed in the Republic of Korea and Taipei, China and, before them, in Japan?

4.2.3 Comparisons with Assistance Rates in Other Regions

The regional upward shift in agricultural RRAs and NRAs toward zero, and even the recent move to positive numbers, is not unique to Asia. Figure 2.8 shows that similar trends, albeit less steep, have resulted from policy reforms in other developing-country regions over the past four decades. This suggests that similar political economy trends might be at work as economies develop. In the past, it has been found that agricultural RRAs and NRAs are positively correlated with per capita incomes and agricultural comparative disadvantage (Anderson 1994, 1995). A glance at Tables 2.2 and 2.3 suggests that Asian economies have

been—and continue to be—contributors to that trend. This is confirmed statistically in the multiple regressions with country and time fixed effects shown in Table 2.4.

4.2.4 Consumer Tax Equivalents of Agricultural Policies

The CTE at the farm level is equivalent to the NRA for each covered product only when no farm input or domestic output price distortions exist, and when no domestic consumption taxes or subsidies are in place. In such cases, the NRA is exclusively the result of border measures such as import or export taxes or restrictions. However, such domestic distortions are present in several Asian economies. In the Republic of Korea, for example, producer prices have been well above consumer prices for several important crop products for decades, while in the PRC, the opposite was true at least until the early 1990s. In the PRC, producers of food staples were taxed more than consumers were subsidized, even taking into account the “iron rice bowl” in-kind partial wage payment received by many urban workers. Also, because of international trade, the weights one uses to aggregate product distortion rates on the consumption side of the market differ from those used on the production side. Hence, aggregate CTEs differ somewhat from aggregate NRAs in each economy.

4.2.5 Welfare and Trade Reduction Indexes

Table 2.5 reports the WRIs for agricultural import-competing products, exportables, all covered tradable products, and all covered products from 1960 to 2007 for Asia and four other regions, and for the world as a whole.⁶ The WRI results for covered products show a similar pattern over the five regions. A constant or increasing tendency for policies from the 1960s to the mid-1980s to reduce welfare existed, but thereafter the opposite occurred in almost all regions, as can be seen from Figure 2.9. This pattern was generated by different policy regimes in different regions. In high-income countries, agriculture was assisted throughout the period, although it peaked in the 1980s (at approximately 60%) and fell thereafter. By contrast, in developing countries, agriculture was “disprotected” until the mid-1980s, and only thereafter did taxation of developing country farmers decline to the point that they received positive assistance by the turn of the century. The WRI is thus able to correctly identify the adverse welfare consequences that result from both positive and negative assistance regimes for the sector.

Regarding the trade restrictiveness of agricultural policy, the TRI for developing countries as a group was roughly constant or rose slightly until the early 1990s, after which it declined, especially for Asia and Latin America. This is evident from TRI estimates shown in Figure 2.10 and Table 2.6. For high-income countries, the TRI time path was similar, but the decline began a few years later. The aggregate results for developing countries are driven by the exportables subsector, which is being taxed, and the import-competing subsector, which is being protected. Like the WRI, the TRI correctly aggregates the restrictiveness of subsector policies that are masked in aggregate NRA and CTE measures where they offset one another.

The TRI generally shows greater variance than the WRI. This is because the TRI measure is sensitive to switches from negative to positive rates of assistance. For example, a move from a -30% to +30% rate of assistance would have little or no effect on the welfare consequences of the policy, but it could have a significant effect on trade restrictiveness. For example, net imports of farm products would be greater when the NRA is negative than when it is positive, other factors being equal. The greater variability of the TRI is most clearly demonstrated for Asia in the period from 1965–1969 to 1985–1989. The WRI measure

⁶ National WRIs are aggregated across countries using an average of the value of consumption and production at undistorted prices. National TRIs are aggregated across countries using the absolute difference between the value of production and the value of consumption at undistorted prices. National and regional indexes for the five-year periods are unweighted averages of the annual indexes.

changed very little throughout that period, whereas the TRI dipped and then spiked upwards in the 1980s (See Figures 2.9 and 2.10).

The fact that NRAs for high-income and developing countries diverged from zero (in opposite directions) in the first half of the period under study and then converged toward zero in the most recent quarter-century means that their weighted average NRA traced out a fairly flat trend. By contrast, Figure 2.11 shows that the WRI and TRI for the world as a whole traced out a hill-shaped path, thus providing less misleading indicators of the evolving disarray in world agricultural markets. Figure 2.11 also suggests that the global welfare cost of distortions was much higher than the NRA indicates, but was more so in earlier decades than in the current one.

4.2.6 Welfare and Trade Effects According to a Global-Economy-Wide Model

It is clear from the above that there has been a great deal of change over the past quarter of a century in policy distortions to agricultural incentives in Asia and throughout the world. This is, as a result of reduced anti-agricultural and anti-trade biases in many developing countries' policies. In addition, export subsidies in high-income countries have been cut, and some re-instrumentation toward less inefficient and less trade-distorting forms of support has begun, particularly in western Europe. However, protection from agricultural import competition has continued its upward trend in both rich and poor countries, notwithstanding the Uruguay Round Agreement on Agriculture that aimed to bind and reduce farm tariffs (Martin and Winters 1996). What, then, have been the net economic effects of agricultural price and trade policy changes around the world since the early 1980s? And how do these effects on global markets, farm incomes, and economic welfare compare with the effects of policy distortions still in place as of 2004?

Valenzuela, van der Mensbrugge, and Anderson (2009) have employed a global-economy-wide model to provide a combined retrospective and prospective assessment of progress toward addressing the policy distortions in world agriculture. Their model quantifies the impacts of both past reforms and current policies by comparing the effects of the NRA distortion estimates in Valenzuela and Anderson (2008) for the period 1980–1984 with those of 2004.

Several key findings from their study are worth emphasizing. First, the policy reforms from the early-1980s to the mid-2000s improved global economic welfare by US\$233 billion per year, and removing the distortions that remain as of 2004 would add another US\$168 billion per year. This suggests that in terms of global welfare, the world moved three-fifths of the way toward global free trade of goods over that quarter century.

Second, developing economies have benefited proportionately more than high-income economies (1.0% compared with 0.7% of national income) from past policy reforms, and would gain nearly twice as much as high-income countries by completing the reform process (an average increase of 0.9% compared with 0.5% for high-income countries). Of the prospective welfare gains from global liberalization, 60% would come from agriculture and food policy reform—a striking result, given that the shares of agriculture and food in global GDP and global trade in goods and services in 2006 were only 3% and 6%, respectively. Even in developing countries, agriculture now contributes, on average, less than 10% of GDP and exports (World Bank 2008). The contribution of farm and food policy reform to the prospective welfare gain for developing countries would be even greater than the 60% globally, at 83%.

Third, the share of global farm production exported in 2004 (excluding intra-EU trade) was reduced slightly as a result of reforms made since 1980–1984, because of lower farm export subsidies. Agriculture's 8% share in 2004 contrasts with the 31% share for other primary products and the 25% for all other goods—a thinness that is an important contributor to the volatility of international prices for weather-dependent farm products. If the policies distorting goods trade in 2004 were removed, the share of global production of farm products that is

exported would rise from 8% to 13%, thereby reducing instability of prices and quantities of those products traded.

Fourth, the developing countries' share of the world's primary agricultural exports rose from 43% to 55% between 1980–1984 and 2004, and its farm output share rose from 58% to 62% in the same period because of reforms, which resulted in rises in nearly all agricultural industries with the exception of rice and sugar. Removing remaining goods market distortions would boost their export and output shares to 64% and 65%, respectively.

Fifth, the average real price in international markets for agricultural and food products would have been 13% lower had policies not changed over the past quarter century. Evidently, the effect of falling RRAs in high-income countries (including cuts to farm export subsidies) in raising international food prices more than offset the opposite effect of rising RRAs (including cuts to agricultural export taxes) in developing countries over that period. By contrast, the removal of distortions remaining as of 2004 is projected to raise the international price of agricultural and food products by, on average, less than 1%. This is contrary to modeling results from previous analyses based on the Global Trade Analysis Project protections database (e.g., Anderson, Martin, and van der Mensbrugghe [2006], which estimated they would rise by 3.1%, or by 5.5% for primary agriculture alone). The lower impact predicted in these new results is due, based on the above NRA estimates, to export taxes in developing countries being included in the new database (most notably for Argentina). Their reform would offset the international price-raising effect of eliminating import protection and farm subsidies elsewhere.

Sixth, for developing countries as a group, net farm income (value added in agriculture) is estimated to be 4.9% higher than it would have been without the reforms of the past quarter century, which is more than ten times the proportional gain for nonagriculture. If policies remaining in 2004 were to be removed, net farm incomes in developing countries would rise a further 5.6%, compared with just 1.9% for non-agricultural value-added. In addition, returns to unskilled workers in developing countries—the majority of whom work on farms—would rise more than returns to other productive factors from that liberalization. Together, these findings suggest that both inequality and poverty could be alleviated by such reform, given that three-quarters of the world's poor are farmers in developing countries (Chen and Ravallion 2007).

Finally, the removal of agricultural price-supporting policies in high-income countries without the institution of a corresponding compensation scheme for local farmers would undoubtedly lead to painful reductions in their income and wealth. It should be kept in mind, however, that the majority of farm household income in high-income countries comes from off-farm sources (OECD 2008b), and, in any case, compensation schemes could easily be afforded by taxing some of the gains from those who benefit from freeing trade.

4.3 Are Policies Stabilizing Domestic Prices? The Case of Rice

A common objective of food policies—in Asia and elsewhere—is the stabilization of food prices and quantities. For no other product is this more obvious than for rice. Governments in Asia frequently use year-to-year fluctuations in trade barriers as a buffer against domestic or international shocks, rather than using trade as a source of lower-priced imports or an opportunity for high export earnings. As Asia produces and consumes four-fifths of the world's rice (compared with about one-third of the world's wheat and maize), this market-insulating behavior of Asian policy makers means that, even as of 2000–2004, only 6.9% of global rice production was being traded internationally⁷ (compared with 14% and 24% for maize and wheat, respectively). International prices are, as a result, much more volatile for

⁷ This was up from the pre-1990s half-decade global shares which are all less than 4.5% (e.g., 4.1% in 1985–1989), and is greater than the Asian share of just 5.7% in 2000–2004, according to Anderson and Valenzuela (2008).

rice than for these other grains. Its coefficient of variation over the 1970–2004 period was 0.63, compared with 0.46 and 0.44 for wheat and maize, respectively (Anderson forthcoming 2009). This means that nominal rates of protection for rice are above trend in years of low international prices and below trend in years of high international prices for rice. Figure 2.12 reveals that this has been the case. Even if figures for all countries in Southeast or South Asia are averaged, the negative correlation between rice NRAs and the international price for rice price is high, at -0.59 for Southeast Asia and -0.75 for South Asia.

4.4 Summary of Pertinent Findings

The key findings of relevance to the question of Asia's contributions to global economic development and stability via reform to policies affecting agricultural incentives include the following:

- Overall trade liberalization, including reduced import protection of manufacturing, has reduced the RRA to nearly zero and improved the competitiveness of the agricultural sector in many economies, especially in the PRC and India.
- The gradual policy shift away from taxing agricultural exportables, although accompanied by a rise in agricultural import protection, has reduced the anti-trade bias in agricultural distortions. This is evident from the movement of the TBI and TRI toward zero over the past quarter century.
- The dispersion in the NRAs and RRAs to farmers across Asian economies has increased rather than diminished, despite reforms in the region. This has also been the case for farm product NRAs within each studied Asian economy. This means there is still scope for reducing the distortions in the region's use of resources in agriculture through greater international and intranational relocation of production. Since openness tends to promote economic growth, total factor productivity growth in agriculture is slower than it would be if remaining price-distorting interventions were removed. As in other regions, such as Latin America (Lopez and Gallinato 2006), there has been comparatively little assistance provided to Asian farmers via public investment in rural infrastructure and agricultural research and development (R&D),⁸ even though social rates of return from such investments remain high (Fan and Hazell 2001; Fan 2008).
- Food policies in Asia continue to seek to reduce fluctuations in domestic food prices and in the quantities available for consumption via fluctuations in barriers to trade, especially for rice. This beggar-thy-neighbor dimension of each government's food policies reduces the role that trade between nations can play in bringing stability to the world's food markets. The more countries insulate their domestic markets, the more other countries perceive a need to do likewise, exacerbating the effect on world prices such that even greater changes in NRAs are desired—a classic collective action problem.⁹

⁸ Data in Pardey et al. (2006) suggest that public R&D expenditure in Asia since the late 1970s has averaged less than 0.5% of the gross value of production at undistorted prices, which is trivial compared with the NRA via price-distorting measures for Asia of 25 to 40 times that (12% in 2000–2004 and below -20% prior to the mid-1980s).

⁹ That policies seeking to insulate domestic food markets from changes in world market prices can be self-defeating because of international spillovers was illustrated in 2007–2008. The imposition of export restrictions in key exporting countries in late 2007 and early 2008 certainly contributed to the sharp increases in world prices in the first half of 2008: such measures simply increase the volatility of world markets as they seek to reduce volatility domestically.

5. How Can Asia Contribute More to Global Development and Stability of Agricultural Markets?

After the current recession in high-income countries passes, it is expected that Asia's developing economies will keep growing rapidly, and that this growth will continue to be more rapid in manufacturing and service activities than in agriculture. In the more densely populated economies of the region, growth will be accompanied by increases in the incomes of low-skilled workers where labor-intensive exports boom. Agricultural comparative advantage is thus likely to decline in these economies. Whether these economies become more dependent on imports of farm products depends, however, on their RRAs. The first wave of Asian industrializers (Japan, then the Republic of Korea and Taipei, China) chose to slow the growth of food import dependence by raising their NRAs for agriculture even as they reduced their NRAs for non-farm tradables such that their RRAs rose above the neutral zero level. A key question is: Will later industrializers follow suit, given the past close associations among RRAs, rising per capita income, and declining agricultural comparative advantage?

If the RRAs for Japan, the Republic of Korea, and Taipei, China are mapped against real per capita income, it is possible to superimpose on that same figure the RRAs for lower-income economies to see to what extent these economies are tracking the first industrializers. Figure 2.13 does that for the PRC and India, and shows that their RRA trends over the past three decades are on the same upward trajectory as the richer economies of Northeast Asia. This provides a reason to expect the governments of later industrializing economies to follow suit, other factors being equal.

One reason one might expect different government behavior now is because earlier industrializers were not bound under the General Agreement on Tariffs and Trade (GATT) to keep agricultural protection down. Had there been strict discipline on farm trade measures at the time Japan and the Republic of Korea joined GATT in 1955 and 1967, respectively, their NRAs might have been kept to less than 20% (Figure 2.14). At the time of the PRC's accession to the WTO in December 2001, its NRA was less than 5%, or 7.3% for import-competing agriculture alone. The PRC's average bound import tariff commitment was about twice that figure (16% in 2005), but more important was its out-of-quota bindings on the items for which imports were restricted by tariff rate quotas. As of 2005, the latter tariff bindings were 65% for grain, 50% for sugar, and 40% for cotton (WTO, International Trade Centre [ITC], and United Nations Conference on Trade and Development [UNCTAD] 2007). The PRC also had bindings on farm-product-specific domestic supports of 8.5%, and was able to provide another 8.5% as non-product-specific assistance if it so wished—a total NRA of 17% from domestic support measures alone, which is in addition to assistance available through out-of-quota tariff protection.

Clearly, the legal commitments the PRC's government made on acceding to the WTO are far from the current levels of domestic and border support it provides its farmers. As a result, the commitments are unlikely to constrain the government much in the next decade or so;¹⁰ and the legal constraints on Asia's developing countries that joined the WTO earlier (with the exception of the Republic of Korea) are even less constraining. In India, Pakistan, and Bangladesh, for example, the estimated NRAs for agricultural importables in 2000–2004 are 34%, 4%, and 6%, respectively, whereas the average bound tariffs on their agricultural imports were 114%, 96%, and 189%, respectively (WTO, ITC, and UNCTAD 2007). Also, as in other developing countries, the governments of these countries have significant bindings on product-specific domestic supports of 10%, and another 10% for non-product-specific assistance, a total of 20 additional percentage points of NRA that could legally be applied through domestic support measures. This compares with the less than 15% currently in effect in South Asia (Table 2.3).

¹⁰ For more on this point, see Anderson, Martin, and Valenzuela (Forthcoming 2009).

One can only hope that the PRC and South and Southeast Asia will not make use of the legal wiggle room they have allowed themselves in their WTO bindings and thereby follow Japan, the Republic of Korea, and Taipei, China into substantial agricultural protection and insulation. Indications from the ongoing Doha Round of multilateral trade negotiations at the WTO are not encouraging. The group of 33 developing countries, led by Indonesia but strongly supported by India and the Philippines, among others, is arguing for additional “special and differential treatment” for developing countries in the form of exemptions from agricultural tariff cuts for so-called “special products,” (that would be subject to only small tariff cuts) and for a special safeguard mechanism that would allow such countries to impose higher than bound tariffs in years of likely import surges. A much more efficient and equitable strategy would involve treating agriculture in the same way as they have been treating non-farm tradables. This would involve opening the sector to international competition, and relying on more-efficient domestic taxes (e.g., income, consumption, or value-added taxes) rather than on trade taxes to raise government revenue, and on general social safety nets rather than on variable trade taxes to cope with food price fluctuations.

It might be argued that such a *laissez faire* strategy might increase rural-urban inequality and poverty and thereby generate social unrest. Nonetheless, import policies that lead to high food prices—for staples in particular—involve potentially serious risks for the urban and rural poor, who are net buyers of food in developing countries. Available evidence suggests that problems relating to rural-urban poverty gaps have been alleviated in parts of Asia when more-mobile members of farm households are able to find full- or part-time work off the farm and repatriate a portion of their higher earnings to family members (Otsuka and Yamano 2006; World Bank 2007). Concerted government intervention through social policy measures is hugely important, both in reducing the gaps between rural and urban incomes, identified as a concern by Hayami (2007), and in raising national incomes overall (Winters, McCulloch, and McKay 2004). Efficient ways of assisting overlooked groups of poor (non-farm or farm) households include public investment measures that have high social payoffs, such as in basic education and health care, rural infrastructure, and agricultural research and development.¹¹

Improvements in farm productivity that increase output while lowering consumer prices are likely to be much more important for long-run food security than import restrictions. Both increase farmer incomes, but productivity growth lowers food costs to consumers. Moreover, recognized social benefits from expanding investments in agricultural R&D have become even greater in recent years, due to the threat of climate change. In many regions agriculture will have to contend with hotter, drier, and more volatile weather, and hence, with scarcer water supplies (Pacific Economic Cooperation Council 2008). New technologies to help farmers adapt to these changing conditions will be needed sooner than they can be produced, even if R&D investments increase immediately, given the very long lags from research start to farmer adoption. Greater volatility in seasonal conditions, expected as a result of climate change, is yet another reason governments should agree to reduce their use of trade measures to insulate their domestic markets from fluctuations in the international food market.

In light of the above, what should developing country policymakers do when faced with a sharp upward movement in international food prices? In 2008, as in the past, many governments simply increased export restrictions or lowered import restrictions on food staples for the duration of the spike (Figure 2.12). What if the recent rise in international prices is more prolonged than the short-lived spikes of the past? Outlook projections issued

¹¹ If only one-twentieth of the current NRA provided to Asian farmers via farm price-support policies was replaced by agricultural R&D expenditure, current public spending on such R&D would more than double, and the latter would increase regional economic welfare (whereas price-distortionary policies reduce it). Such a boost to Asian R&D could generate a second green revolution of the order of magnitude of the one that began in the 1960s, especially if it took full advantage of new developments in biotechnology (as shown for rice, for example, in Anderson, Jackson, and Nielsen [2005]).

by international agencies in 2008 suggest prices may remain elevated for the foreseeable future, and that growth in net food imports by rapidly industrializing economies in Asia is a significant contributor to this phenomenon.¹² Yet, as shown in Figure 2.7 and Table 2.1 above, over the past two or more decades, the PRC and India have steadily raised their RRAs, despite their having been sufficient to keep both countries very close to self-sufficiency in primary agricultural products over the previous four decades. In terms of total agricultural and processed food trade, however, in 2000–2004 the PRC became a net importer for the first time, while, in South Asia, India's net exports of farm products were less than those of Pakistan or Bangladesh for the first time since the late 1960s (Sandri, Valenzuela, and Anderson 2007).¹³ Should these governments choose to maintain RRAs at current levels (close to zero), the import dependence of these countries in agriculture could increase. If this occurs, other developing countries might reconsider their current position in the WTO's Doha Round of trade negotiations. By agreeing to substantially lower their bound tariffs and subsidies on agricultural products, they could extract greater concessions from high-income countries without having to reduce their actual applied rates for the foreseeable future. If a successful Doha agreement was then concluded, the result would be a reduction in tariff binding overhangs, and hence of the scope to vary taxes on farm trade. This would boost agricultural trade, "thickening" international markets for farm products, and reducing food price instability. If Asia wishes to take a lead in this direction, there is no better product to focus on than rice.

12 The World Bank's commodity forecast as of May 2008 for grain prices was that by 2020 in real terms they will still be 10% above 2006 levels, which in turn were 20% above the average for 2001-2005. IFPRI (2007) and the OECD and FAO (2008) similarly projected food prices to remain high well into next decade and beyond.

13 This change for the PRC was largely due to increases in imports of cotton needed to supply the PRC's surging production of textiles and clothing for export.

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**Table 2.1: Export Orientation, Import Dependence, and Self-Sufficiency in Primary Agricultural Production, Major Regions of the World,^a 1961–2004
(percent at undistorted prices)**

(a) Exports as Share of Production

	1961–1964	1970–1974	1980–1984	1990–1994	2000–2004
Africa	19	17	12	7	8
Asia	5	4	4	6	5
Latin America	24	27	16	16	27
Western Europe	13	16	27	37	43
United States and Canada	14	14	20	20	21
Australia and New Zealand	41	35	44	43	48
Japan	1	2	1	0	1
All countries	11	11	13	16	16
Developing countries	8	8	7	8	8
High-income countries	14	15	22	26	29

(b) Imports as Share of Apparent Consumption

	1961–1964	1970–1974	1980–1984	1990–1994	2000–2004
Africa	2	2	5	4	4
Asia	4	4	8	16	14
Latin America	2	4	7	10	17
Western Europe	32	28	34	41	46
United States and Canada	4	4	5	9	12
Australia and New Zealand	3	2	3	5	6
Japan	23	24	24	26	27
All countries	11	10	12	19	18
Developing countries	3	4	8	14	13
High-income countries	18	16	20	25	27

(c) Self-Sufficiency Ratio

	1961–1964	1970–1974	1980–1984	1990–1994	2000–2004
Africa	120	117	107	104	105
Asia	102	100	96	89	91
PRC	99	100	98	101	98
India	98	99	99	100	100
Latin America	129	132	110	107	114
Western Europe	78	85	90	94	94
United States and Canada	111	112	119	114	111
Australia and New Zealand	165	151	174	170	183
Japan	78	78	77	74	74
All countries	100	101	101	96	98
Developing countries	105	104	99	93	95
High-income countries	96	98	103	101	102

EU = European Union, FAO = Food and Agriculture Organization of the United Nations, NAFTA = North American Free Trade Agreement, PRC = People's Republic of China

Notes: ^a Includes intra-EU (and intra-NAFTA) trade

Source: Anderson (Forthcoming 2009) using estimates of total agricultural production valued at undistorted prices and the FAO's total agricultural trade value data

**Table 2.2: Nominal Rates of Assistance to Agriculture,^a
Asian-Focus Economies, 1955—2004^b
(percent)**

	1955– 1959	1960– 1964	1965– 1969	1970– 1974	1975– 1979	1980– 1984	1985– 1989	1990– 1994	1995– 1999	2000– 2004
Japan	38.8	45.8	50.4	46.9	65.9	68.3	116.6	115.8	118.6	119.8
Northeast Asia	-42.8	-42.6	-41.7	-41.2	-39.5	-38.2	-25.7	-1.7	14.4	11.9
Republic of Korea	-3.2	4.0	13.4	35.7	56.3	89.4	126.1	152.8	129.8	137.3
Taipei,China	-12.0	3.6	3.0	9.3	7.1	14.9	27.1	38.1	46.4	61.3
PRC ^b	-45.2	-45.2	-45.2	-45.2	-45.2	-45.2	-35.5	-14.3	6.6	5.9
Southeast Asia	na	-6.8	5.9	-8.8	0.0	4.6	-0.4	-4.2	0.0	11.1
Indonesia	na	na	na	-2.6	9.3	9.2	-1.7	-6.6	-8.6	12.0
Malaysia	na	-7.2	-7.5	-9.0	-13.0	-4.6	1.3	2.3	-0.2	1.2
Philippines	na	-5.3	14.4	-5.1	-7.1	-1.0	18.7	18.5	32.9	22.0
Thailand	na	na	na	-20.3	-14.0	-2.0	-6.2	-5.7	1.7	-0.2
Viet Nam	na	na	na	na	na	na	-13.9	-25.4	0.6	21.2
South Asia	0.0	-0.5	0.6	0.4	-5.5	0.6	20.9	0.7	0.2	13.6
Bangladesh	na	na	na	-16.0	1.4	-3.3	11.7	-1.5	-5.2	2.7
India ^b	0.1	0.1	0.1	0.2	-5.6	1.9	24.9	1.8	0.7	15.8
Pakistan	na	-0.7	15.3	6.8	-8.5	-6.4	-4.0	-6.9	-1.6	1.2
Sri Lanka	-2.3	-22.8	-24.5	-16.3	-25.5	-13.5	-9.9	-1.2	12.2	9.5
Asian dev economies^a	-27.3	-26.7	-25.1	-25.3	-23.8	-20.6	-9.0	-2.0	7.5	12.0
Av. dispersion ^c	39	37	56	42	48	51	67	56	56	64

na = data unavailable, NRA = nominal rate of assistance, PRC = People's Republic of China

Notes: ^a Weighted average includes product-specific input distortions and non-product-specific assistance as well as authors' guesstimates for non-covered farm products, with weights based on gross value of agricultural production at undistorted prices.

^b Estimates for the PRC pre-1981 and India pre-1965 assume the nominal rates of assistance to agriculture in those years were the same as the average NRA estimates for those economies for 1981–1984 and 1965–1969, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981–1984 and 1965–1969, respectively. This set of assumptions is conservative in the sense that for both countries the average NRA was probably even lower (more negative) in earlier years.

^c Simple average across countries of the standard deviation of product NRAs around the weighted mean for each country each year.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).

**Table 2.3: Relative Rates of Assistance (RRA) to Agriculture,^a
Asian-Focus Economies, 1955—2004
(percent)**

	1955– 1959	1960– 1964	1965– 1969	1970– 1974	1975– 1979	1980– 1984	1985– 1989	1990– 1994	1995– 1999	2000– 2004
Japan										
NRA Ag.	37.2	44.5	50.4	47.3	70.8	67.0	127.7	129.7	133.4	133.6
NRA Non-Ag.	2.5	3.9	3.8	2.8	1.6	1.1	1.3	1.1	0.8	0.7
RRA	33.9	39.1	44.9	43.3	68.1	65.2	124.8	127.1	131.4	132.1
Northeast Asia										
NRA Ag.	-43.1	-42.5	-42.2	-41.3	-40.0	-18.4	-26.2	-1.7	14.7	12.0
NRA Non-Ag.	40.9	40.8	40.0	39.7	39.4	71.1	18.8	15.0	6.8	3.3
RRA	-58.2	-57.7	-56.6	-55.7	-53.7	-51.9	-38.0	-14.2	7.4	8.5
Republic of Korea										
NRA Ag.	-3.3	4.9	16.3	46.1	71.8	118.6	159.8	197.6	164.8	171.9
NRA Non-Ag.	45.6	37.1	22.3	11.4	11.7	6.8	5.7	3.3	2.3	1.7
RRA	-32.6	-21.4	-4.8	30.5	53.9	104.8	145.9	188.2	158.8	167.3
Taipei, China ^b										
NRA Ag.	-15.8	4.7	3.9	12.0	8.9	18.7	33.8	46.3	54.9	70.9
NRA Non-Ag.	8.8	9.3	8.8	7.5	7.0	5.2	4.5	2.6	1.8	1.0
RRA	-22.5	-4.2	-4.5	4.2	1.7	12.9	28.0	42.5	52.2	69.0
PRC ^b										
NRA Ag.	-45.2	-45.2	-45.2	-45.2	-45.2	-45.2	-35.5	-14.3	6.6	5.9
NRA Non-Ag.	41.6	41.6	41.6	41.6	41.6	41.6	28.3	24.9	9.9	5.0
RRA	-60.5	-60.5	-60.5	-60.5	-60.5	-60.5	-49.9	-31.1	-3.0	0.9
Southeast Asia										
NRA Ag.	na	-5.8	5.6	-10.2	0.1	4.9	-0.9	-4.7	0.0	12.1
NRA Non-Ag.	na	11.5	15.4	20.2	22.0	21.1	18.0	11.5	8.2	8.1
RRA	na	-15.5	-8.5	-25.3	-18.0	-13.4	-16.1	-14.5	-7.7	3.7
Indonesia										
NRA Ag.	na	na	na	-3.8	10.4	10.5	-1.9	-7.5	-9.7	13.9
NRA Non-Ag.	na	na	na	27.7	27.7	27.7	26.5	17.6	10.6	8.1
RRA	na	na	na	-24.7	-13.6	-13.5	-22.5	-21.3	-18.3	5.4
Malaysia										
NRA Ag.	na	-7.6	-7.9	-9.4	-13.7	-4.9	1.4	2.6	-0.2	1.5
NRA Non-Ag.	na	7.4	7.0	7.1	6.5	5.2	3.9	2.8	2.0	0.9
RRA	na	-14.0	-13.9	-15.5	-18.9	-9.6	-2.4	-0.3	-2.2	0.6
Philippines										
NRA Ag.	na	-1.7	14.3	-6.0	-7.2	-4.0	15.8	16.7	35.7	23.5
NRA Non-Ag.	na	19.0	20.3	16.3	16.3	12.9	11.0	9.9	8.6	6.4
RRA	na	-17.4	-5.0	-19.8	-20.3	-14.9	4.3	6.1	24.9	15.9
Thailand										
NRA Ag.	na	na	na	-23.1	-15.9	-2.3	-6.9	-6.4	1.8	-0.2
NRA Non-Ag.	na	na	na	16.1	16.0	14.2	11.1	10.0	8.9	7.8
RRA	na	na	na	-33.7	-27.5	-14.4	-16.3	-14.9	-6.5	-7.4
Viet Nam ^b										
NRA Ag.	na	na	na	na	na	na	-15.9	-26.4	0.0	20.7
NRA Non-Ag.	na	na	na	na	na	na	4.3	-11.2	1.5	20.8
RRA	na	na	na	na	na	na	-19.2	-17.4	-1.3	0.0
South Asia										
NRA Ag.	4.7	3.9	4.4	9.7	-7.7	1.8	47.1	0.2	-2.4	12.7
NRA Non-Ag.	112.7	115.5	143.1	81.7	57.8	54.6	39.9	18.6	15.0	10.1
RRA	-56.2	-56.8	-57.0	-39.8	-41.6	-33.3	5.1	-15.5	-14.9	3.4
Bangladesh										
NRA Ag.	na	na	na	na	3.1	-3.9	17.5	-2.4	-8.0	4.0
NRA Non-Ag.	na	na	na	na	28.4	22.4	28.5	33.3	29.0	23.4
RRA	na	na	na	na	-19.7	-21.5	-8.6	-26.7	-28.6	-15.8
India ^b										
NRA Ag.	5.2	5.2	5.2	12.6	-7.4	4.1	67.5	2.0	-2.3	15.4
NRA Non-Ag.	113.0	113.0	113.0	83.1	64.8	59.3	48.6	15.9	12.6	5.2
RRA	-56.3	-56.3	-56.3	-38.3	-43.8	-33.5	11.7	-12.1	-12.9	12.5
Pakistan ^b										

	1955– 1959	1960– 1964	1965– 1969	1970– 1974	1975– 1979	1980– 1984	1985– 1989	1990– 1994	1995– 1999	2000– 2004
NRA Ag.	na	-1.0	21.7	9.3	-11.8	-9.3	-5.9	-10.2	-2.6	1.5
NRA Non-Ag.	na	169.7	224.5	146.7	44.0	48.3	45.1	39.3	27.0	14.6
RRA	na	-63.8	-62.4	-55.9	-38.6	-38.6	-35.1	-35.2	-23.0	-11.5
Sri Lanka										
NRA Ag.	-2.7	-25.7	-27.6	-18.5	-29.0	-15.4	-11.2	-1.3	14.0	10.8
NRA Non-Ag.	104.9	124.6	138.4	70.7	52.9	57.1	59.0	47.1	36.4	22.9
RRA	-52.5	-66.6	-68.0	-51.6	-53.5	-46.2	-44.3	-32.9	-16.3	-9.8
Asian dev. economies^c										
NRA Ag.	-29.0	-27.7	-26.9	-24.3	-31.3	-18.8	-11.2	-2.6	7.5	11.7
NRA Non-Ag.	66.8	67.1	70.9	50.3	50.3	38.3	15.4	14.9	9.6	4.3
RRA	-57.5	-56.4	-55.3	-47.9	-44.7	-40.8	-22.8	-15.2	-1.9	7.1
Dispersion of national RRAs ^d	21.9	30.7	36.2	37.6	41.5	51.9	56.0	65.1	50.5	50.8

NRA = nominal rate of assistance, PRC = People's Republic of China

Notes: ^a The RRA is defined as $100 * [(100 + \text{NRA}_{\text{ag}}) / (100 + \text{NRA}_{\text{nonag}}) - 1]$, where NRA_{ag} and $\text{NRA}_{\text{nonag}}$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

^b Estimates for The PRC pre-1981 and India pre-1965 are based on the assumption that the nominal rates of assistance to agriculture in those years was the same as the average NRA estimates for those economies for 1981–1984 and 1965–1969, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981–1984 and 1965–1969, respectively. This NRA assumption is conservative in the sense that for both countries the average NRA was probably even lower in earlier years, according to the authors of those country case studies.

^c Weighted averages of the above national averages, using weights based on gross value of national agricultural production at undistorted prices.

^d Simple average of the standard deviation around a weighted mean of the national RRAs for the region each year.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).

Table2.4: Relationships between Nominal Rates of Assistance to Farm Products and some of their Determinants, Asian Developing Economies, 1960—2004

Explanatory variables: ^c	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ln GDP per Capita	-0.28* (-0.03)	-0.21* (-0.03)	-0.23* (-0.03)	-0.22* (-0.03)	-0.11 (-0.05)	-0.06 (-0.05)	-0.14 (-0.06)	-0.16* (-0.06)	-0.38* (-0.10)	-0.28* (-0.9)	-0.44* (-0.10)	-0.38* (-0.11)
Ln GDP per Capita Squared	0.23* (-0.02)	0.20* (-0.01)	0.21* (-0.01)	0.21* (-0.01)	0.19* (-0.02)	0.15* (-0.02)	0.21* (-0.03)	0.18* (-0.02)	0.23* (-0.03)	0.19* (-0.02)	0.22* (-0.03)	0.21* (-0.03)
Importable		0.33* (-0.04)	0.34* (-0.04)	0.32* (-0.04)		0.40* (-0.04)	0.41* (-0.04)	0.40* (-0.04)		0.39* (-0.04)	0.39* (-0.04)	0.39* (-0.04)
Exportable		-0.13 (-0.04)	-0.12 (-0.04)	-0.14 (-0.04)		-0.03 (-0.04)	-0.03 (-0.04)	-0.03 (-0.04)		-0.04 (-0.04)	-0.04 (-0.04)	-0.04 (-0.04)
Revealed Comparative Advantage ^a				0.03* (-0.01)				-0.07* (-0.02)				-0.04 (-0.03)
Trade Specialization Index ^b			0.11* (-0.03)				-0.13 (-0.09)				-0.03 (-0.10)	
Constant	0.14* (-0.01)	0.03 (-0.03)	0.00 (-0.03)	-0.02 (-0.04)	0.07* (-0.02)	-0.11 (-0.04)	-0.05 (-0.05)	0.07 (-0.07)	-0.49* (-0.12)	0.23* (-0.11)	-0.19 (-0.09)	-0.08 (-0.10)
R ²	0.10	0.27	0.27	0.27	0.07	0.23	0.22	0.22	0.14	0.28	0.29	0.29
No. of obs.	2766	2766	2594	2594	2766	2766	2594	2594	2766	2766	2594	2594
Country Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Ln GDP = log of gross domestic product in \$10,000s, NRA = nominal rate of assistance, OLS = ordinary least squares,

Notes: ^a Revealed comparative advantage index is the share of agriculture and processed foods in national exports as a ratio of that sector's share of global exports (world=1).

^b Net exports as a ratio of the sum of exports and imports of agricultural and processed food products (world=1).

^c Dependent variable for regressions is NRA by commodity and year. Results are OLS estimates, with standard errors in parentheses.

* Statistically significant at the 1% level

Source: Anderson and Martin (2009)

**Table 2.5: Welfare Reduction Indexes, Asian, African, Latin American, European Transition Economies, and High-Income Regions,^a
All Covered Tradable Farm Products, 1960–2007
(percent)**

	1960–1964	1965–1969	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2007
Import-Competing Products										
Africa	59	52	53	47	51	98	43	32	30	na
Asia	36	45	46	50	48	62	48	44	48	na
Latin America	54	34	27	37	47	40	46	26	32	na
All Developing Countries	49	46	43	44	44	54	36	28	30	na
European Transition Economies	na	na	na	na	na	na	60	44	45	43
High-Income Countries	79	87	71	100	106	123	102	91	87	50
World	74	76	65	85	81	100	78	65	65	45
Exportable Products										
Africa	37	44	48	49	48	55	58	41	40	na
Asia	24	43	34	34	48	45	24	10	7	na
Latin America	28	22	36	32	36	33	29	12	15	na
All Developing Countries	31	38	38	36	46	44	26	11	10	na
European Transition Economies	na	na	na	na	na	na	37	33	31	42
High-Income Countries	12	20	16	12	12	25	22	11	11	10
World	16	27	26	24	34	39	26	13	12	15
All Covered Farm Tradables										
Africa	52	52	52	49	51	82	52	37	36	na
Asia	27	43	39	42	47	45	28	19	16	na
Latin America	43	25	38	36	44	39	42	20	22	na
All Developing Countries	44	44	42	42	47	47	31	19	18	na
European Transition Economies	na	na	na	na	na	na	47	40	40	44
High-Income Countries	49	48	46	64	69	70	51	38	37	22
World	48	47	45	55	57	57	41	28	27	23

CTE = consumer tax equivalent, na = data unavailable, NRA = nominal rate of assistance

Notes: Regional aggregates are weighted using the average of the value of production and the value of consumption at undistorted prices.

Source: Lloyd, Croser, and Anderson (2009), based on product NRAs and CTEs in Anderson and Valenzuela (2008).

**Table 2.6: Trade Reduction Indexes, Asian, African, Latin American, European Transition Economies, and High-Income Regions,^a
All Covered Tradable Farm Products, 1960–2007
(percent)**

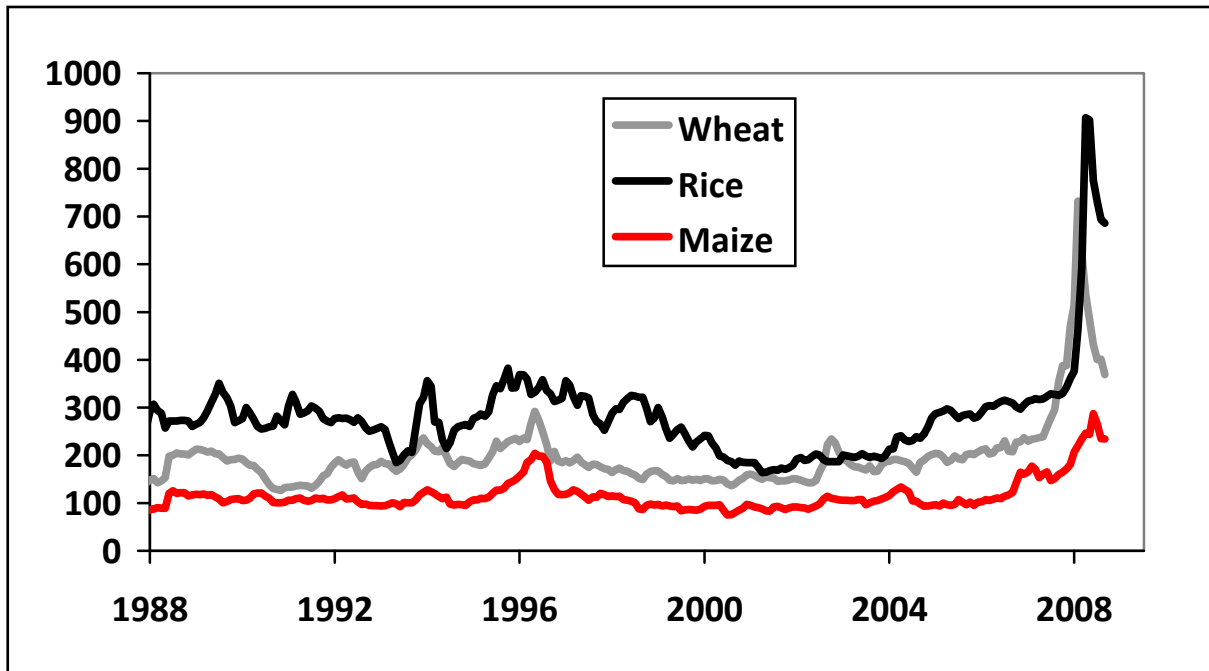
	1960–1964	1965–1969	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2007
Import-Competing Products										
Africa	-28	-23	-19	3	0	112	7	10	4	na
Asia	11	25	19	26	38	70	68	63	76	na
Latin America	28	27	11	2	6	1	32	11	20	na
All Developing Countries	-1	20	10	11	7	48	26	10	16	na
European Transition Economies	na	na	na	na	na	na	13	23	26	29
High-Income Countries	79	80	52	72	88	89	83	84	81	63
World	64	55	42	56	58	80	59	60	62	56
Exportable Products										
Africa	29	39	43	47	41	36	38	24	30	na
Asia	14	27	26	23	35	20	17	8	0	na
Latin America	20	15	28	22	23	21	5	2	3	na
All Developing Countries	22	29	32	30	34	25	17	9	6	na
European Transition Economies	na	na	na	na	na	na	0	2	-2	-9
High-Income Countries	-8	-12	-9	-5	-8	-21	-13	-4	-2	-2
World	3	7	11	12	17	8	4	4	3	-8
All Covered Farm Tradables										
Africa	32	33	33	34	18	54	17	16	23	na
Asia	15	28	23	28	34	28	18	8	6	na
Latin America	22	8	19	17	19	13	23	7	8	na
All Developing Countries	26	28	26	28	28	29	22	9	10	na
European Transition Economies	na	na	na	na	na	na	-4	13	14	2
High-Income Countries	19	9	16	21	27	30	28	18	18	7
World	21	17	20	24	28	30	21	14	14	2

CTE = consumer tax equivalent, na = data unavailable, NRA = nominal rate of assistance

Notes: Regional aggregates are weighted using the absolute value of net imports (computed as the difference between the value of consumption and the value of production) at undistorted prices.

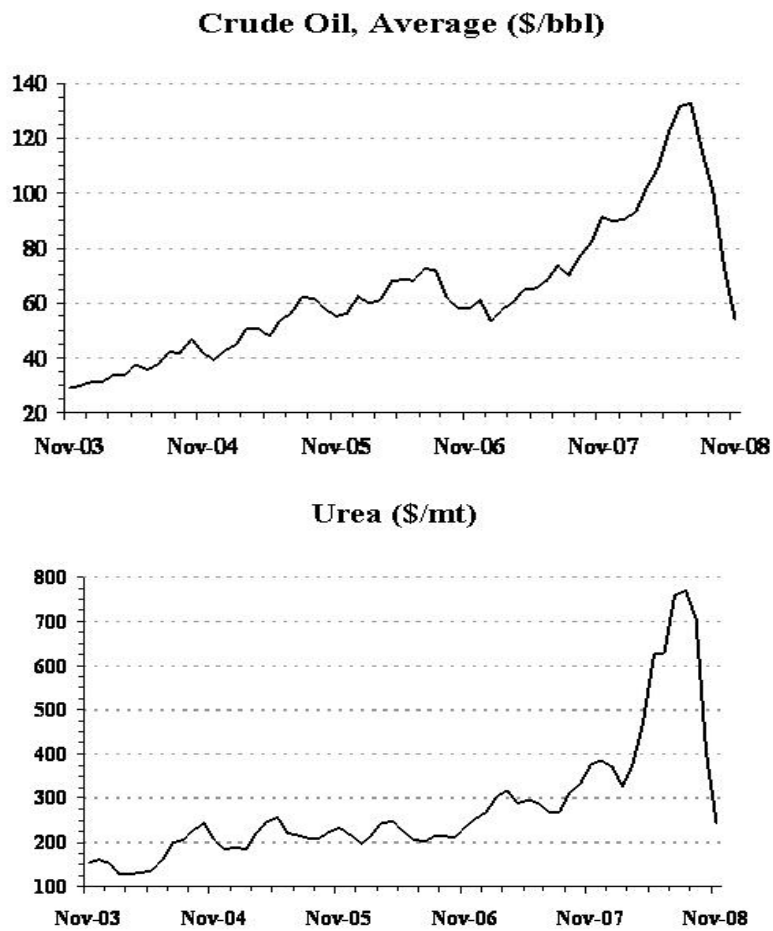
Source: Lloyd, Croser, and Anderson (2009), based on product NRAs and CTEs in Anderson and Valenzuela (2008).

Figure 2.1: Nominal International Market Prices for Wheat, Rice, and Maize, 1988 to mid-2008 (current US\$ per ton)



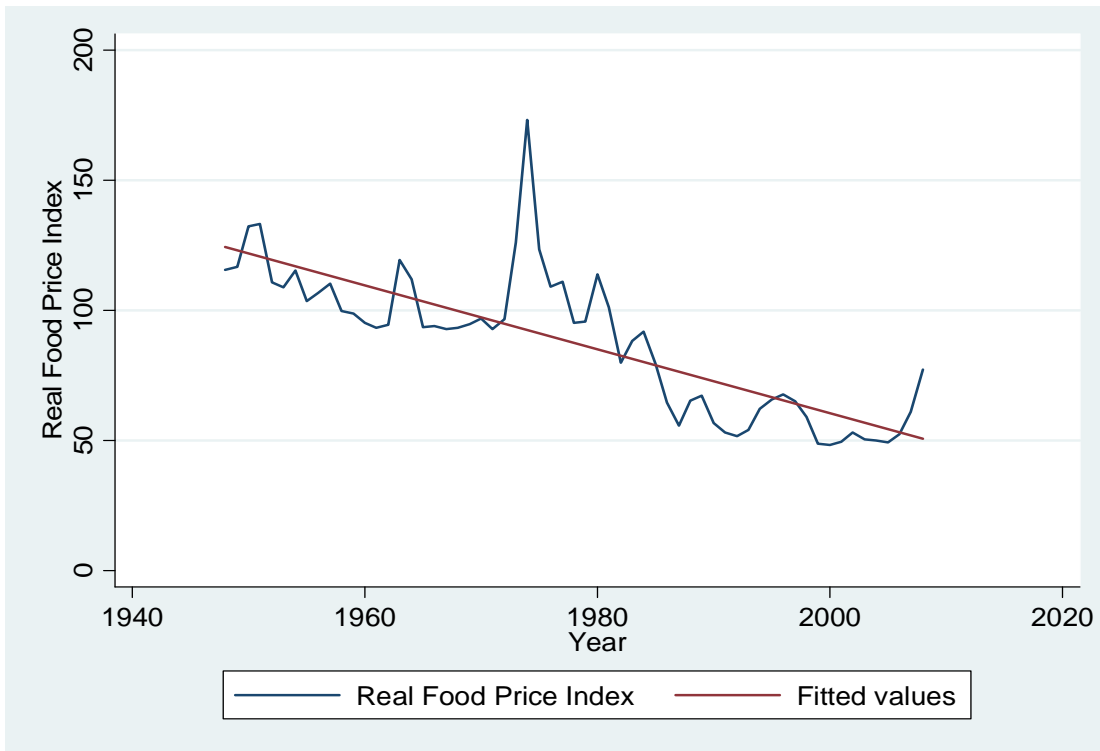
Source: World Bank (2008b)

Figure 2.2: Nominal International Market Prices for Crude Oil and Urea Fertilizer, October 2003—October 2008 (current US\$)



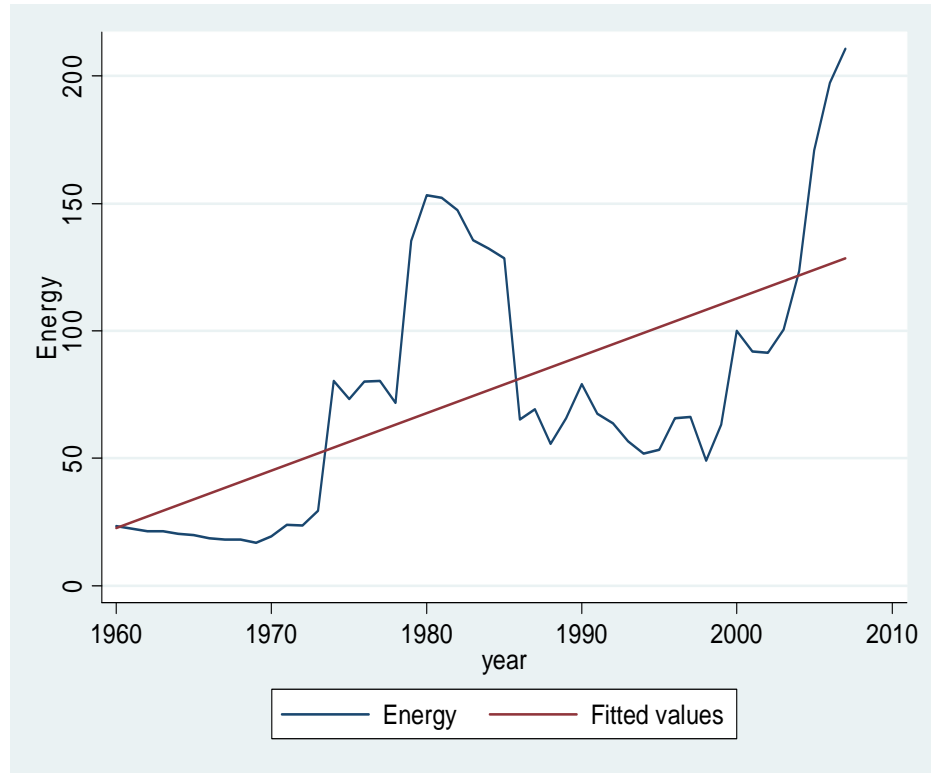
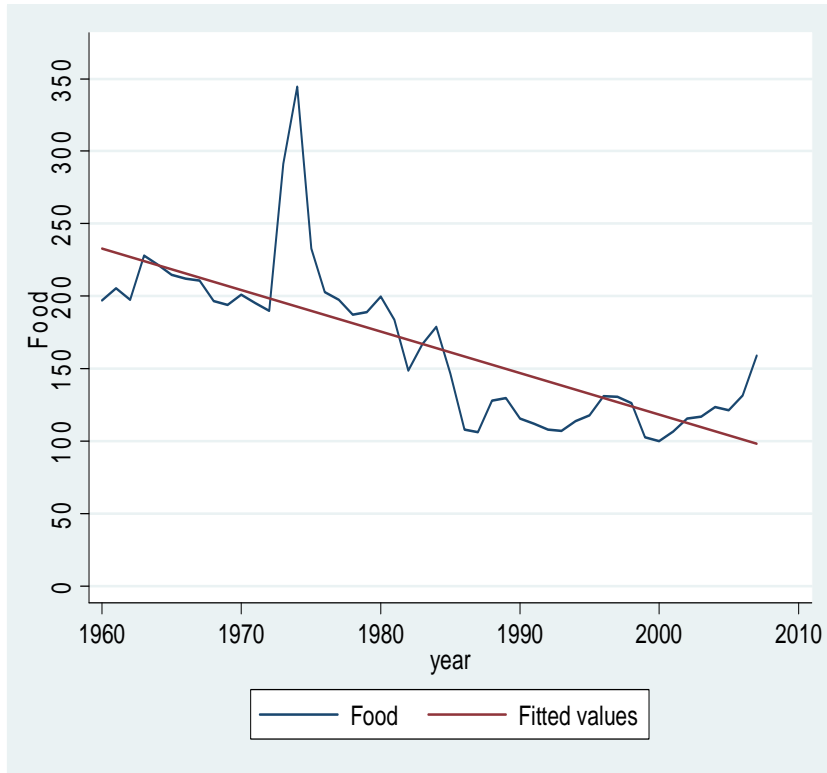
Source: World Bank (2008c).

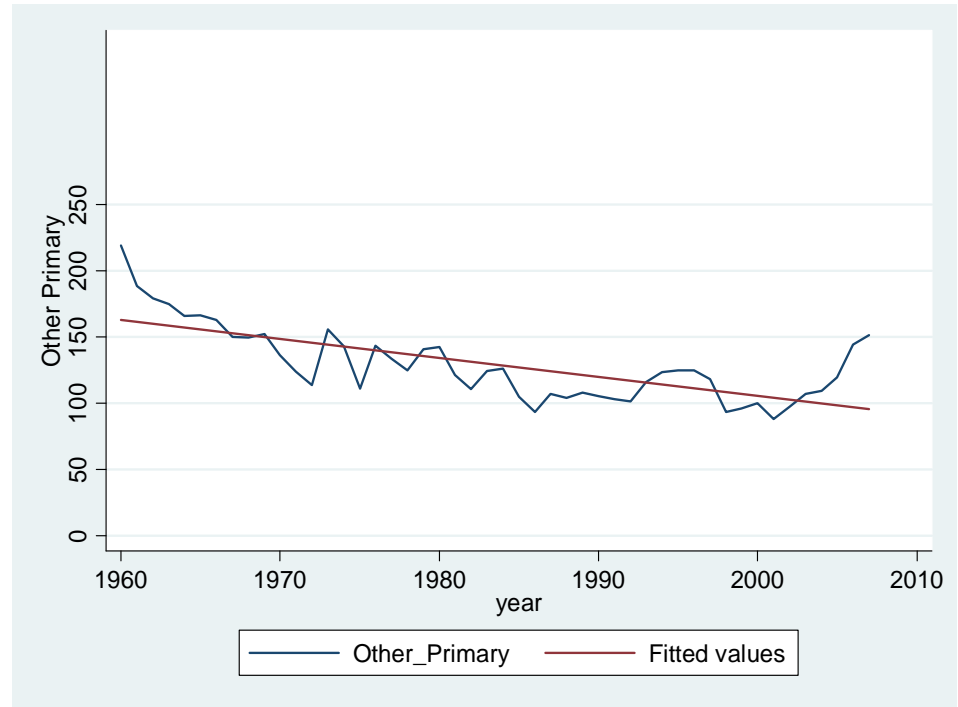
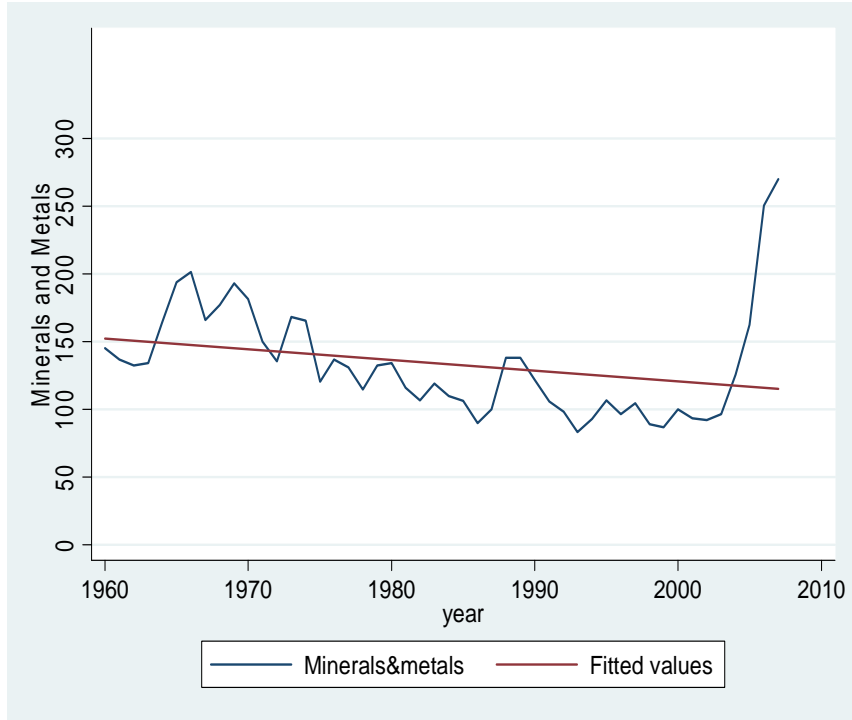
**Figure 2.3: Real International Food Price Index, 1948—2008
(1977–79 = 100)**



Source: Author's compilation using data from Pfaffenzeller, Newbolt, and Rayner 2007, updated from 2004 with data from World Bank (2008c).

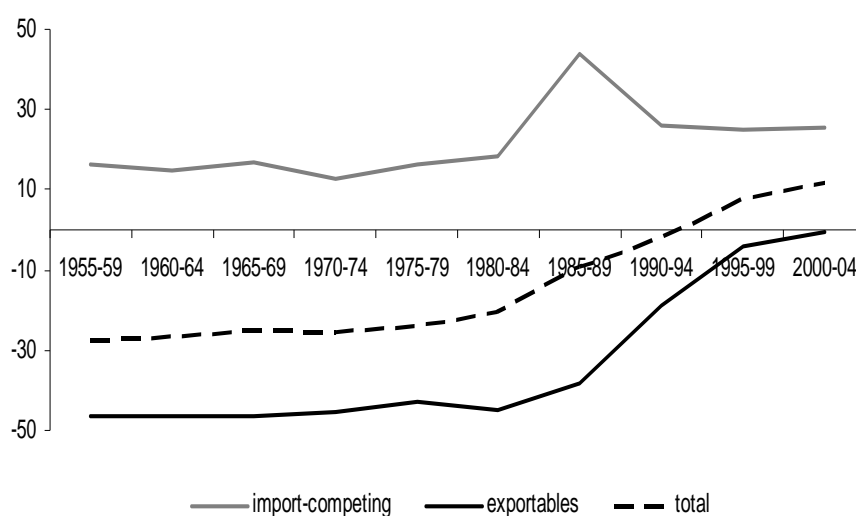
**Figure 2.4: Real International Price Index, Food, Energy, Minerals and Metals, and Other Primary Products, 1920—2007
(1977–79 = 100)**





Source: Author's compilation using data from World Bank (2008c)

Figure 2.5: Nominal Rates of Assistance to Exportable, Import-Competing, and All^a Agricultural Products, Asian Developing Economies,^b 1955—2004 (percent, weighted averages across 12 developing economies)



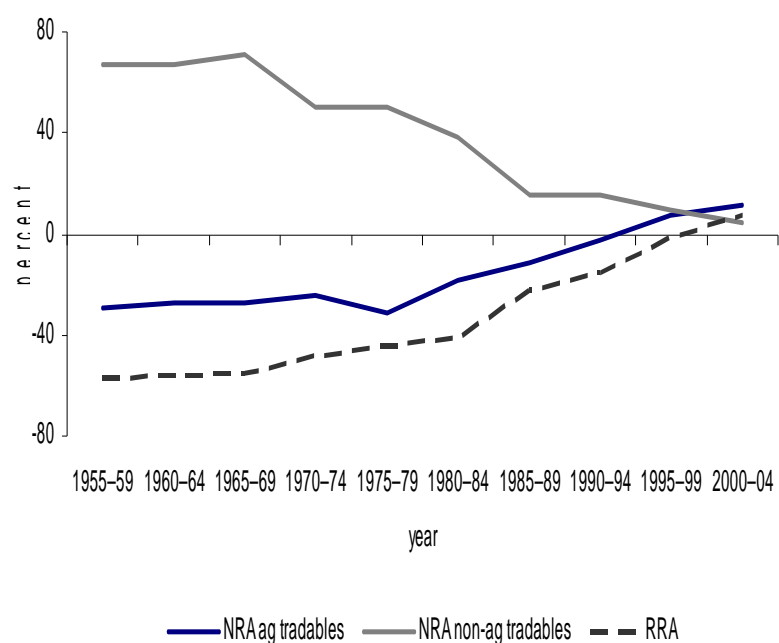
NRA = nominal rate of assistance, PRC = People's Republic of China

Notes: ^a The total NRA can be above or below the exportable and importable averages because assistance to nontradables and non-product specific assistance is also included.

^b The exportables, import-competing and total estimates are based on The PRC pre-1981 and India pre-1965 values estimated on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those economies for 1981–1984 and 1965–1969, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981–1984 and 1965–1969, respectively.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).

Figure 2.6: Nominal Rates of Assistance to Agricultural and Non-agricultural Tradable Products and Relative Rate of Assistance,^a Asia Developing Economies,^b 1955—2004 (percent, weighted averages across 12 economies)



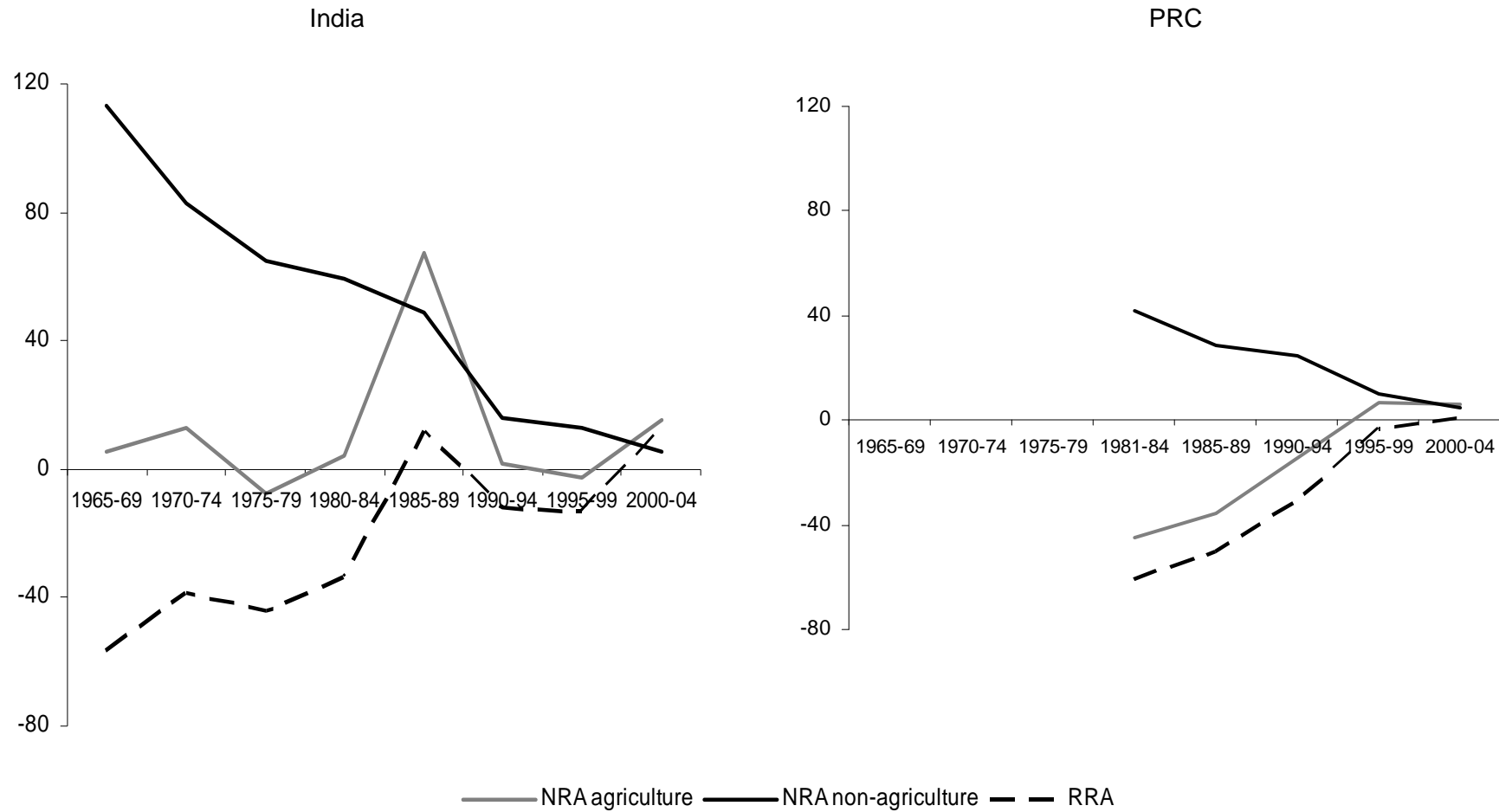
NRA = nominal rate of assistance, RRA = relative rate of assistance

Notes: ^a The RRA is defined as $100 * [(100 + \text{NRA}_{\text{ag}}^t) / (100 + \text{NRA}_{\text{non-ag}}^t) - 1]$, where NRA_{ag}^t and $\text{NRA}_{\text{non-ag}}^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

^b The exportables, import-competing and total estimates are based on The PRC pre-1981 and India pre-1965 values estimated on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those economies for 1981–1984 and 1965–1969, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981–1984 and 1965–1969, respectively.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).

**Figure 2.7: Nominal and Relative Rates of Assistance, PRC, and India, 1965—2005
(percent)**

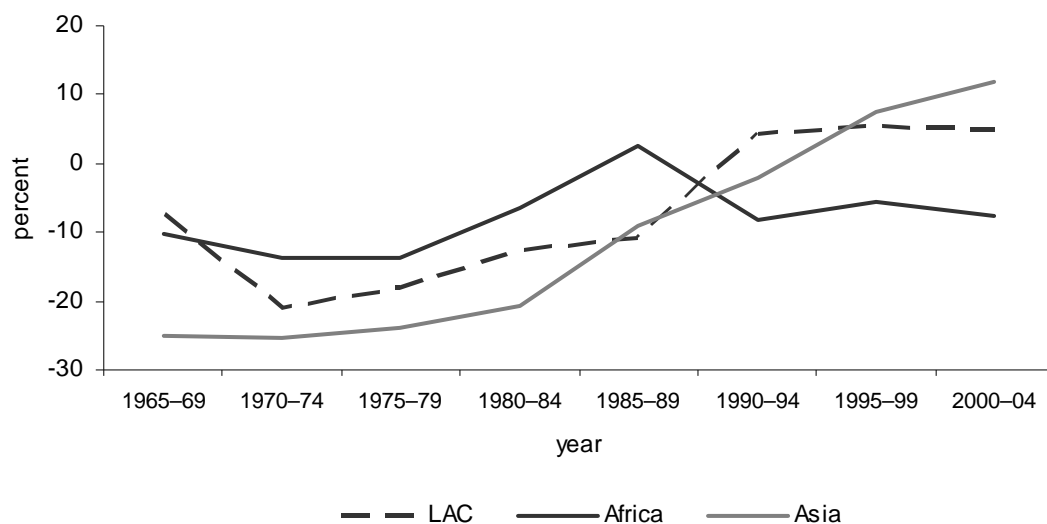


NRA = nominal rate of assistance, PRC = People's Republic of China, RRA = relative rate of assistance

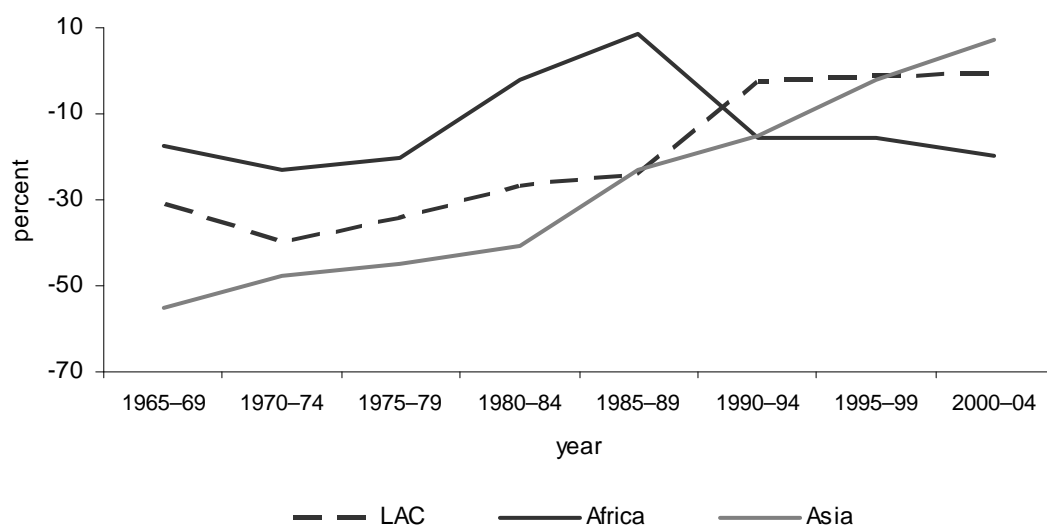
Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).

**Figure 2.8: Nominal and Relative Rates of Assistance,^a
Asian, African, and Latin American Regions, 1965—2004^b
(percent)**

(a) NRA



(b) RRA



LAC = Latin American Countries, NRA = nominal rate of assistance, PRC = People's Republic of China, RRA = relative rate of assistance

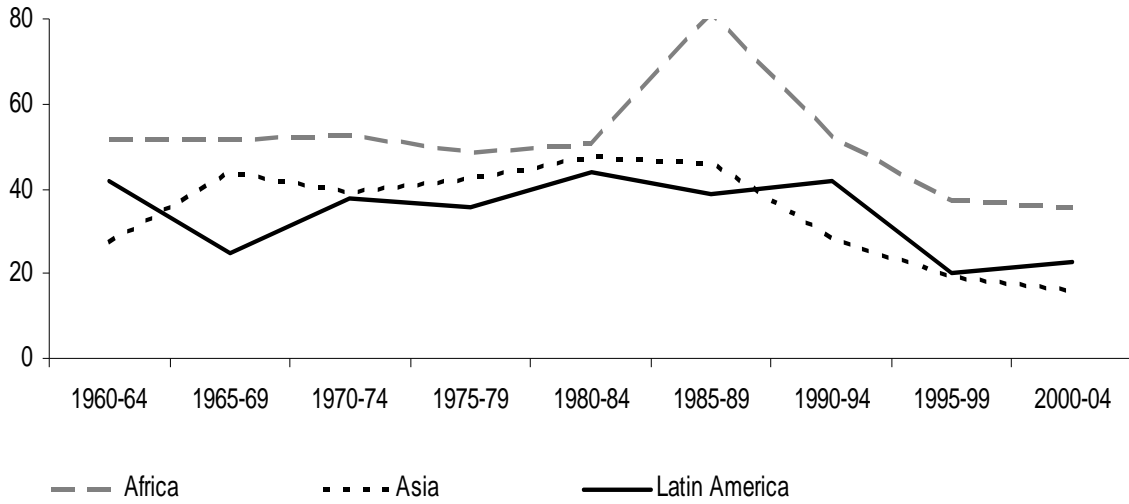
Notes: ^a 5-year weighted averages with value of production at undistorted prices as weights.

^b Estimates for The PRC pre-1981 and India pre-1965 are based on the assumption that the nominal rates of assistance to agriculture and national share or regional agricultural production in those years were the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively.

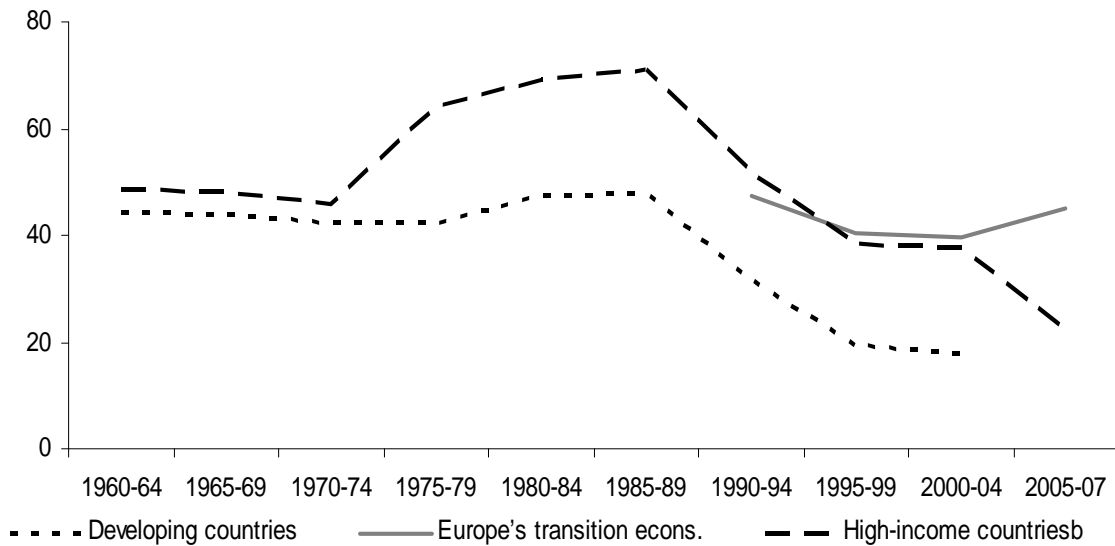
Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Masters (2009), Anderson and Martin (2009), and Anderson and Valdés (2008).

Figure 2.9: Welfare Reduction Indexes for Covered Tradable Farm Products, by Region, 1960—2007 (percent)

(a) Africa, Asia, and Latin America



(b) Developing Countries, High-Income Countries, and European Transition Economies

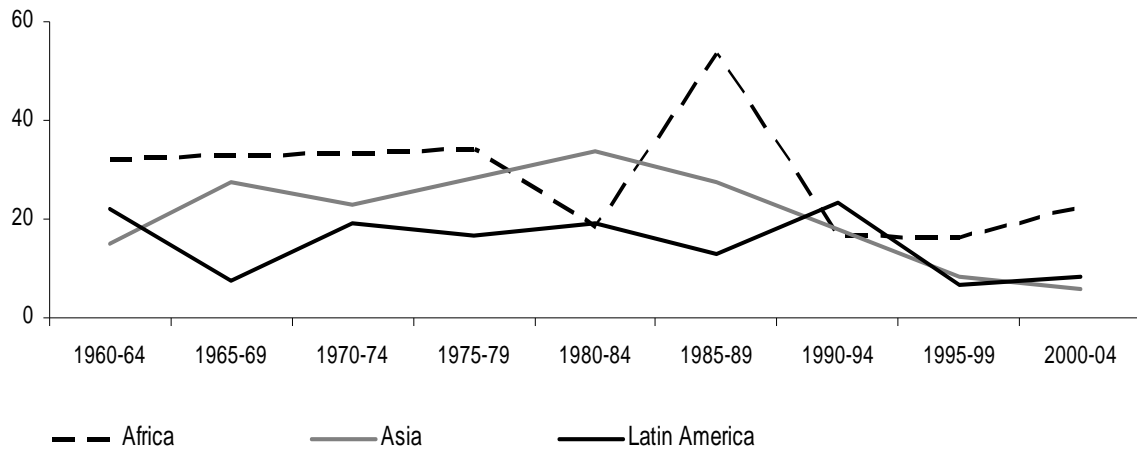


CTE = consumer tax equivalent, NRA = nominal rate of assistance

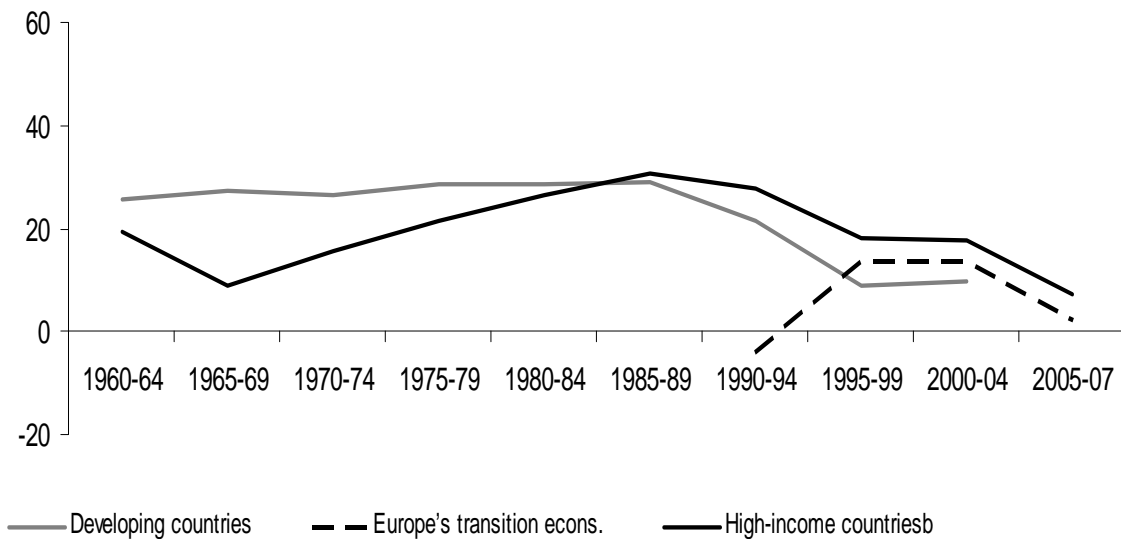
Source: Lloyd, Croser, and Anderson (2009), based on NRAs and CTEs in Anderson and Valenzuela (2008).

Figure 2.10: Trade Reduction Indexes for Covered Tradable Farm Products, by Region, 1960—2007 (percent)

(a) Africa, Asia, and Latin America



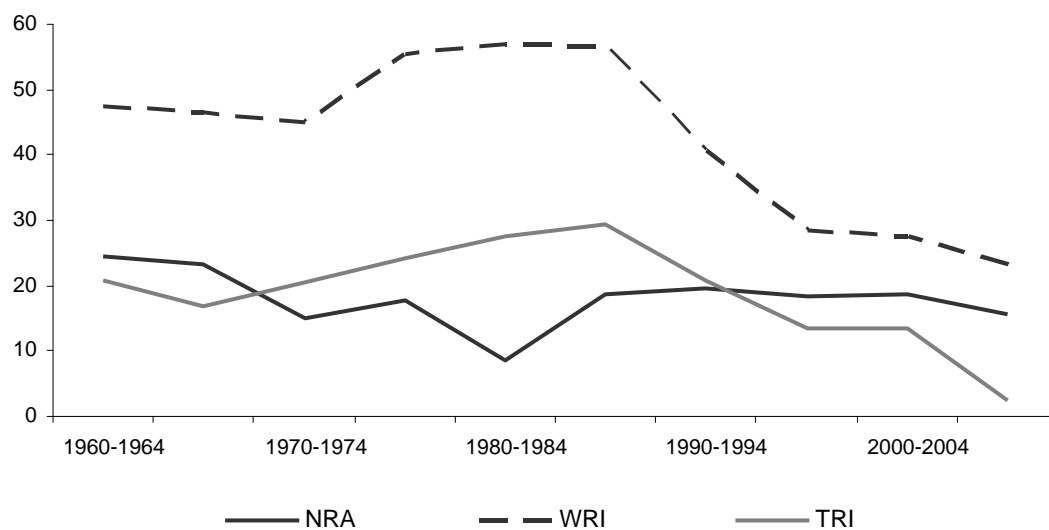
(b) Developing Countries, High-Income Countries, and European Transition Economies



CTE = consumer tax equivalent, NRA = nominal rate of assistance

Source: Lloyd, Croser, and Anderson (2009), based on NRAs and CTEs in Anderson and Valenzuela (2008).

Figure 2.11: Nominal Rate of Assistance and Welfare and Trade Reduction Indexes for Covered Tradable Farm Products, World, 1960—2007 (percent)

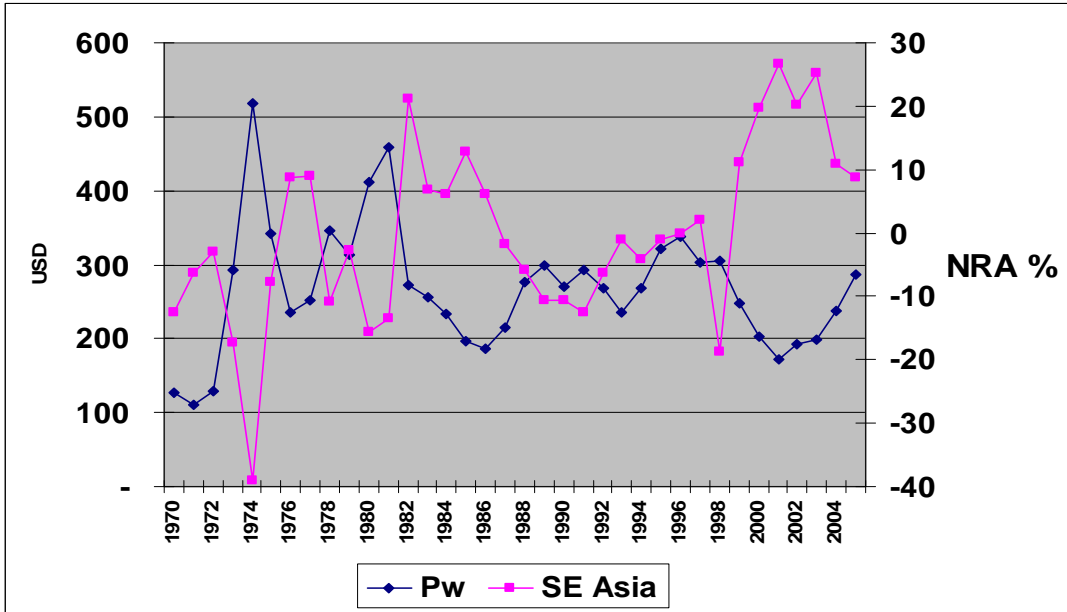


CTE = consumer tax equivalent, NRA = nominal rate of assistance, TRI = trade reduction index, WRI = welfare reduction index

Source: Lloyd, Croser, and Anderson (2009), calculations based on NRAs and CTEs in Anderson and Valenzuela (2008).

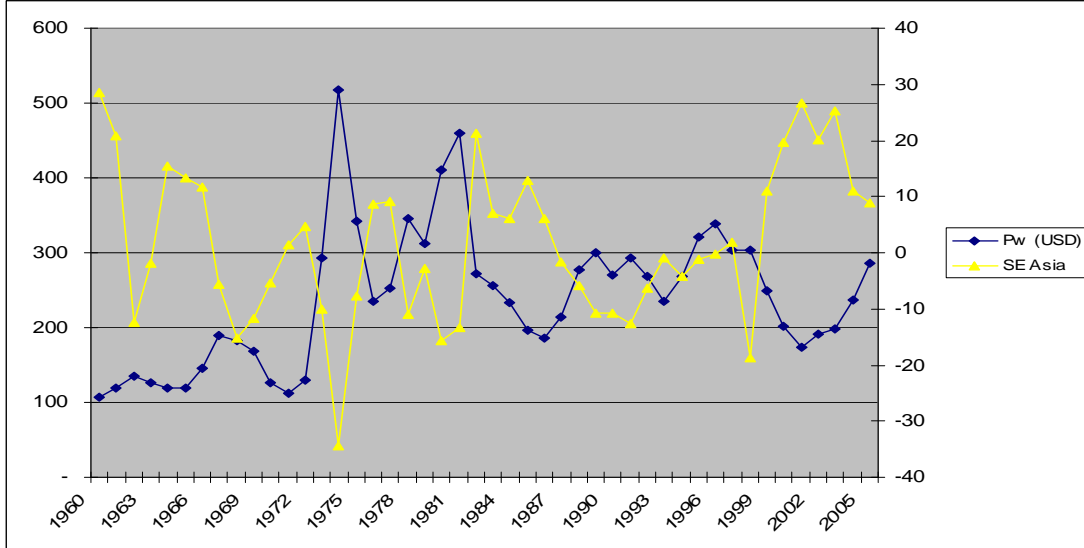
Figure 2.12: Rice NRA and International Rice Price, South and Southeast Asia, 1970—2005
(left axis is int'l price in USD, right axis is NRA in%)

(a) South Asia



Note: Correlation coefficient is -0.75

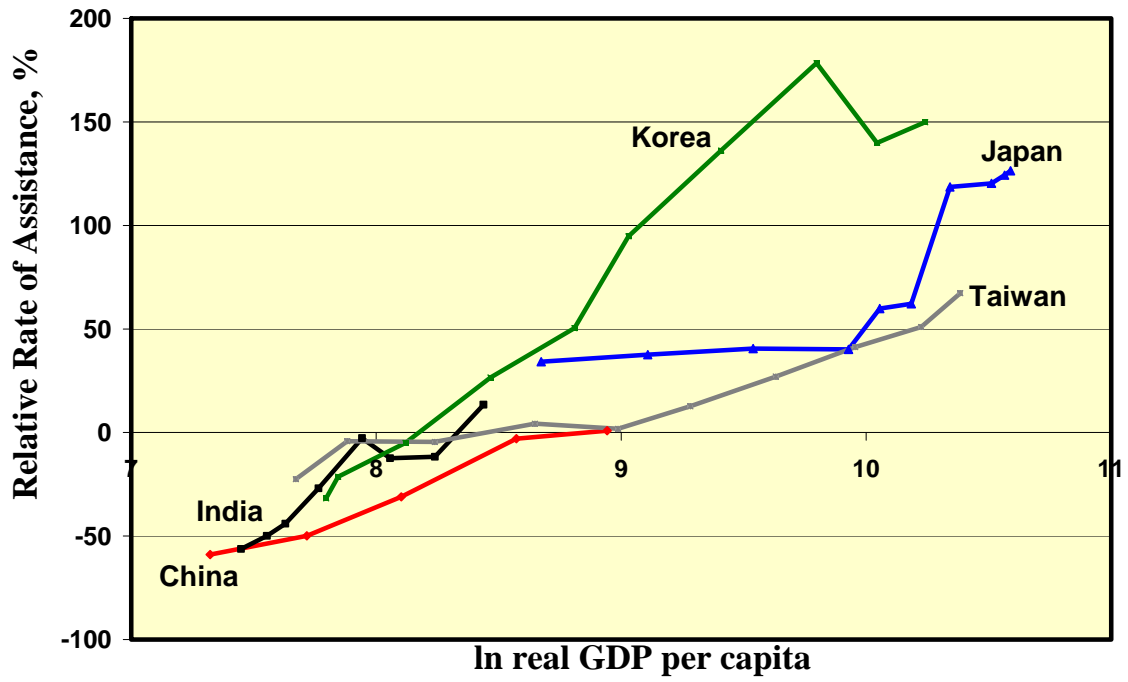
(b) Southeast Asia



Note: Correlation coefficient is -0.59

Source: Anderson and Martin (2009), based on data in Anderson and Valenzuela (2008)

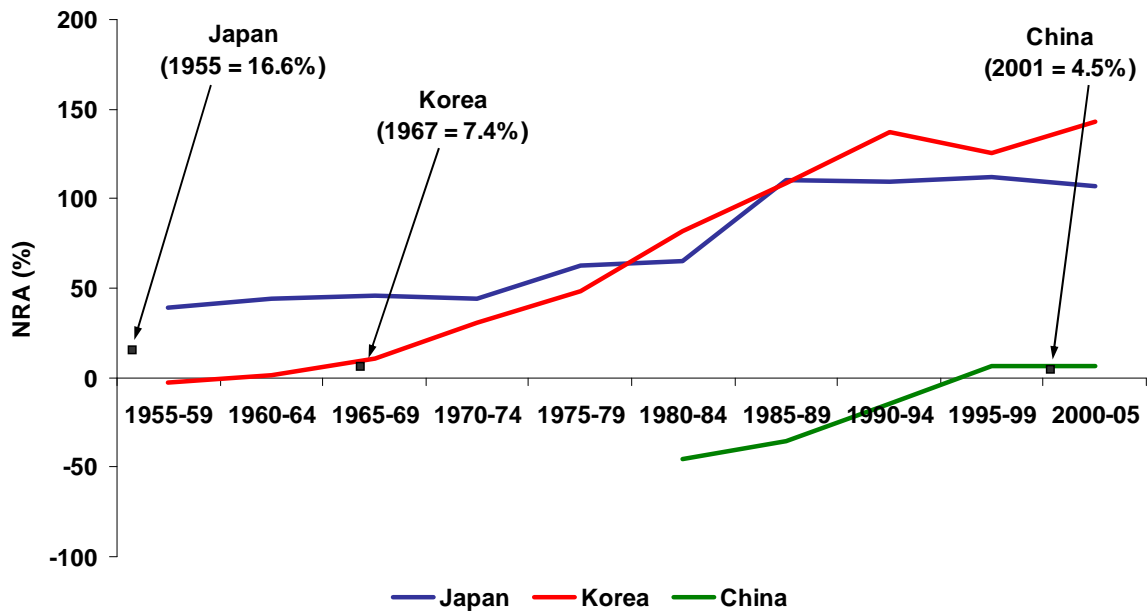
Figure 2.13: RRAs and Log of Real Per Capita GDP, India and Northeast Asian-Focus Economies, 1955—2005



GDP = gross domestic product, RRA = relative rate of assistance

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).

Figure 2.14: NRAs for Japan, Republic of Korea, and PRC, and Date of Accession to GATT or WTO, 1955—2005 (percent)



GATT = General Agreement on Tariffs and Trade, NRA = nominal rate of assistance, PRC = People's Republic of China, WTO = World Trade Organization

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2009).