Agricultural distortion patterns since the 1950s: what needs explaining?

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Abstract

This paper summarizes a new database that sheds light on the impact of trade-related policy developments over the past half century on distortions to agricultural incentives and thus also to consumer prices for food in 75 countries spanning the per capita income spectrum. Price-support policies of advanced economies hurt not only domestic consumers and exporters of other products but also foreign producers and traders of farm products, and they reduce national and global economic welfare. On the other hand, the governments of many developing countries have directly taxed their farmers over the past half-century, both directly (e.g., export taxes) and also indirectly via overvaluing their currency and restricting imports of manufactures. Thus the price incentives facing farmers in many developing countries have been depressed by both own-country and other countries' agricultural price and international trade policies. We summarize these and realted stylized facts that can be drawn from a new World Bank database that is worthy of the attention of political economy theorists, historians and econometricians. These indicators can be helpful in addressing such questions as the following: Where is there still a policy bias against agricultural production? To what extent has there been overshooting in the sense that some developing-country food producers are now being protected from import competition along the lines of the examples of earlier-industrializing Europe and Japan? What are the political economy forces behind the more-successful reformers, and how do they compare with those in less-successful countries where major distortions in agricultural incentives remain? And what explains the pattern of distortions across not only countries but also industries and in the choice of support or tax instruments within the agricultural sector of each country?

Keywords: Political economy, agricultural price and trade policies

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Kym Anderson, Johanna Croser, Damiano Sandri and Ernesto Valenzuela

Among the most important influences on the long-run economic growth and distribution of global welfare are trade-related policy developments in individual countries and their combined effect on other countries via the terms of trade in international markets.[1] Some of the policy developments of the past half century have happened quite suddenly and been transformational. They include the end of colonization around 1960, the creation of the Common Agricultural Policy in Europe in 1962, the floating of exchange rates and associated liberalization, deregulation, privatization and democratization in the mid-1980s in many countries, and the opening of China in 1979, Vietnam in 1986, and Eastern Europe following the fall of the Berlin Wall in 1989 and the demise of the Soviet Union in 1991. Less newsworthy and hence less noticed are the influences of policies that change only gradually in the course of economic development as comparative advantages evolve. This chapter is focused on summarizing a new database that sheds light on the combined impact of trade-related policy developments over the past half century on distortions to agricultural incentives and thus also to consumer prices for food.

For advanced economies the most commonly articulated reason for farm trade restrictions has been to protect domestic producers from import competition as they come under competitive pressure to shed labor as the economy grows. But in the process those protective measures hurt not only domestic consumers and exporters of other products but also foreign producers and traders of farm products, and they reduce national and global economic welfare. For decades agricultural protection and subsidies in high-income (and some middle-income) countries have been depressing international prices of farm products, which lowers the earnings of farmers and associated rural businesses in developing countries.

[1] See, for example, Anderson and Winters (2009) and the literature surveyed therein.

The Haberler (1958) report to GATT Contracting Parties forewarned that such distortions might worsen, and indeed they did between the 1950s and the early 1980s (Anderson, Hayami and Others 1986), thereby adding to global inequality and poverty because three-quarters of the world's poorest people depend directly or indirectly on agriculture for their main income (World Bank 2007).

In addition to this external policy influence on rural poverty, the governments of many developing countries have directly taxed their farmers over the past half-century. A well-known example is the taxing of exports of plantation crops in post-colonial Africa (Bates 1981). At the same time, many developing countries chose also to overvalue their currency, and to pursue an import-substituting industrialization strategy by restricting imports of manufactures. Together those measures indirectly taxed producers of other tradable products in developing economies, by far the most numerous of them being farmers (Krueger, Schiff and Valdés 1988, 1991). Thus the price incentives facing farmers in many developing countries have been depressed by both own-country and other countries' agricultural price and international trade policies.

This disarray in world agriculture, as D. Gale Johnson (1973) described it in the title of his seminal book, means there has been over-production of farm products in high-income countries and under-production in low-income countries. It also means there has been less international trade in farm products than would be the case under free trade, thereby thinning markets for these weather-dependent products and thus making them more volatile. Using a stochastic model of world food markets, Tyers and Anderson (1992, Table 6.14) found that instability of international food prices in the early 1980s was three times greater than it would have been under free trade in those products. During the past 25 years, however, numerous countries have begun to reform their agricultural price and trade policies. That has raised the extent to which farm products are traded internationally, but not nearly as fast as globalization has proceeded in the non-farm sectors of the world's economies.[2]

To what extent have reforms of the past two decades reversed the above-mentioned policy developments of the previous three decades? Empirical indicators of agricultural price distortions (called Producer Support and Consumer Subsidy Estimates or PSEs and CSEs) have been provided in a consistent way for 20 years by the Secretariat of the OECD (2008) for its 30 member countries. However, there are no comprehensive time series rates of

[2] In the two decades to 2000-04, the value of global exports as a share of GDP rose from 19 to 26 percent, even though most of GDP is nontradable governmental and other services, while the share of primary agricultural production exported globally, including intra-European Union trade, rose from only 13 percent to just 16 percent (World Bank 2007 and FAO 2007, as summarized in Sandri, Valenzuela and Anderson 2007).

assistance to producers of nonagricultural goods to compare with the PSEs, nor do they tell us what happened in those advanced economies in earlier decades – which are of more immediate relevance if we are to see how the two groups of countries' policies developed during similar stages of development. As for developing countries, almost no comparable time series estimates have been generated since the Krueger, Schiff and Valdes (1988) study, which covered the 1960-1984 period for just 17 developing countries.[3] An exception is a new set of estimates of nominal rates of protection for key farm products in China, India, Indonesia and Vietnam since 1985 (Orden et al. 2007). The OECD (2009) also has released PSEs for Brazil, China and South Africa as well as several more East European countries. The World Bank's new Database of Agricultural Distortions (Anderson and Valenzuela 2008) complements and extends those two institutions' efforts and the seminal Krueger, Schiff and Valdés (1988, 1991) study. It builds on them by providing similar estimates for other significant (including many low-income) developing economies, by developing and estimating new, more comprehensive policy indicators, and by providing estimates of NRAs for non-agricultural tradables.

The purpose of this chapter is to summarize the stylized facts that can be drawn from the Anderson and Valenzuela (2008) compilation that are worthy of the attention of political economy theorists, historians and econometricians. These indicators can be helpful in addressing such questions as the following: Where is there still a policy bias against agricultural production? To what extent has there been overshooting in the sense that some developing-country food producers are now being protected from import competition along the lines of the examples of earlier-industrializing Europe and Japan? What are the political economy forces behind the more-successful reformers, and how do they compare with those in less-successful countries where major distortions in agricultural incentives remain? Over the past two decades, how important have domestic political forces been in bringing about reform relative to international forces (such as loan conditionality, rounds of multilateral trade negotiations within the General Agreement on Tariffs and Trade, regional integration agreements, accession to the World Trade Organization, and the globalization of supermarkets and other firms along the value chain) and compared with forces operating in earlier decades? What explains the pattern of distortions across not only countries but also

[3] A nine-year update for the Latin American countries in the Krueger, Schiff and Valdés sample by the same country authors, and a comparable study of seven central and eastern European countries, contain estimates at least of direct agricultural distortions (see Valdés 1996, 2000). The Krueger, Schiff and Valdés (1991) chapters on Ghana and Sri Lanka have protection estimates back to 1955, as does the study by Anderson, Hayami and Others (1986) for Korea and Taiwan (and Japan, and much earlier in the case of rice).

industries and in the choice of support or tax instruments within the agricultural sector of each country? What policy lessons may be drawn from these differing experiences with a view to ensuring better growth-enhancing and poverty-reducing outcomes—including less overshooting that results in protectionist regimes—in still-distorted economies during their reforms in the future?

The new database includes estimates for 75 countries that together account for between 90 and 96 percent of the world's population, farmers, agricultural GDP and total GDP (table 1). The sample countries also account for more than 85 percent of farm production and employment in each of Africa, Asia, Latin America and the transition economies of Europe and Central Asia, and their spectrum of per capita incomes ranges from the poorest (Zimbabwe and Ethiopia) to among the richest (Norway).[4] Nominal rates of assistance and consumer tax equivalents (NRAs and CTEs) are estimated for more than 70 different products, with an average of almost a dozen per country. In aggregate the coverage represents around 70 percent of the gross value of agricultural production in the focus countries,[5] and just under two-thirds of global farm production valued at undistorted prices over the period covered. Not all countries had data for the entire 1955-2007 period, but the average number of years covered is 41 per country.[6] Of the world's 30 most valuable agricultural products, the NRAs cover 77 percent of global output, ranging from two-thirds for livestock, three-quarters for oilseeds and tropical crops, and five-sixths for grains and tubers. Those products represent an even higher share (85 percent) of global agricultural exports (see Appendix for details). Having such a comprehensive coverage of countries, products and years offers the prospect of obtaining a reliable picture of both long-term trends in policies, and annual fluctuations around those trends, for individual countries and commodities as well as for country groups, regions, and the world as a whole.

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[4] See Appendix for more coverage details. The only countries not well represented in the sample are those in the Middle East and the many small ones, but in total the omitted countries account for less than 4 percent of the global economy (made up of 0.2 percent from each of Sub-Saharan Africa and Asia, 0.9 percent from Latin America, and the rest from the Middle East and North Africa).

[5] Had seven key mostly-nontraded food staples (bananas, cassava, millet, plantain, potato, sweet potato and yam) been included for all instead of just some developing countries, their product coverage would have risen from around 70 to 76 percent; and had those staples had an average NRA of zero, they would have brought the weighted average NRA for all covered agriculture in developing countries only about half of one percentage point closer to zero each decade over the sample period (Anderson 2009, Table 12.10).

[6] By way of comparison, the seminal multi-country study of agricultural pricing policy by Krueger, Schiff and Valdes (1988, 1991) covered an average of 23 years to the mid-1980s for its 18 focus countries that accounted for 5-6 percent of the global agricultural output; and the producer and consumer support estimates of the OECD (2008) cover 22 years for its 30 countries that account for just over one-quarter of the world's agricultural output valued at undistorted prices.

This chapter begins with a brief history of agricultural policy developments in outline of the methodology used to generate annual indicators of the extent of government interventions in markets, details of which are provided in Anderson et al. (2008). A selection of stylized facts that can be gleaned from the distortions database is then summarized across products, sectors, regions and over the decades since the mid-1950s.[7] The chapter concludes with a list of political economy questions needing to be addressed, many of which are the subject of subsequent chapters in this volume.

Methodology for measuring price distortions[8]

The present study's methodology focuses mainly on government-imposed distortions that create a gap between domestic prices and what they would be under free markets. Since it is not possible to understand the characteristics of agricultural development with a sectoral view alone, not only are the effects of direct agricultural policy measures (including distortions in the foreign exchange market) examined, but also those of distortions in non-agricultural tradable sectors.

Specifically, the Nominal Rate of Assistance (NRA) for each farm product is computed 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). Included are any product-specific input subsidies. A weighted average NRA for all covered products is derived using the value of production at undistorted prices as product weights (unlike the PSEs and CSEs computed by OECD (2008) which are expressed as a percentage of the distorted price). To that NRA for covered products is added a 'guesstimate' of the NRA for non-covered products (on average around 30 pecent of the total) and an estimate of the NRA from non-product-specific forms of assistance or taxation. Since the 1980s some high-income governments have also provided so-called 'decoupled' assistance to farmers but, because that support in principle does not distort resource allocation, its NRA has been computed separately and is not included for direct comparison with the NRAs for

[7] These estimates and associated analytical narratives are discussed in far more detail in a global overview volume (Anderson 2009), and the detailed developing country case studies are reported in four regional volumes covering Africa (Anderson and Masters 2009), Asia (Anderson and Martin 2009a), Latin America (Anderson and Valdés 2008) and Europe's transition economies (Anderson and Swinnen 2008).

[8] Only a brief summary of the methodology is provided here. For details see Anderson et al. (2008) or Appendix A in Anderson (2009).

other sectors or for developing countries. Each farm industry is classified either as import-competing, or 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 covered tradable farm products. We also generate a production-weighted average NRA for nonagricultural tradables, for comparison with that for agricultural tradables via the calculation of a percentage Relative Rate of Assistance (RRA), defined as:

$$RRA = 100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$$

where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural (including non-covered) and non-agricultural sectors, respectively.[9] Since the NRA cannot be less than -100 percent if producers are to earn anything, neither can the RRA (since the weighted average $NRAnonag^t$ is non-negative in all our country case studies). And 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 sectoral policy regime has an anti- (pro-)agricultural bias.

This approach is not well suited to analysis of the policies of Europe's or Asia's former socialist economies prior to their reform era, because prices then played only an accounting function and currency exchange rates were enormously distorted. During their reform era, however, the price comparison approach provides as valuable a set of indicators for them as for other market economies of distortions to incentives for farm production, consumption and trade, and of the income transfers associated with interventions.[10]

In addition to the mean NRA, a measure of the dispersion or variability of the NRA estimates across the covered farm products also is generated for each economy. The cost of government policy distortions to incentives in terms of resource misallocation tend to be greater the greater the degree of substitution in production. In the case of agriculture which involves the use of farm land that is sector-specific but transferable among farm activities, the greater the variation of NRAs across industries within the sector then the higher will be the welfare cost of those market interventions. A simple indicator of dispersion is the standard deviation of the covered industries' NRAs.

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[9] Farmers are affected not just by prices of their own products but also by the incentives nonagricultural 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) provided his Symmetry Theorem that proved that in a two-sector economy, an import tax has the same effect as an export tax. This carries over to a model that also includes a third sector producing only nontradables.

[10] Data availability also affects the year from which NRAs can be computed. For Europe's transition economies that starting date is 1992 (2000 for Kazahkstan), for Vietnam it is 1986 and for China it is 1981.

Anderson and Neary (2005) show that it is possible to develop a single index that captures the extent to which the mean and standard deviation of protection together contribute to the welfare cost of distortionary policies. That index recognizes that the welfare cost of a government-imposed price distortion is related to the square of the price wedge, and so is larger than the mean and is positive regardless of whether the government's agricultural policy is favoring or hurting farmers. In the case where it is only import restrictions that are distorting agricultural prices, the index provides a percentage tariff equivalent which, if applied uniformly to all imports, would generate the same welfare cost as the actual intra-sectoral structure of protection from import competition. Lloyd, Croser and Anderson (2009) show that, once *NRAs* and *CTEs* have been calculated, they can be used to generate such an index even in the more complex situation where there may be domestic producer or consumer taxes or subsidies in addition to not only import tariffs but any other trade taxes or subsidies or quantitative restrictions. They call it a Welfare Reduction Index (WRI). Such a measure is the percentage agricultural trade tax (or uniform NRA and CTE) which, if applied equally to all agricultural tradables, would generate the same reduction in national economic welfare as the actual intra-sectoral structure of distortions to domestic prices of tradable farm goods. They also show that, if one is willing to assume that domestic price elasticities of supply (demand) are equal across farm commodities, then the only information needed to estimate the WRI, in addition to the *NRAs* and *CTEs*, is the share of each commodity in the domestic value of farm production (consumption) at undistorted prices.

While most of the focus is on agricultural producers, we also consider the extent to which consumers are taxed or subsidized. To do so, we calculate a Consumer Tax Equivalent (CTE) by comparing the price that consumers pay for their food and the international price of each food product at the border. Differences between the NRA and the CTE arise from distortions in the domestic economy that are caused by transfer policies and taxes/subsidies that cause the prices paid by consumers (adjusted to the farmgate level) to differ from those received by producers. In the absence of any other information, the CTE for each tradable farm product is assumed to be the same as the NRA from border distortions and the CTE for nontradable farm products is assumed to be zero.

To obtain dollar values of farmer assistance and consumer taxation, we have taken the country authors' NRA estimates and multiplied them by the gross value of production at undistorted prices to obtain an estimate in US dollars of the direct gross subsidy equivalent of assistance to farmers (GSE). These GSE values are calculated in constant dollars, and are also expressed on per-farm-worker basis. Likewise a value of the consumer transfer is derived

from the CTE, by assuming the consumption value is the gross value of production at undistorted prices divided by the self-sufficiency ratio for each product (production divided by consumption, derived from national volume data or the FAO's commodity balance sheets). These transfer values can be added up across products for a country, and across countries for any or all products, to get regional aggregate transfer estimates for the studied economies. That valuation is also helpful for generating an estimate of the contribution of each policy instrument to the overall NRA, and the trade data that provide the self-sufficiency ratio helped each country author attach a trade status to each product each year.

Once each farm industry is classified either as import-competing, or a producer of exportables, or as producing a non-tradable (its status could change over time), it is possible to generate for each year the weighted average *NRAs* for the two different groups of tradable farm industries. They can then be used to generate an agricultural trade bias index defined as:

$$(7) \qquad TBI = \left[\frac{1+NRAag_x}{1+NRAag_m} - 1\right]$$

where $NRAag_m$ and $NRAag_x$ are the average *NRAs* for the import-competing and exportable parts of the agricultural sector (their weighted average being $NRAag^t$). This index has a value of zero when the import-competing and export sub-sectors are equally assisted, and its lower bound approaches -1 in the most extreme case of an anti-trade policy bias.

Anderson and Neary (2005) show also that it is possible to develop a single index that captures the extent to which import protection reduces the volume of trade. Once *NRAs* and *CTEs* have been calculated, Lloyd, Croser and Anderson (2009) show how they can be used to generate a more-general Trade Reduction Index (TRI), that allows for the trade effects also of domestic price-distorting policies, and regardless of whether they (or the trade measures) are positive or negative. Such a measure is the percentage agricultural trade tax (or uniform NRA and CTE) which, if applied equally to all agricultural tradables, would generate the same reduction in trade volume as the actual intra-sectoral structure of distortions to domestic prices of tradable farm goods. They also show that, if the domestic price elasticities of supply (demand) are equal across farm commodities, then again the only information needed to estimate the TRI, in addition to the *NRAs* and *CTEs*, is the share of each commodity in the domestic value of farm production (consumption) at undistorted prices.

Needless to say, there are numerous challenges in applying the above methodology, especially in less developed economies with poor-quality data. Ways to deal with the standard challenges are detailed in Anderson et al. (2008) and the country-specific challenges

are discussed in the analytical narratives in the regional and global volumes listed in footnote 6 above.

We turn now to summarizing the stylized facts that have emerged from Anderson and Valenzuela's (2008) compilation and aggregation of the NRAs and related estimates provided by the project's country case studies, and Anderson and Croser's (2009) estimation of the WRIs and TRIs, from which numerous questions emerge for political economy theorists, historians and econometricians to address.

Stylized facts: global agricultural distortion patterns

For the purposes of the present study, the world economy is divided into high-income countries (Western Europe, the United States/Canada, Japan, and Australia/New Zealand),[11] three developing country regions (Africa, Asia and Latin America), and Europe's economies that were in transition from socialism in the 1990s plus Turkey.[12]

North America and Europe (including the newly acceded eastern members of the EU) each account for one-third of global GDP, and the remaining one-third is shared almost equally by developing countries and the other high-income countries.[13] When the focus turns to just agriculture, however, developing countries are responsible for slightly over half the value added globally, with Asia accounting for two-thirds of that lion's share. The developing countries' majority becomes stronger still in terms of global population and even more so in terms of farmers, almost three-quarters of whom are in Asian developing countries. Hence the vast range of per capita incomes and agricultural land per capita, and thus agricultural comparative advantages, across the country groups in table 1.

Asia has had much faster economic growth and export-led industrialization than the rest of the world: since 1980, Asia's per capita GDP has grown at four times, and exports nearly two times, the global averages, and the share of Asia's GDP that is exported is now

[11] Korea and Taiwan are categorized here as 'developing' rather than high-income because at the beginning of the 50-year period under study they were among the poorest economies in the world.
[12] Turkey is included in this last group because it is in the same geographic region and, like others in that region, has been seeking European Union accession which has influenced the evolution of its agricultural price and trade policies.
[13] The only countries not well represented in the sample are those middle- to high-income ones in the Middle East and the many small (often low-income) ones elsewhere that together account for less than 4 percent of the global economy.

one-third above that for the rest of the world and for Latin America and far above that for Africa (Sandri, Valenzuela and Anderson 2007). Asia's GDP per capita is now half as high again as that of our focus African countries, although still only one-third that of Latin America (table 1). However, in the earlier half of our time series Asia was poorer than Africa and hence the poorest of the country groups in table 1.

By 2000-04 just 12 percent of Asia's GDP came from agriculture on average. That contrasts with Africa where the share for our focus countries ranges from 20 to 40 percent, and with Latin America and Europe's transition economies where it is down to 6 percent (and to just 2 percent on average in high-income countries). The share of employment in agriculture remains very high in Asia though, at just under 60 percent – which is the same as in Africa and three times the share in Latin America and Eastern Europe, although more farmers work part-time on their farms in Asia than in other developing countries. By contrast, less than 4 percent of workers in high-income countries are still engaged in agriculture. Hence the much greater importance to developing country welfare, inequality and poverty of own-country and rest-of-world distortions to agricultural incentives.

Regional NRAs and RRAs: rising with economic growth and industrialization

We turn first to the estimates of NRAs for covered products plus non-product-specific assistance and guesstimates of assistance to the roughly 30 percent of the value of farm products that have not been included in the study's explicit price comparison exercise. These are summarized in table 2, from which (in combination with the right-hand half of table 1) it is apparent that the NRAs are higher, the higher a region's income per capita and the weaker its agricultural comparative advantage. The NRAs are also rising over time, and fastest for fastest-growing Asia and least so for slowest-growing Africa, with the exception of declines in Western Europe and Australia/New Zealand since the late 1980s. For developing countries as a whole, their average NRA has gradually moved from more than 20 percent below zero in the 1960s and 1970s to 9 percent above zero during 2000-04.

When the changes in NRAs to non-farm tradable sectors are taken into account by calculating the RRA, the intersectoral changes in distortions are even starker. Table 3 shows that Latin America, Asia and Australia/New Zealand all had high rates of manufacturing protection in the first half of the period that were dramatically reduced over the most recent three decades. As a result, the RRA for developing countries as a group has transformed from -50 percent prior to the mid-1970s to slightly above zero by the end of the 1990s. The RRA

for Australia/New Zealand was also negative in the first half of the period (averaging more than 10 percent below zero) but notwithstanding the decline in its NRA for farm products the RRA has risen almost to zero because the manufacturing protection cuts were bigger than the cuts in farm subsidies (as explained in Anderson, Lloyd and MacLaren 2007). Even in the other high-income countries the decline in manufacturing protection has accentuated the improvement in farm incentives prior to the 1990s.

Western Europe is the only significant region where the agricultural sector trend RRAs have declined as incomes have grown, and only since the late 1980s. That does not take account of the fact that there has been much re-instrumentation of support for farmers in Western Europe over the past two decades. When payments decoupled from farm production are included in the NRA, there was very little decline in the trend level of overall farmer assistance between 1986 and 2004. The drop since then (figure 1) is not due to any policy change in Europe but simply a rise in international food prices that has not been passed on to farmers there – and which will have since bounced back with the crash in those food prices in the second half of 2008.

Using the full data set of countries and years, the positive relationship between RRA and real national GDP per capita is very clear from figure 2, with developing countries having the archtypical anti-agricultural bias (RRA<0) and high-income countries having the pro-agricultural bias described in Anderson (1995). The negative relationship between agricultural comparative advantage and NRA or RRA is not quite as strong, but it is certainly visible, as in figure 3 for RRAs. The individual country average agricultural NRA and RRA, shown for 2000-04 in figure 4, lends further visual support to these tendencies. They suggest strongly that the world's agricultural production is far from optimally distributed around the globe or even within each continent. That is, the world's farm resources are being squandered by this wide dispersion of NRAs and RRAs.

Together these data suggest at least six stylized facts:

- **Fact 1:** National nominal and relative rates of assistance to agriculture tend to be higher, the higher the country's income per capita;
- **Fact 2:** National nominal and relative rates of assistance to agriculture tend to be higher, the weaker the country's agricultural comparative advantage;
- **Fact 3:** As a corollary to Facts 1 and 2, national nominal and relative rates of assistance to agriculture tend to rise over time as the country's per capita income

rises, and more so the more that growth is accompanied by a decline in agricultural comparative advantage.

- **Fact 4:** While there is a wide range in the trend levels of agricultural sector NRAs and RRAs and in their rates of change in both high-income and developing countries, over most of the past half century the policy regime on average in developing countries has had an anti-agricultural bias and in high-income countries it has had a pro-agricultural bias;
- **Fact 5:** The only significant region where the agricultural sector trend RRAs have declined as incomes have grown is Western Europe since the late 1980s, but the decline in the trend level of overall farmer assistance has declined little when payments decoupled from farm production are included; and
- **Fact 6:** The only other countries where the agricultural sector trend NRA has declined as incomes have grown are Australia and New Zealand since the 1970s, but there it was tolerated by farmers because it was accompanied by even larger reductions in manufacturing protection such that the RRA rose for farmers there (not unlike in many developing countries).

Wide dispersion of product NRAs

The regional average NRAs just discussed hide a great deal of diversity across products and countries, including within each region. This can be seen clearly from national Box plots shown in Figure A.4 in the Appendix to this volume (Anderson and Croser 2010). One other way of summarizing the within-country NRA diversity across products is to calculate the standard deviation around the mean NRA for all covered farm products each year. Even when that is averaged over 5-year periods and for whole geographic regions, the diversity is still evident (table 4). What is also evident from that table is that the average of those standard deviations for all 75 focus countries is hardly any lower in the second half of the period than it is in the first half. This has important welfare implications, because the cost of government policy distortions to incentives in terms of resource misallocation tend to be greater the greater the degree of substitution in production (Lloyd 1974). In the case of agriculture which involves the use of farm land that is sector-specific but transferable among farm activities, the greater the variation of *NRAs* across industries within the sector, the higher will be the welfare cost of those market interventions.

That wide range of product NRAs carries over globally too. The Box plots for the regions are shown in Figure A.3 in the Appendix to this volume (Anderson and Croser 2010), and a summary for the world is provided in figure 5 for a dozen key products. Each of those figures reveals the range of NRAs over the sample time period (the long bar), with the shaded area showing where 95 percent of the NRAs fall, and the vertical line within that shows the mean NRA for the sample for each product.

When developing and high-income countries are considered separately, it is revealed that the rice pudding ingredients of sugar, rice and milk are the most protected in both sets of countries in 2000-04 (figure 6). Cotton, on the other hand, is protected in high-income countries but taxed in developing countries, while prices of inputs into livestock feedmixes (maize, soybean, pork, poultry) are only distorted in both sets of countries.

These data suggest another three stylized facts:

- **Fact 7:** Within the agricultural sector of each country, whether developed or developing, there is a wide range of product NRAs;
- **Fact 8:** Despite the fall in average agricultural NRAs, the across-product standard deviation of NRAs around the national average each year is no less in the present decade than it was in the three previous decades for both developed and developing countries; and
- **Fact 9:** Some product NRAs are positive and high in almost all countries (sugar, rice and milk), others are positive and high in developed economies but highly negative in developing countries (most noticeably cotton), and yet others are relatively low in all countries (feedgrains, soybean, pork, poultry).

Anti- trade bias in NRAs

The most robust NRA estimates are for the covered farm products for which direct price comparisons have been made. Those products have been categorized each year as either exportable, import-competing or nontradable. Figure 7 summarizes those NRAs and reveals a marked difference in the levels of support to import-competing versus exportable farm products. Exportables in high-income countries received relatively little support other than during the export subsidy ‘war’ of the mid-1980s, while in developing countries they were increasingly taxed from the late 1950s until the 1980s and then that taxation was gradually phased out (although some taxes remained in 2000-04, for example in Argentina).

Importables, by contrast, have been assisted throughout the past five decades in both developed and developing countries on average (even though some import subsidization of staple foods occurred from time to time in low-income countries), and the long-run fitted trend line has almost the same slope for both sets of countries, albeit with a lower intercept for developing countries.

Part of the anti-trade bias in developing countries was the result of government intervention in the domestic market for foreign currency. The most common arrangement was a dual exchange rate, whereby exporters had to sell part or all of their foreign currency to the government at a low price. This effectively taxed and thus discouraged production of exportables. At the same time it created an artificial shortage of foreign currency so that potential importers bid up its purchase price, which had the same effect as an import tax and thus encouraged import-competing production. The size of these effective if implicit trade taxes depends on the extent to which the government purchase price is misaligned with what would be the free-market equilibrium price, the price elasticities of demand for and supply of foreign currency, and the retention rate. In some countries there were more-complex multiple exchange rates, whereby traders of some products were subject to more favorable treatment than others. In estimating NRAs in developing countries, participants in the Agricultural Distortions research project endeavored to include the effects of these implicit trade taxes, and to show how much impact they had on the NRAs and RRA (see Anderson et al. 2008, which draws on Dervis, de Melo and Robinson 1981). The practice was rife in newly independent developing countries in the 1960s and 1970s, but was gradually phased out over the 1980s and early 1990s as part of overall macroeconomic policy reform initiatives.

The net effect of all the explicit and implicit trade taxes and subsidies, together with domestic taxes and subsidies on tradable farm products, is that the NRA for exportable farm products is typically well below the NRA for importables, so that the trade bias index, as defined in the methodology section above, is negative. Table 5 shows that the anti-agricultural trade bias index has declined over time for the developing country group, but mainly because of the decline in agricultural export taxation and in spite of growth in agricultural import protection. For the high-income group, the anti-agricultural trade bias index has shown little trend over time. That is mainly because the rise and then decline in agricultural export subsidies has been matched by a similar trajectory for import protection.

The two sub-sectors to which that index's NRAs refer (exportable and import-competing farm products, respectively) are not equal contributors to overall farm production, however, so the trade bias index when weighted across numerous products/countries is not a

perfect indicator. A superior one is the trade-reduction index discussed in the methodology section above. The trade-reduction index (and, incidentally, the welfare-reduction index) associated with NRAs and CTEs for covered agricultural products have fallen substantially since the latter 1980s for both high-income and developing country groups and hence globally (figure 8). That fall in the TRI has been more because of the fall in national mean NRAs than in their variance, however.

These features of government intervention suggest another five stylized facts:

- **Fact 10:** With respect to individual farm products, the NRA tends to be lower the stronger the country's comparative advantage in that product;
- **Fact 11:** As a corollary to Fact 10, the agricultural policy regime of each country tends to have an anti-trade bias;
- **Fact 12:** The anti-agricultural trade bias has declined over time for the developing country group, but mainly because of the decline in agricultural export taxation and in spite of growth in agricultural import protection, whereas for the high-income group, the anti-agricultural trade bias has shown little trend over time, mainly because the rise and then decline in agricultural export subsidies has been matched by a similar trajectory for import protection;
- **Fact 13:** The trade-reduction (and the welfare-reduction) indexes associated with NRAs and CTEs for covered agricultural products have fallen substantially since the latter 1980s for both high-income and developing country groups and hence globally, but more because of the fall in national mean NRAs than in their variance; and
- **Fact 14:** Up to the 1980s and in some cases early 1990s it was not uncommon for government interventions in the market for foreign exchange in developing countries to add to the overall anti-trade bias in policy regimes, but those interventions had all but disappeared by the mid-1990s as part of overall macroeconomic policy reform initiatives.

Volatility of NRAs

If a country would be close to self-sufficient in a product under free markets, but there is a significant transport cost associated with importing or exporting it, then there would be no trade in this product except in years when the international price was relatively high or low. In the absense of government intervention, the NRA would be zero regardless of whether

trade took place, but without trade the domestic price could be anywhere within the range of the fob export price and the cif import price. If import and export taxes or quantitative restrictions applied, they would make trade even less likely and they would widen the range of variation in the domestic price of this mostly nontraded good. In that case the interventions would cause the estimated NRA to switch from negative to zero to positive and back to zero as and when the international price gyrated well above and below trend.

A much more common reason for NRAs to vary from year to year, though, is because the government deliberately seeks to reduce fluctuations in domestic food prices and in the quantities available for consumption. One way for a country to achieve that objective is by varying the restrictions on its international trade in food according to seasonal conditions domestically and changes in prices internationally. Effectively this involves exporting domestic instability and not importing instability from abroad.

To distinguish between these two sources of volatility in the NRA for a product whose national self sufficiency is always close to zero, one can compare the movements in domestic versus border prices. As an illustration, figure 9 does that for rice in India: clearly in that case the government has been able to maintain an almost-constant real domestic rice price for decades despite huge fluctuations in the international price of rice. Indeed that has been the practice of most governments in South and Southeast Asia, where rice is the predominant food staple. As a result, since 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 very little rice production has been traded internationally: less than 7 percent in 2000-04,[14] compared with 14 and 24 percent for maize and wheat. This insulating behavior of governments[15] also means international prices are much more volatile for rice than for those other grains.

To get a sense of how much this practice varies across products and whether it has changed much since policy reforms began around the mid-1980s, table 6 reports the average across focus countries of the percentage point deviation each year of national NRAs for 12 key farm products around their trend value for the sub-periods before and from 1985. For most products that indicator is lower in the latter period, the exceptions being rice, wheat and (at least in developing countries) soybean. Rice had one of the smaller average deviations in

[14] This was up from the pre-1990s half-decade global shares which are all less than 4.5 percent (Anderson and Valenzuela 2008).

[15] This begger-thy-neighbor dimension of each country's policy is not restricted to developing countries. In high-income coountries, however, the motivation for intervention is more commonly concern for instability in producer prices and farm incomes rather than in instability of prices and availability of staples for urban consumers.

the earlier period, but by the latter period rice shared the honour of the largest deviations with sugar and milk.

That nominal rates of protection tend to be above trend in years of low international prices and conversely in years when international prices are high is clear from table 7, which shows the extent of the negative correlation between the NRAs for varuious products and their international price. That coefficient globally and in high-income countries is negative for all but beef, and even in the various developing country regions it is negative in all but one-quarter of the cases. For almost all of those 12 products the regional correlation is highest for the South Asian region. Among the developing countries it is again rice, sugar and milk that have the highest correlation coefficients.

One other way of capturing this phenomenon is to estimate the elasticity of transmission of the international product price to the domestic market. Following Tyers and Anderson (1992, pp. 65-75), we use a geometric lag formulation to estimate elasticities for each product for all focus countries for the period 1985 to 2007. The average of estimates for the short run elasticity ranged from a low of 0.3 for sugar and milk to 0.5 for rice, wheat and pigmeat, 0.6 for cotton, cocoa, maize and poultry, and 0.7 for beef, soybean and coffee. The unweighted average across all of those 12 key products is 0.54, suggesting that within the first year little more than half the movement in international prices is transmitted domestically. Even the long run elasticity appears well short of unity after full adjustment: the average of the elasticities for those 12 products acoss the focus countries is just 0.69.

These data provide two more stylized facts about government distortions to agricultural incentives:

- **Fact 15:** Around the long-run trend for each country there is much fluctuation from year to year in individual product NRAs, and while this tendency has diminished since the mid-1980s for most key products it has increased for rice and wheat; and
- **Fact 16:** Product NRAs tend to be negatively correlated with movements in international prices of the products in question (most so in developing countries for rice, sugar and milk), and on average barely half of the change in an international price is transmitted to domestic markets within the first year.

Dominance of trade measures in farm policy instrument choice

Since the mid-1980s, when the GATT's Uruguay Round got under way, it has been common in trade negotiations to focus on three sets of agricultural policy instruments that distort production and trade: import restrictions, export subsidies, and domestic producer subsidies. When the Doha round of negotiations was launched a decade ago, much of the focus of attention by developing countries was on farm subsidies by high-income countries, until it was shown that import restrictions were far more important to theirs – and global – economic welfare. According to the GTAP global economy wide model and protection database, 93 percent of the global welfare cost of government interventions in agricultural markets as of 2001 was due to market access restrictions, and only 5 percent to domestic support and 2 percent to export subsidies (Anderson, Martin and Valenzuela 2006).

However, that GTAP protection database does not include all the apparent export taxes, import subsidies and domestic producer taxes in developing countries identified in the World Bank's new Database of Agricultural Distortions. But even when the fuller set of policy instruments from the new database are included, and even when the relatively new decoupled payments to farm households are counted, it is still the case that trade measures at the border (export and import taxes or subsidies and their equivalent from quantitative trade restrictions and multiple exchange rates) are the dominant forms of intervention. Table 8 shows the various contributions of different policy measures to the overall estimated NRAs as of 1981-84 and 2000-04. In both periods, trade measures accounted for around three-fifths of the total NRA for both developing and high-income countries.[16]

Trade measures are responsible for an even larger share – almost 90 percent – of the distortion to consumer prices of food, since direct domestic consumer subsidies (or taxes), as distinct from the indirect ones provided by border measures, are relatively rare (table 9).

The dominance of trade measures in both consumer tax equivalents (CTEs) and NRAs for agricultural products means we should expect those two indicators to be highly correlated. And indeed that is the case: for all focus countries, covered products and available years in the panel set, the coefficient of correlation between NRAs and CTEs is 0.93 (see numbers in parentheses in the last column of table 7).

[16] If one assumes that the price elasticities of supply and demand for farm products are equal, and that there are no costs of collecting taxes and dispersing them as subsidies, then the trade-reducing effects of trade measures would be twice as high as for an equally high NRA provided by production subsidies – and an even bigger multiple of the effects of so-called decoupled payments, depending on the extent to which the latter are in practice truly decoupled from production decisions. Furthermore, the welfare-reducing effects of trade measures are in proportion to the square of the trade tax-cum-subsidy. Thus border measures would be responsible for much more than three-fifths of the global welfare cost of distortions to agricultural prices, and possibly not much below the more-limited but widely quoted estimate for 2001 of 93 percent by Anderson, Martin and Valenzuela (2006).

Subsidies to farm inputs, and support for public agricultural research, have been common but have added little to overall farmer assistance in high-income countries, and have done very little to offset the effective taxation of farmers in developing countries. The most notable exception is India, where large subsidies to fertilizer, water and power for irrigation add several percentage points to India's agricultural NRA. The bottom row of table 8 reports expenditure on public agricultural research and development expressed as a percentage of gross agricultural production valued at undistorted prices. Despite the estimated high social rates of return at the margin to such public investment (Pardey et al. 2007), developing countries invest less than 0.4 percent of the value of their farm output on agricultural research, or less than half the intensity of agricultural R&D in high-income countries.

Three more stylized facts about government distortions to agricultural incentives thus can be listed:

- **Fact 17:** Even when decoupled payments are included in total support payments, trade policy instruments (export and import taxes, subsidies or quantitative restrictions plus dual exchange rates) account for no less than three-fifths of agricultural NRAs, and hence for an even larger share of their global welfare cost (since trade measures also tax consumers, and welfare costs are proportional to the square of a trade tax), with domestic subsidies to or taxes on farm output making only minor contributions;
- **Fact 18:** Direct subsidies to (or taxes on) food consumption have been very minor, hence consumer tax equivalents (CTEs) tend to be highly correlated with NRAs for agricultural products; and
- **Fact 19:** Subsidies to farm inputs, and support for public agricultural research, have been common but have added little to overall farmer assistance in high-income countries and have done very little to offset the effective taxation of farmers in developing countries.

Contribution to rising RRA of reforms in non-farm sectors

Trade policies have contributed even more to agricultural distortions than indicated in the NRA and CTE estimates in tables 8 and 9, because they are also responsible for all of the estimated distortions to the NRA facing producers of non-farm tradable goods. Most of the country case studies contributing to the World Bank's Agricultural Distortions database were

able to include only tariffs (in addition to exchange rate distortions) in their estimates of non-agricultural NRAs. They therefore understate those NRAs, especially in earlier decades when non-tariff barriers to imports of manufactures were rife. Hence they also understate the contribution of the decline in those rates to the rise in the RRA. Notwithstanding those biases, that latter contribution is still estimated to have been very substantial. To see this, we report in table 10 what the RRA would have been in different regions in 2000-04 had the NRA for non-agricultural tradable goods not changed from its (relatively high) level during the pre-reform period of 1960-84. The final column of that table indicates that slightly over half of the rise in the RRA for developing countries since the mid-1980s, and two-thirds of the RRA rise for high-income countries, is due to falls in protection to producers of non-farm tradable goods. This suggests much of the reduction in relative prices faced by farmers over the past two decades can be attributed to general trade liberalization rather than to specific farm policy reform.

Our final stylized fact is thus:

- **Fact 20:** The fall in assistance to producers of non-farm tradable goods has contributed to more than half the rise since the mid-1980s in the RRA for developing countries, and as much as two-thirds of the RRA rise for high-income countries.

What still needs explaining

The above stylized facts (a) confirm some things that were well established and understood two decades ago and (b) highlight a lot more variation in NRAs and RRAs across countries and products and time that still requires explanation.

The most robust facts have to do with the correlation between assistance to farmers and both per capita income and agricultural comparative advantage. Reasons for expecting those facts have been spelt out in such writings and Anderson, Hayami and Others (1986), Krueger (1992), Anderson (1995) and de Gorter and Swinnen (2002). How much do they explain of the variation across countries and time in national NRAs and RRAs that is captured in the new agricultural distortions panel database? Table 11 reports the simplest of OLS regressions using the full panel of data for all focus countries from 1955 to 2007. The log of real GDP per capita on its own accounts for nearly 40 percent of the national average NRA variation. Figure 2 above suggests a quadratic relationship, and indeed when the log of

that variable is included the adjusted R^2 rises to 0.44. If the log of arable land per capita is added, to represent the factor endowment ratio affecting agricultural comparative advantage, the adjusted R^2 increases further to 0.55.[17] In each of those regressions all variables are significant at the 1 percent level and with the expected sign.[18] When we switch the variable being explained from NRA to RRA, the adjusted R^2 is a few points higher in each case and is 0.59 in the case of the final regression. That is, these two variables alone – per capita income and a factor endowment indicator of agricultural comparative advantage – explain a little more than half of the variation in the full panel's NRAs and RRAs.

When those panel data are separated by region, however, there is a considerable range in the extent to which those two variables account for the variation across countries. In the case of RRAs, table 12 shows that the adjusted R^2 is a high 0.72 for Asia, a moderate 0.33 and 0.42 for Latin America and high-income countries, respectively, but just 0.07 for Africa. Clearly there is a great deal more heterogeneity among countries to be explained outside of Asia, and especially in Africa.

Incidentally, we used the NRA counterparts to the RRA regressions in table 12 to predict the NRAs in non-focus countries in each developing country region, so as to explore the representativeness of the sample of focus developing countries (which account for 91 percent of agricultural output of all developing countries, as compared with virtually 100 percent for high-income countries). Those predictions, shown in Table 13, suggest three things. One is that the impact on the aggregate average NRA for developing countries of omitting those non-focus countries is very minor, changing it in 2000-04 only from 9 to 8 percent (and hence affecting the estimated global NRA by only half of one percentage point). The second thing to note is that the missing countries in each of Sub-Saharan Africa, Asia and Latin American have an average predicted NRA below that estimated for the region's focus countries, but by no more than 2 percentage points, suggesting the non-focus countries of each region are slightly poorer and/or more agrarian than the focus countries of the region. And thirdly, the predicted NRA for the developing countries of the Middle East and North Africa (excluding Egypt) is slightly above the estimated NRA for focus developing countries, which is consistent with the fact that those MENA countries have relatively high per capita incomes and low agricultural comparative advantages.

[17] Logs of these variables are used to reduce the influence of outliers.
[18] So too is a variable representing comparative advantage in non-farm primary products (net exports as a proportion of the sum of gross exports and gross imports of such products), although it has little impact on the R^2 and slightly reduces the adjusted R^2 so we have not included that regression in the table.

Also well-known two decades ago was that NRAs vary greatly across the product range, both within country groups and globally, and tend to be higher for import-competing producers than for exporters of the product in question. The former point is illustrated in Figure 6 above for the most important traded farm products, and the anti-trade bias of farm policies is clear from table 5. When the global NRAs for each of ten key traded products are regressed on the log of real GDP per capita, log of arable land per capita and a dummy for to distinguish exportable from import-competing products, the adjusted R^2 is above 0.32 for beef, milk, rice and wheat, and between 0.28 and 0.31 for pigmeat, poultry, soybean and sugar (and 0.23 for cotton and 0.20 for maize – see table 14). The income coefficients are all highly significant with the expected signs, as are the coefficients for land endowment except for cotton. The coefficients on the dummy variable used to distinguish exportable from import-competing products are significant at the 1 percent level for all but soybean, and have the expected sign in all cases except pigmeat. This table of results suggests that another area where further political economy analysis would be helpful is at the commodity level. In addition to seeking to explain the differences in R^2 values in that table, a more-specific question is: why are some farm industries more protected than others in both rich and poor countries (e.g., sugar, dairy), more taxed than others in poor countries (e.g., perennial tropical crops), and taxed in poor countries but subsidized in rich countries (even though they may be exported by the latter, as with cotton in the United States)?

The above tables and figures provide but a beginning to the questions that might be posed following further scrutiny of the panel data. We conclude by simply listing some of the other questions that political economists might address, a few of which are taken up in the chapters that follow in this volume:

- What are the political economy forces behind the trend declines in positive agricultural NRAs in some high-income countries, and how do they differ from those in countries where agricultural NRAs remain or continue to grow?
- What are the political economy forces behind the more-reforming developing countries that have reduced/eliminated their anti-agricultural policy bias, and how do they differ from those in less-successful countries where negative distortions to agricultural incentives remain?
- In particular, what explains the differing pace and timing of the reforms in the various reforming countries?

- What explains the exceptional developing country policy reversals in which the anti-agricultural bias has worsened (such as in Zimbabwe from the mid-1990s and the reversion back to agricultural export taxation in Argentina after 2001)?
- What explains the choices of (typically n-th best) policy instruments, including exchange rates and the simultaneous use of measures that help and hurt farmers?
- In particular, why have countries tended to have an anti-trade bias in their distortions pattern within the agricultural sector? What explains the exceptions such as export or import subsidies?
- What explains the evolution of policy instrument choice over time, including towards more decoupled forms of domestic support in some but not all high-income countries (e.g. single farm payments) and yet a continuing reluctance to end inefficient farm programs such as by providing one-off lump-sum buy-outs?
- Why have governments used trade policy instruments when trying to reduce year-to-year fluctuations around trend levels of domestic prices for producers or consumers of some farm products, rather than more-efficient instruments?
- Why have societies tended to under-invest in what appear to be high-payoff public investments such as in agricultural research, rural infrastructure, and basic rural education and health, and instead spend scarce public funds on distortionary subsidies (e.g. credit, fertilizer) or charge inadequately for some other items (e.g. water, power, environmental damage), all of which tend to add to inequality by assisting large farmers more than small farmers?
- What influence have international institutional and market forces (loan conditionality, GATT rounds, regional integration agreements, WTO accession, non-reciprocal trade agreements (e.g., for former colonies and Least Developed Countries), globalization of supermarkets and other firms along the value chain) had on the extent, pattern and evolution of distortions to agricultural incentives, relative to domestic political forces, especially in bringing about reform during the past two decades in contrast to the earlier decades of worsening distortions analyzed by Krueger, Schiff and Valdes (and others) in the 1980s?

Will more developing countries increase assistance to farmers?

The first wave of densely populated industrializers (Britain, other Western Europe, then Japan, and then Korea and Taiwan) chose to slow the growth of food import dependence by raising their NRA for import-competing agriculture even as they were bringing down their NRA for non-farm tradables, such that their RRA became increasingly above the neutral zero level. Only in the past decade or two has the world seen a second example of declining RRAs (the first one being in the mid-19th century in Europe), as the European Union (EU) began to re-instrument its assistance by moving toward decoupled payments. The reason for that exception has to do with the EU's unique institutional provision of supra-national support via its Common Agricultural Policy (CAP). As explained by Josling (2009), the decline in price supports in the EU is occuring largely because the budgetary cost of continuing past levels of support would have sky-rocketed following the EU membership expansion eastwards, with little if any of those extra payments going to the traditional lobbyists for the CAP.

This almost complete absence of examples of reforms aimed at reducing relative assistance to farmers is not inconsistent with the fact that the GATT and now WTO members have found it extremely difficult to conclude multilateral agreements to reduce support for agriculture. It begs a key question: will more developing countries follow the example of earlier industrializers?

The past close association of RRAs with rising per capita income and falling agricultural comparative advantage (see figures 2 and 3) suggests that, in the absense of any new shocks to the political equilibria, one should expect this to continue in the decades ahead. From a global viewpoint the most important developing countries to watch are the largest and fastest growing, namely China and India, both of which also happen to be relatively densely populated and hence vulnerable to declines in their agricultural comparative advantages as they become more industrialized. When their RRA trends are mapped against per capita income for the past three-plus decades as in figure 10, it is clear that to date China and India have been on the same trajectory as richer Northeast Asian economies.

One reason one might expect different government behavior now is because the earlier industrializers were not bound under GATT to keep down their agricultural protection. At the time of China's accession to WTO in December 2001, its NRA was 7.3 percent for just import-competing agriculture (Huang et al. 2009). Its average bound import tariff commitment was about twice that (16 percent in 2005), but what matters most is China's out-of-quota bindings on the items whose imports are restricted by tariff rate quotas. The latter

tariff bindings as of 2005 were 65 percent for grains, 50 percent for sugar and 40 percent for cotton (WTO, ITC and UNCTAD 2007, p. 60). China also has bindings on farm product-specific domestic supports of 8.5 percent, and can provide another 8.5 percent as non-product specific assistance if it so wishes – a total 17 percent NRA from domestic support measures alone, in addition to what is available through out-of-quota tariff protection. Clearly the legal commitments China made on acceding to WTO are a long way from current levels of domestic and border support for its farmers, and so are unlikely to constrain the government very much in the next decade or so;[19] and the legal constraints on Asia's developing countries that joined the WTO earlier (except for Korea) are even less constraining. For India, Pakistan and Bangladesh, for example, their estimated NRAs for agricultural importables in 2000-04 are 34, 4 and 6 percent, respectively, whereas the average bound tariffs on their agricultural imports are 114, 96 and 189 percent, respectively (WTO, ITC and UNCTAD 2007). Also, like other developing countries, they have high bindings on product-specific domestic supports of 10 percent and another 10 percent for non-product specific assistance, a total of 20 more percentage points of NRA that legally could come from domestic support measures – compared with currently 10 percent in India and less than 3 percent in the rest of South Asia (Anderson and Martin 2009, Ch. 1).

One oft-stated reason for governments being inclined to keep raising the RRA over time is that they fear a laissez faire strategy could increase rural-urban inequality and poverty and thereby generate social unrest (Hayami 2007). Available evidence suggests that problems of rural-urban poverty gaps have been alleviated in parts of Asia and Africa by some of the more-mobile members of farm households finding full- or part-time work off the farm (including abroad as guest workers) and repatriating part of their higher earnings back to those remaining in farm households (Otsuka and Yamano 2006, Otsuka, Estudillo and Sawada 2009). But these are only fragmentary elements of the developments that are altering the political economy of agricultural policies in emerging economies. Much more systematic analysis of the evolving political economy is needed not only to address the question as to whether more developing countries will become more agricultural protectionist but also to suggest politically feasible ways of countering that tendency of the past.

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[19] For more on this point, see Anderson, Martin and Valenzuela (2009).

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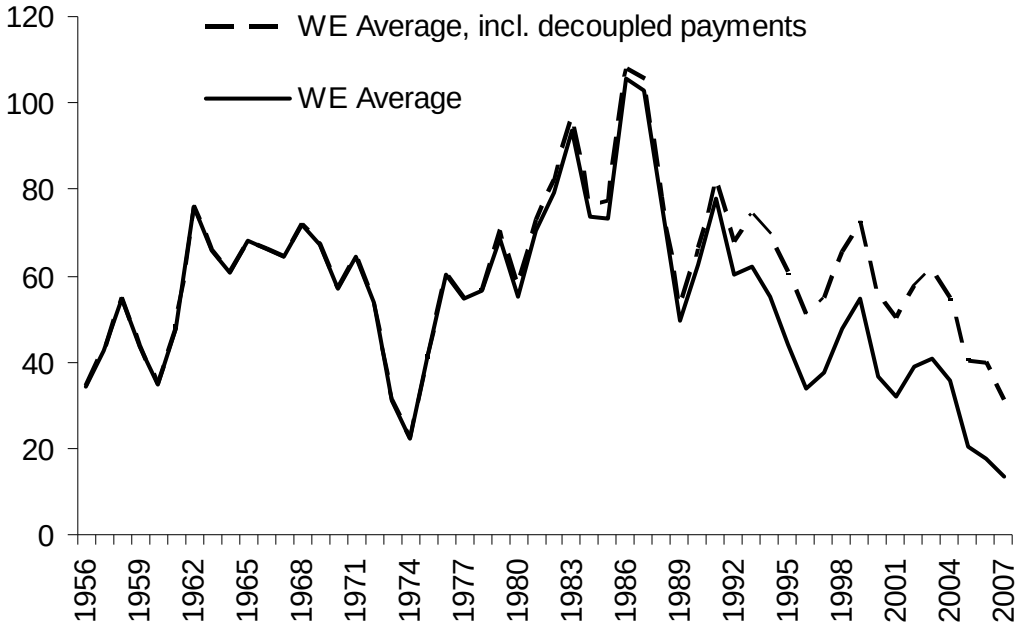
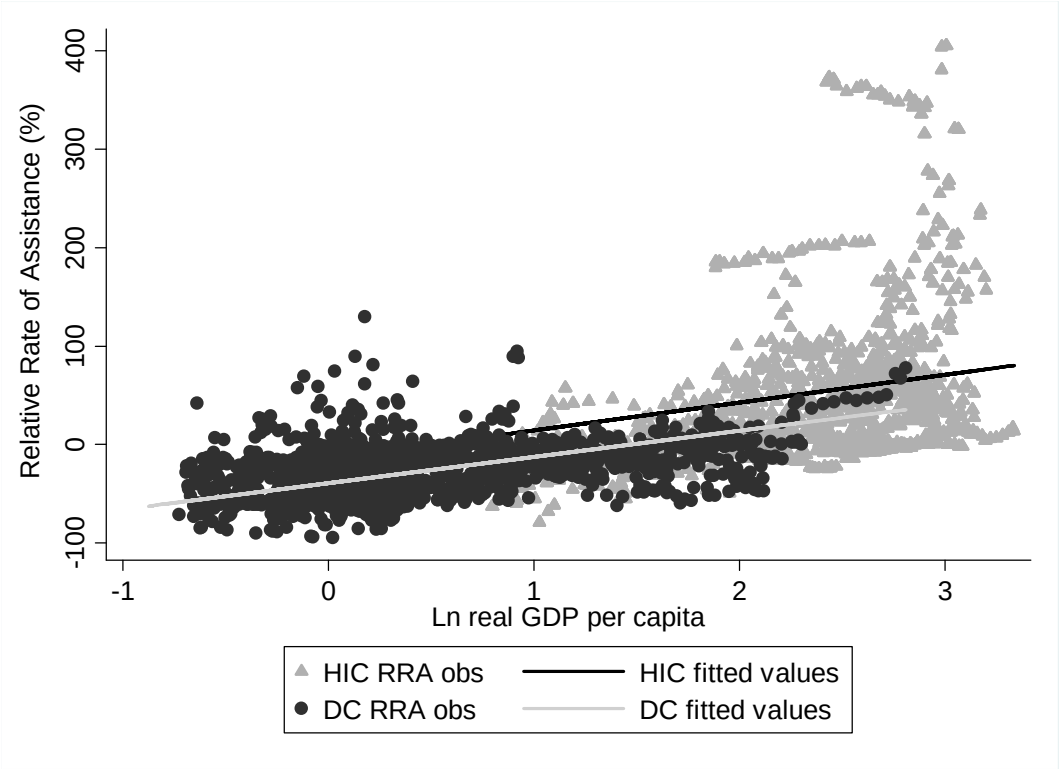
Figure 1: NRAs to agriculture without and with decoupled payments, Western Europe, 1956 to 2007

(percent)



Source: Anderson and Valenzuela (2008) as reported in Josling (2009), which draws heavily on OECD (2008) for calculations from 1979.

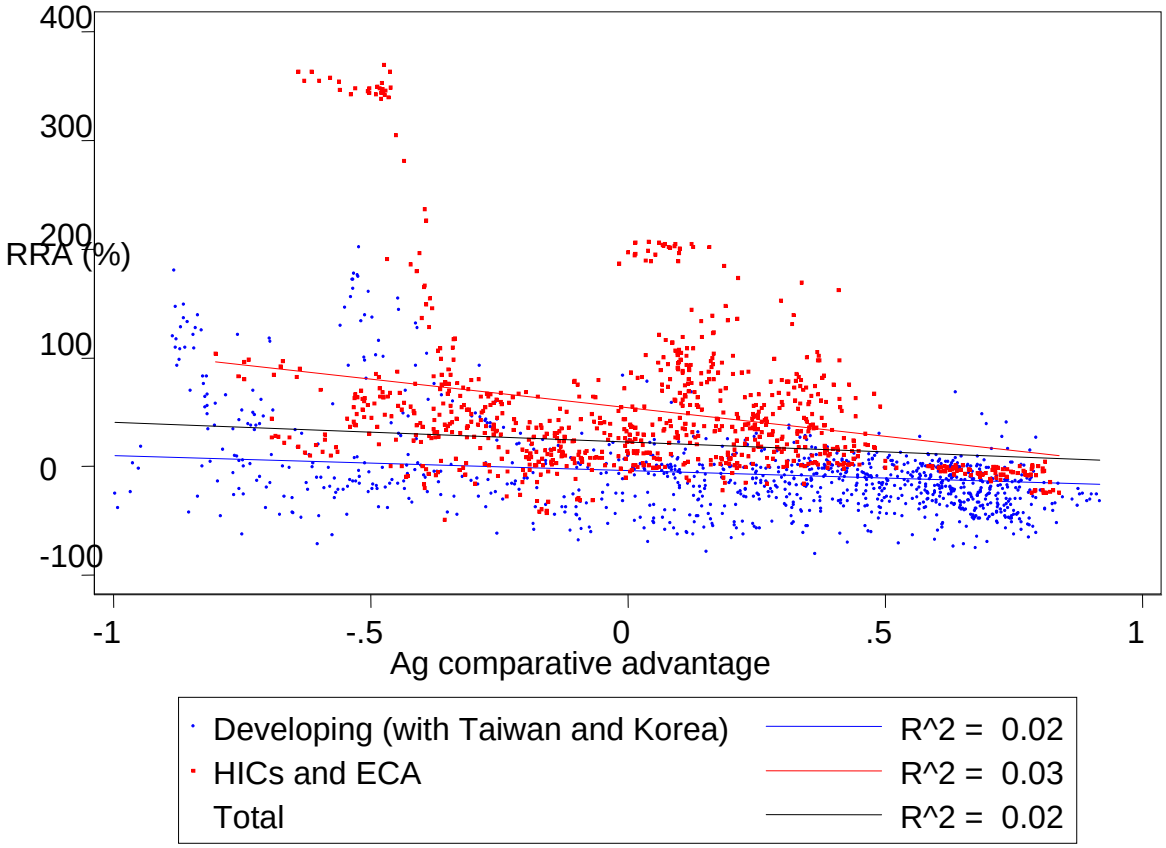
Figure 2: Relationships between real GDP per capita and RRA, all 75 focus countries, 1955 to 2007



	Coefficient	Standard error	R^2
DCs	0.26	0.02	0.17
HICs	0.28	0.03	0.14

Source: Authors' derivation with country fixed effects, using data in Anderson and Valenzuela (2008).

Figure 3: Relationships between agricultural comparative advantage[a] and RRA, all 75 focus countries, 1955 to 2007

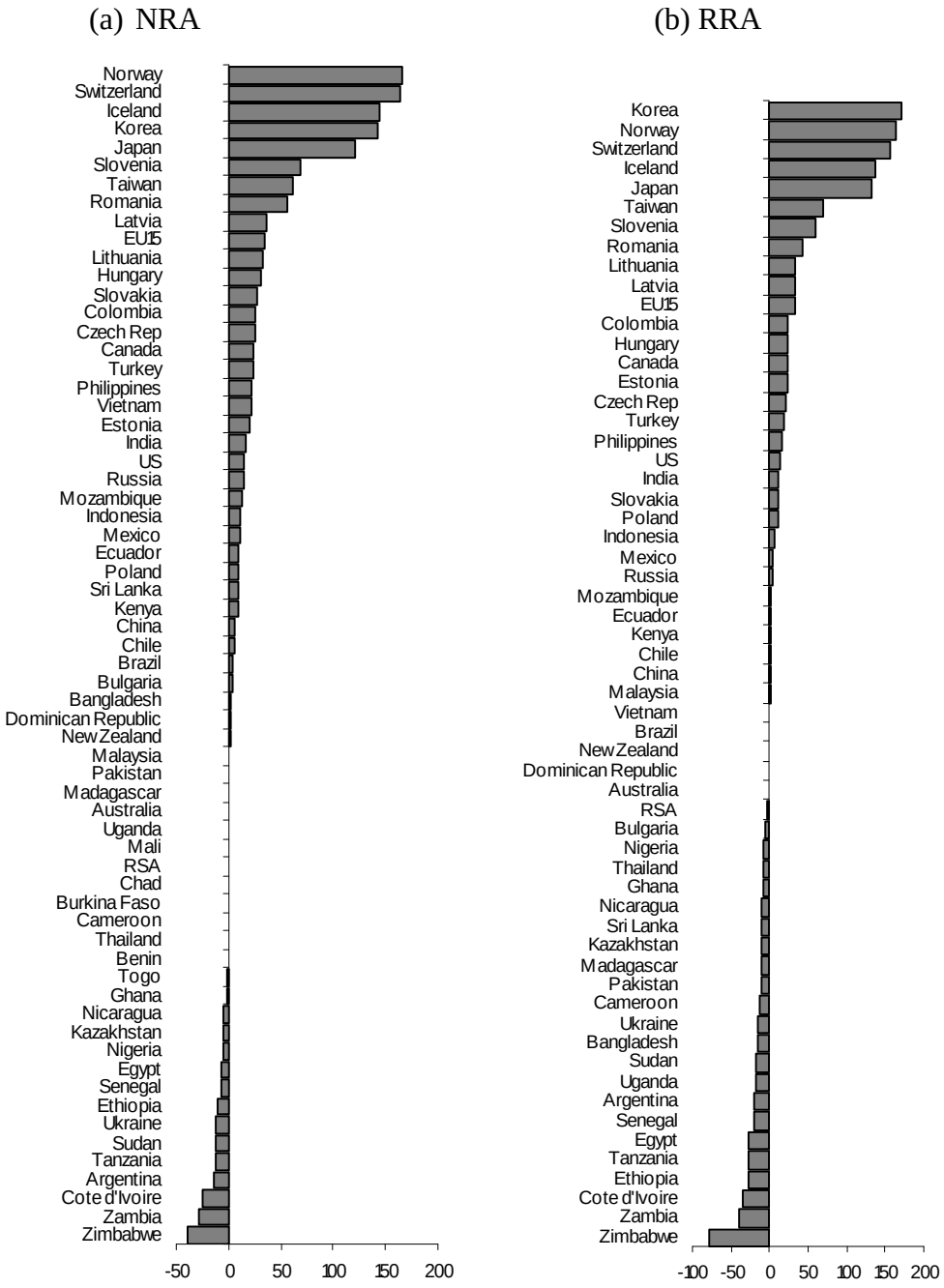


[a] Net exports divided by the sum of exports and imports of agricultural products.

Source: Authors' derivation with country fixed effects, using data in Anderson and Valenzuela (2008).

Figure 4: Cross-country dispersion of NRA (all agriculture products, including non-product-specific support) and RRA, 2000-04

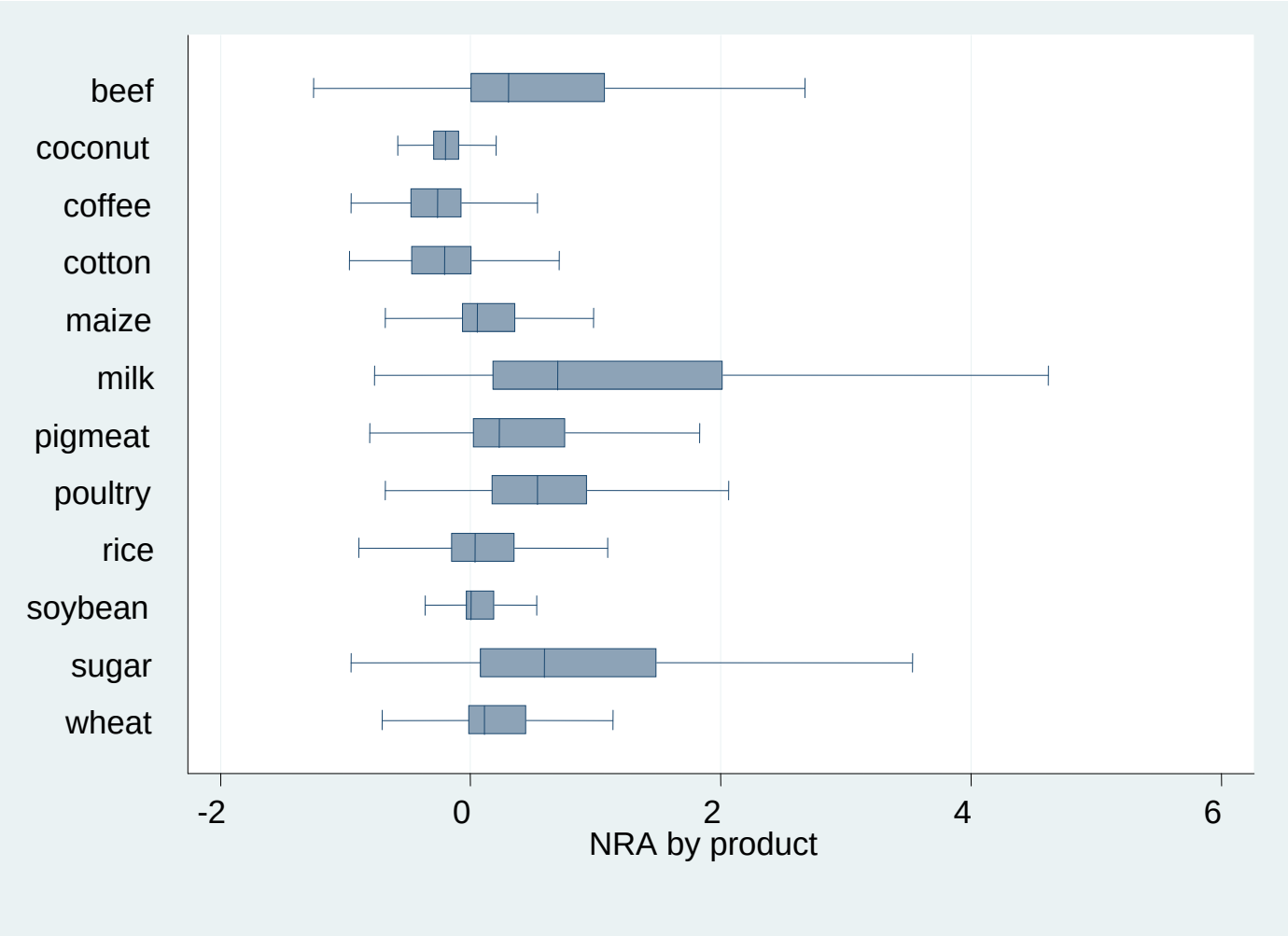
(percent)



Source: Author's derivation, using data in Anderson and Valenzuela (2008).

Figure 5: Distribution of output-based global average NRA, 12 key products, 1955 to 2007

(percent/100)

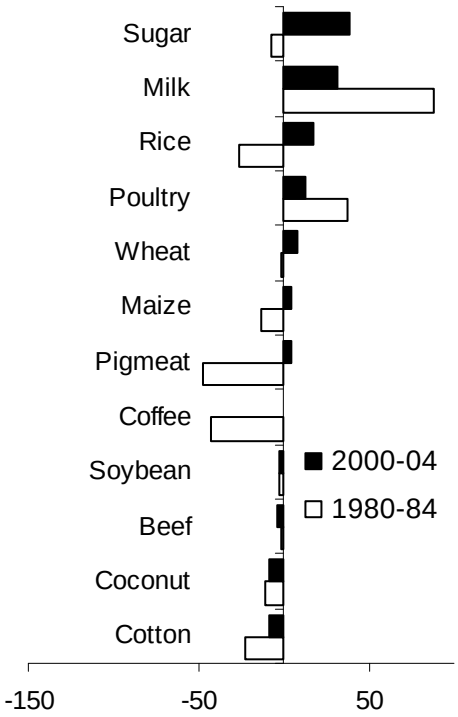


Source: Authors' derivation using data in Anderson and Valenzuela (2008).

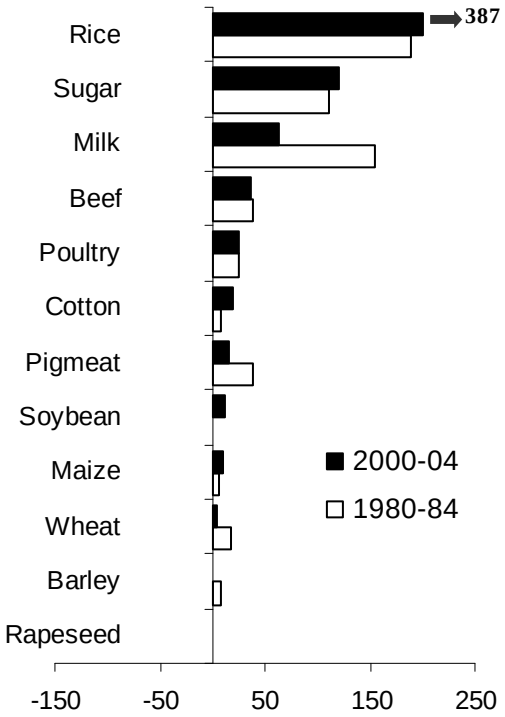
Figure 6: Nominal rates of assistance, key covered products, high-income and developing countries, 1980-84 and 2000-04

(percent)

(a) Developing countries



(b) High-income countries

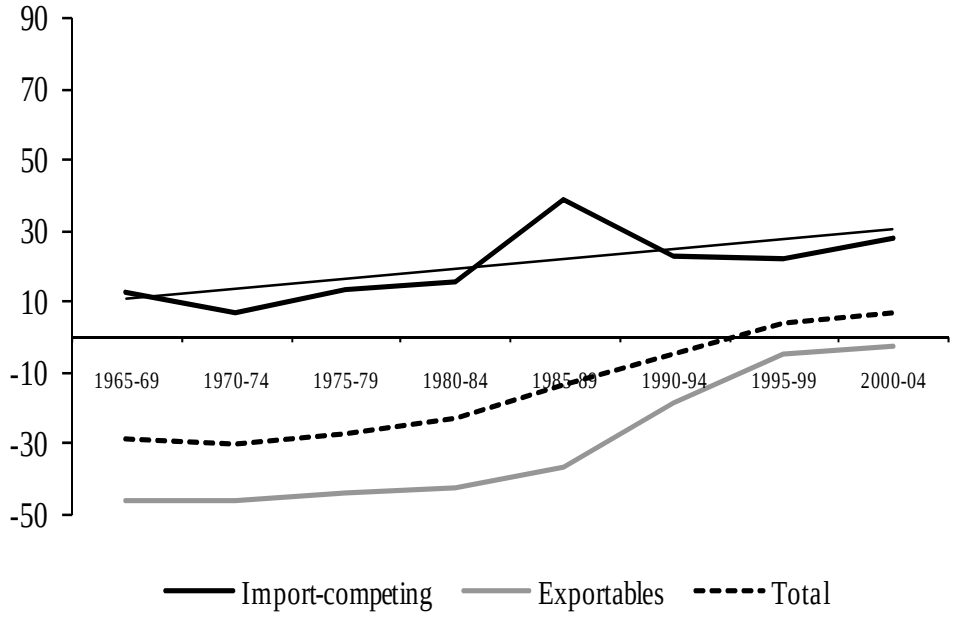


Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

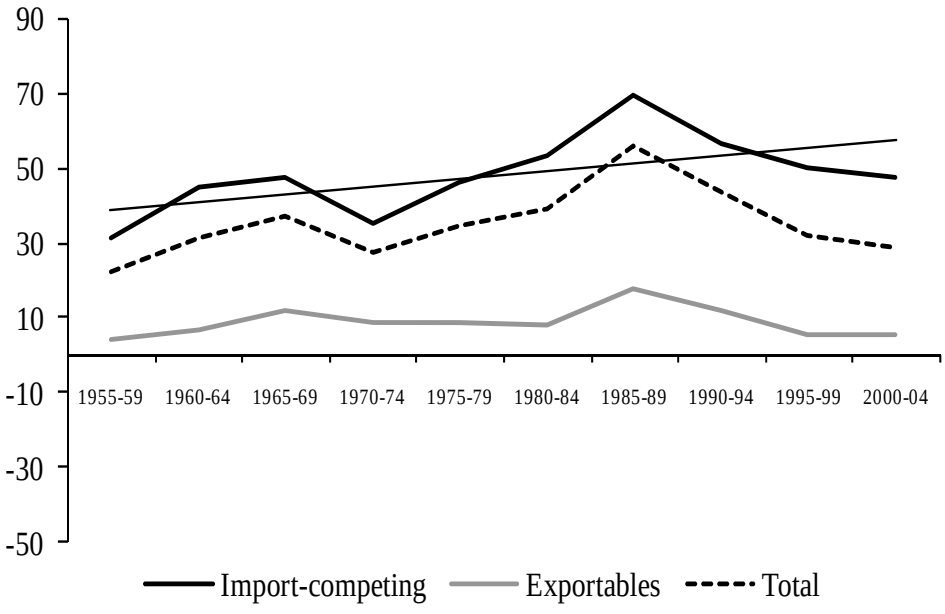
Figure 7: Nominal rates of assistance to exportable, import-competing and all covered agricultural products,[a] high-income and developing countries, 1955 to 2004

(percent)

(a) Developing countries



(b) High-income countries plus Europe's transition economies

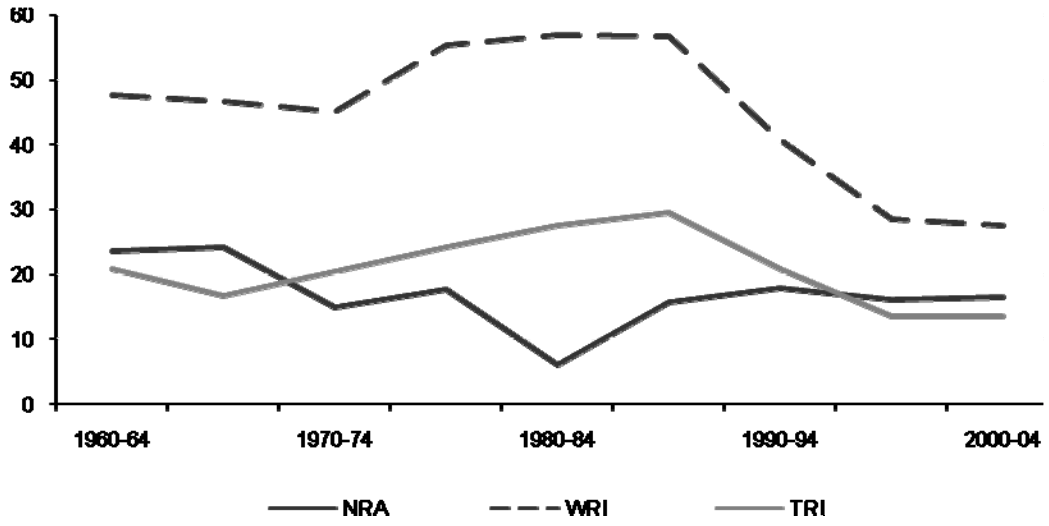


[a] Covered products only. The total also includes nontradables.

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

Figure 8: Nominal Rate of Assistance and Trade and Welfare Reduction Indexes for covered tradable farm products, world, 1960 to 2007

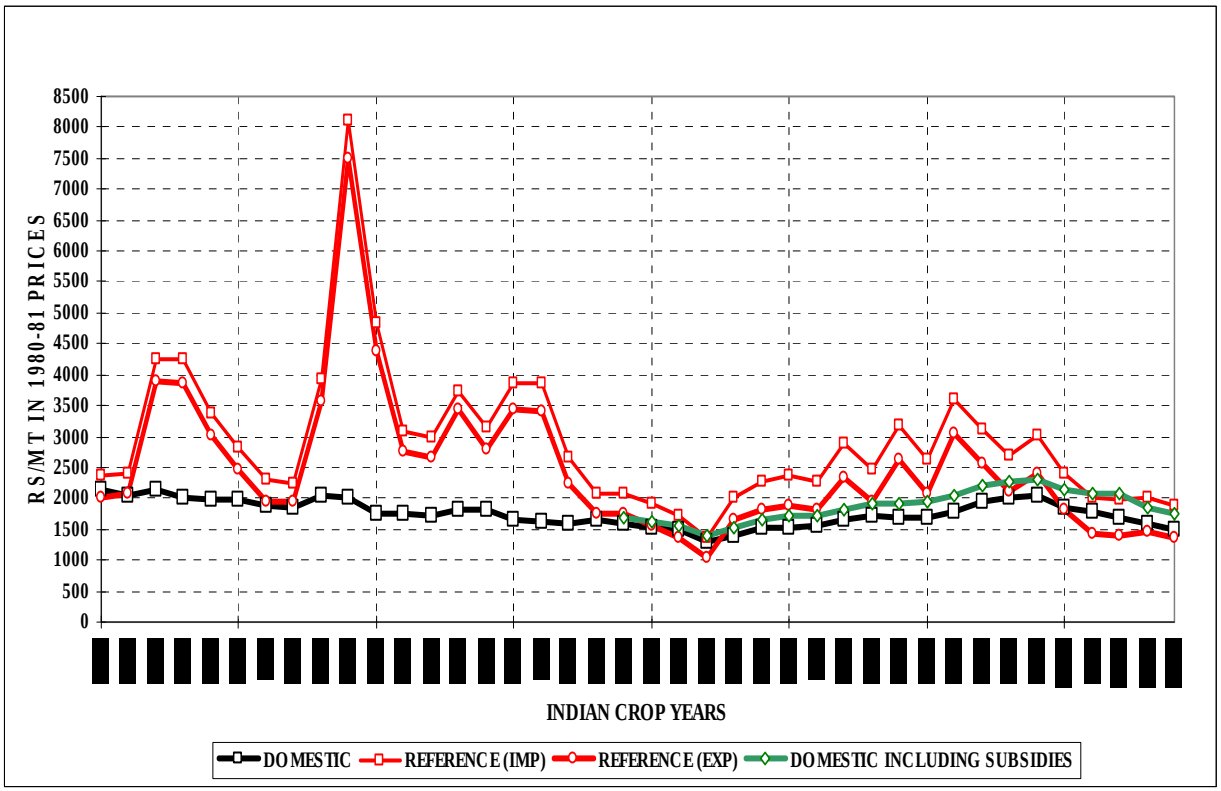
(percent)



Source: Authors' calculations based on NRAs and CTEs in Anderson and Valenzuela (2008).

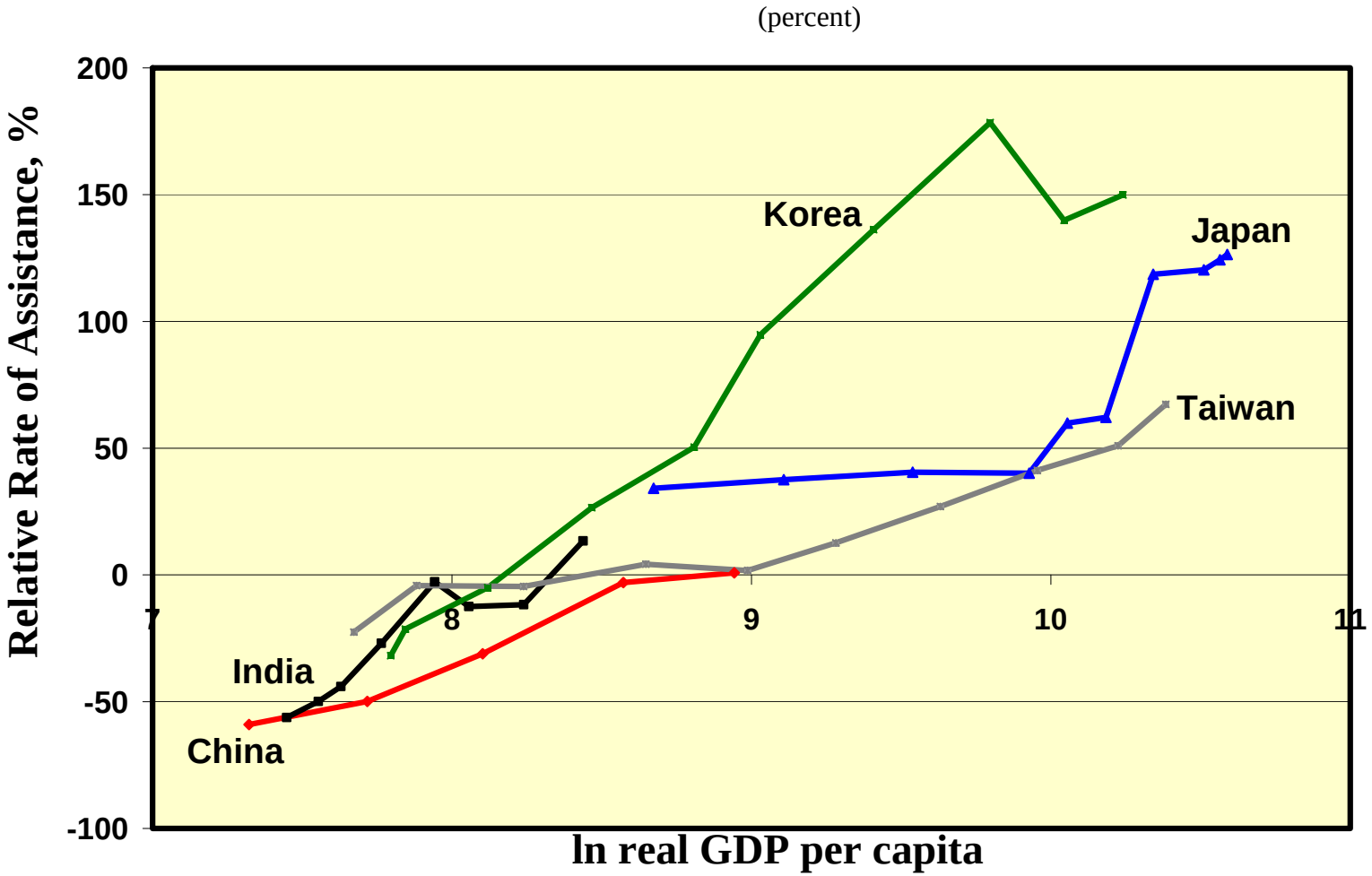
Figure 9: Real domestic producer and international reference prices for rice, India, 1965 to 2004

(Rs/tonne in 1981 prices)



Source: Pursell, Gulati and Gupta (2009).

Figure 10: RRAs and log of real per capita GDP, India and Northeast Asian focus economies, 1955[a] to 2005



[a] From only 1965 for India and 1981 for China.
Source: Authors' derivation based on RRAs in Anderson and Valenzuela (2008).

Table 1: Key economic and trade indicators of focus countries, by region, 2000–04

	Share (%) of world:				National relative to world (world=100)			Agric trade special-ization index[b]
	Pop'n	Total GDP	Agric GDP	Agric worker	GDP per capita	Ag land per capita	RCA,[a] agric & food	
Africa	10	1	6	11	14	148	na	na
Asia	51	10	37	73	20	34	80	-0.03
Latin America	8	5	8	3	64	171	na	na
Europe and Central Asia	7	4	6	3	48	178	na	na
Western Europe	6	29	16	1	454	46	106	-0.03
United States and Canada	5	33	11	0.3	636	186	119	0.08
Australia and New Zealand	0.4	2	2	0.1	405	2454	354	0.62
Japan	2	13	5	0.2	610	5	12	-0.84
All focus countries	90	96	91	92	na	na	na	na
Other (non-focus) developing and transition economies	10	4	9	8	na	na	na	na

Source: Sandri, Valenzuela and Anderson (2007), compiled mainly from World Bank (2007) and FAO (2007).
a. Revealed comparative advantage index is the share of agriculture and processed food in national exports as a ratio of that sector's share of global exports.
b. Primary agricultural trade specialization index is net exports as a ratio of the sum of exports and imports of agricultural and processed food products (world average =0.0).

Table 2: Nominal rates of assistance to agriculture,[a] focus countries, 1955 to 2007[c]

(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Africa	-14	-8	-11	-15	-13	-8	-1	-9	-6	-7	na
Asia	-27	-27	-25	-25	-24	-21	-9	-2	8	12	na
Latin America	-11	-8	-7	-21	-18	-13	-11	4	6	5	na
Europe and Central Asia[b]	na	na	na	na	na	na	na	10	18	18	25
Western Europe	44	57	68	46	56	74	82	64	44	37	18
United States and Canada	13	11	11	7	7	13	19	16	11	17	11
Australia and New Zealand	6	7	10	8	8	11	9	4	3	1	2
Japan	39	46	50	47	67	72	119	116	120	120	81
Developing countries	-26	-23	-22	-24	-22	-18	-8	-2	6	9	na
High-income countries	22	29	35	25	32	41	53	46	35	32	17
All focus countries (wted. average):	3	5	6	0	2	5	17	18	17	18	na

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

a. Weighted average for each country, including non-product specific assistance as well as authors' guesstimates for non-covered farm products (but not decoupled assistance), with weights based on gross value of agricultural production at undistorted prices. Estimates for China pre-1981 and India pre-1965 are based on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those countries for 1981-84 and 1965-69, 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 1981-84 and 1965-69, respectively. Developing country and world aggregates are computed accordingly.

[b] ECA countries are not included in the high-income or developing country aggregates.

Table 3: Nominal rates of assistance to agricultural and nonagricultural tradables, and the RRA,[a] by region, 1955 to 2007

(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Africa											
NRA agric.	na	-13.3	-19.6	-25.0	-22.1	-13.5	-0.3	-15.4	-8.7	-12.0	na
NRA non-agric.	na	3.7	2.7	1.5	5.7	1.6	9.2	2.7	2.0	7.3	na
RRA	na	-15.2	-21.4	-26.0	-25.9	-13.1	-8.3	-17.1	-10.4	-18.0	na
Latin America											
NRA agric.	na	-11.4	-9.3	-23.0	-19.0	-12.9	-11.2	4.4	5.5	4.9	na
NRA non-agric.	na	26.9	31.3	27.8	23.3	18.5	16.8	7.3	6.6	5.4	na
RRA	na	-30.2	-30.9	-39.8	-34.2	-26.6	-24.0	-2.7	-1.0	-0.5	na
South Asia[b]											
NRA agric.	na	4.1	4.4	9.7	-7.7	1.8	47.1	0.2	-2.4	12.7	na
NRA non-agric.	na	114.4	117.8	81.7	57.8	54.6	39.9	18.6	15.0	10.1	na
RRA	na	-51.5	-51.9	-39.8	-41.6	-33.3	5.1	-15.5	-14.9	3.4	na
China and Southeast Asia[b]											
NRA agric.	na	-43.6	-42.6	-40.1	-35.7	-34.5	-27.8	-12.0	4.9	7.1	na
NRA non-agric.	na	36.5	36.5	33.7	30.8	20.6	23.3	19.8	9.6	5.5	na
RRA	na	-58.7	-58.0	-55.2	-50.8	-43.4	-41.6	-26.4	-4.2	1.5	na
Japan, Korea and Taiwan											
NRA agric.	30.1	39.9	48.8	51.3	75.5	78.8	124.3	129.9	130.5	138.1	126.1
NRA non-agric.	8.6	8.3	6.1	4.2	3.5	2.4	2.5	1.4	1.1	0.6	1.0
RRA	19.7	29.1	40.2	44.9	69.6	74.6	118.7	126.7	128.1	136.7	123.7
European transition econs.											
NRA agric.	na	na	na	na	na	na	na	10.0	18.3	16.1	17.0
NRA non-agric.	na	na	na	na	na	na	na	9.8	5.5	4.6	2.7
RRA	na	na	na	na	na	na	na	0.1	12.2	11.0	13.9
Western Europe											
NRA agric.	43.8	57.0	67.5	45.7	56.3	74.4	82.0	63.4	43.6	36.8	18.5
NRA non-agric.	8.0	7.2	5.7	3.8	2.5	1.5	1.7	1.3	1.5	1.4	1.2
RRA	33.1	46.5	58.6	40.4	52.6	71.9	79.0	61.3	41.5	34.9	17.1
North America											
NRA agric.	12.5	10.5	10.9	7.5	7.6	13.8	20.2	16.1	11.4	17.3	11.2
NRA non-agric.	6.1	7.4	7.4	5.5	4.1	3.8	3.7	3.3	2.1	1.5	1.3
RRA	6.0	2.9	3.3	1.8	3.4	9.7	15.8	12.4	9.1	15.5	9.7
ANZ											
NRA agric.	5.5	6.6	8.3	7.9	7.3	10.6	8.7	4.3	2.9	1.0	0.6
NRA non-agric.	20.0	21.5	24.0	19.7	14.3	13.5	10.3	6.4	3.4	2.4	2.4
RRA	-12.1	-12.2	-12.6	-9.9	-6.1	-2.6	-1.5	-2.0	-0.5	-1.4	-1.8
Developing countries[b]											
NRA agric.	na	-24.0	-27.3	-31.9	-25.5	-21.0	-15.6	-3.9	4.0	7.4	na
NRA non-agric.	na	58.3	60.0	45.8	37.3	34.6	27.0	16.7	9.8	6.3	na
RRA	na	-52.0	-54.5	-53.3	-45.8	-41.3	-33.6	-17.6	-5.3	1.1	na
High-income countries											
NRA agric.	23.0	30.9	36.8	26.5	34.7	43.0	55.5	48.2	36.6	33.9	18.3
NRA non-agric.	7.5	8.5	7.7	5.4	3.6	3.4	3.2	2.5	1.7	1.3	-0.7
RRA	14.3	20.6	27.1	19.9	30.1	38.3	50.6	44.6	34.3	32.1	19.2
World[b]											
NRA agric.	na	5.6	7.6	0.8	2.6	5.7	18.7	19.7	18.4	18.6	na
NRA non-agric.	na	19.0	20.5	16.1	13.7	10.0	9.8	7.6	6.0	4.0	na
RRA	na	-11.3	-10.7	-13.2	-9.8	-3.6	8.1	11.3	11.8	14.0	na

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

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

b. Estimates for the RRA for China pre-1981 and India pre-1965 are based on the assumption that the agricultural NRAs in those years were the same as the average

NRA estimates for those countries for 1981-84 and 1965-69, respectively, and that the value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively. Developing and world country aggregates are computed accordingly.

Table 4: Dispersion of nominal rates of assistance across covered agricultural products,[a] focus regions, 1965 to 2007 (percent)

	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Africa	31	30	37	36	36	31	25	25	na
Asia	56	42	49	53	66	56	57	64	na
Latin America	49	44	52	52	44	42	32	40	na
Europe and Central Asia	34	33	41	26	39	56	39	45	44
Western Europe	119	85	112	98	122	86	69	74	64
United States and Canada	29	15	31	62	71	39	31	37	28
Australia and New Zealand	40	45	26	17	20	14	12	7	5
Japan	69	82	156	143	175	162	136	143	116
All focus countries (wted. average)	54	45	55	51	59	53	43	48	na
Product coverage [b]	68	70	71	73	*73*	*72*	*71*	*68*	*70*

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

a. Dispersion for each region is a simple average of the country-level annual standard deviations around a weighted mean of NRAs per country across covered products each year.

b. Share of gross value of total agricultural production at undistorted prices accounted for by covered products.

Table 5: Nominal rates of assistance to agricultural exportables, import-competing products, and the trade bias index,[a] focus regions, 1955 to 2007

(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-07
Africa											
NRA agric. exportables	na	-30.1	-38.4	-42.6	-42.6	-35.0	-36.7	-35.8	-26.1	-24.6	na
NRA agric. imp-comp	na	18.6	11.8	1.9	14.5	13.2	58.3	5.2	9.8	1.6	na
Trade Bias Index	na	-0.41	-0.45	-0.44	-0.50	-0.43	-0.60	-0.39	-0.33	-0.26	na
Latin America											
NRA agric. exportables	na	-20.4	-12.8	-27.0	-25.2	-27.1	-25.0	-10.5	-3.5	-4.6	na
NRA agric. imp-comp	na	26.3	8.7	-2.8	1.1	13.6	5.1	19.4	12.5	20.6	na
Trade Bias Index	na	-0.37	-0.20	-0.25	-0.26	-0.36	-0.29	-0.25	-0.14	-0.21	na
South Asia[c]											
NRA agric. exportables	na	-37.5	-37.2	-30.0	-36.1	-27.9	-20.6	-15.8	-12.0	-6.2	na
NRA agric. imp-comp	na	39.2	41.2	39.4	45.1	37.9	63.3	25.1	14.5	26.5	na
Trade Bias Index	na	-0.55	-0.56	-0.50	-0.56	-0.48	-0.51	-0.33	-0.23	-0.26	na
China and Southeast Asia[c]											
NRA agric. exportables	na	-55.5	-55.1	-51.8	-50.1	-50.0	-41.0	-20.8	-2.2	0.1	na
NRA agric. imp-comp	na	-10.3	-8.9	-9.4	-2.6	0.5	15.1	3.3	13.3	12.3	na
Trade Bias Index	na	-0.50	-0.51	-0.47	-0.49	-0.50	-0.49	-0.23	-0.14	-0.11	na
Japan, Korea and Taiwan											
NRA agric. exp	-18.1	5.7	4.3	15.4	10.3	25.1	48.9	57.1	57.0	70.3	na
NRA agric. imp-comp	35.6	43.3	52.8	54.1	76.6	83.7	124.9	127.4	127.0	134.6	122.6
Trade Bias Index	-0.40	-0.26	-0.32	-0.25	-0.38	-0.32	-0.34	-0.31	-0.31	-0.27	na
European transition econs.											
NRA agric. exportables	na	na	na	na	na	na	na	-3.2	-1.0	-1.0	15.2
NRA agric. imp-comp	na	na	na	na	na	na	na	32.5	35.4	35.7	32.3
Trade Bias Index	na	na	na	na	na	na	na	-0.27	-0.27	-0.27	-0.13
Western Europe											
NRA agric. exp	9.3	17.4	31.7	22.5	33.3	31.1	50.1	38.0	15.0	8.1	1.7
NRA agric. imp-comp	59.4	77.2	82.9	55.7	61.7	79.5	87.6	67.2	52.8	50.5	28.9
Trade Bias Index	-0.31	-0.34	-0.28	-0.21	-0.18	-0.27	-0.20	-0.17	-0.25	-0.28	-0.21
North America											
NRA agric. exportables	2.7	2.8	6.1	5.1	2.9	5.4	10.5	6.0	5.4	7.6	4.1
NRA agric. imp-comp	8.6	9.3	8.8	6.7	10.5	19.7	23.6	18.6	11.3	16.8	11.0
Trade Bias Index	-0.05	-0.06	-0.02	-0.01	-0.07	-0.11	-0.10	-0.10	-0.05	-0.08	-0.06
ANZ											
NRA agric. exportables	3.8	4.7	6.6	5.8	5.5	7.6	6.5	3.6	2.2	0.2	0.2
NRA agric. imp-comp	7.9	8.3	9.3	11.7	8.7	8.4	6.5	3.8	2.0	2.0	1.5
Trade Bias Index	-0.04	-0.03	-0.02	-0.05	-0.03	-0.01	0.00	0.00	0.00	-0.02	-0.01
Developing countries[c]											
NRA agric. exportables	na	-46.5	-44.6	-45.4	-43.9	-41.4	-35.8	-18.7	-5.5	-3.0	na
NRA agric. imp-comp	na	12.7	13.5	7.8	12.8	16.5	37.7	22.6	22.0	23.0	na
Trade Bias Index	na	-0.53	-0.51	-0.49	-0.50	-0.50	-0.53	-0.34	-0.23	-0.21	na
High-income countries											
NRA agric. exportables	4.2	7.4	13.5	10.3	11.3	12.1	22.3	15.9	8.1	6.9	2.9
NRA agric. imp-comp	31.2	45.9	50.2	36.5	47.4	58.1	71.4	62.4	53.9	50.7	30.8
Trade Bias Index	-0.21	-0.26	-0.24	-0.19	-0.24	-0.29	-0.29	-0.29	-0.30	-0.29	-0.21
World [c]											
NRA agric. exportables	na	-23	-20	-23	-25	-24	-17	-7	-1	0	na
NRA agric. imp-comp	na	35	37	27	34	38	57	43	38	36	na
Trade Bias Index	na	-0.43	-0.42	-0.39	-0.44	-0.45	-0.47	-0.35	-0.28	-0.26	na

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

a. NRAs for non-covered products are included here (unlike in Figure 1.3).

b. Trade Bias Index, TBI = $(1+NRAag_x/100)/(1+NRAag_m/100) - 1$, where $NRAag_x$ and $NRAag_m$ are the weighted average percentage NRAs for the exportable and import-competing parts of the agricultural sector, with weights based on production valued at

undistorted prices. TBIs shown here are calculated using the regional 5-year averages of $NRAag_x$ and $NRAag_m$.

c. Estimates for China pre-1981 and India pre-1965 are based on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those countries for 1981-84 and 1965-69, 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 1981-84 and 1965-69, respectively. The developing country and world averages are computed accordingly.

Table 6: Deviation of national NRA around its trend value,[a] 12 key covered farm products,[b] developing, high-income and all focus countries, 1965-84 and 1985-2004

(NRA percentage points)

	Developing countries		High-income countries		All focus countries	
	1965-1984	1985-2004	1965-1984	1985-2004	1965-1984	1985-2004
Grains, oils, sugar						
Rice	32	64	66	229	37	103
Wheat	33	47	80	91	56	65
Maize	36	33	53	58	43	41
Soybean	46	117	75	61	56	94
Sugar	53	66	179	173	132	116
Tropical cash crops						
Cotton	38	33	42	28	35	32
Coconut	22	20	na	na	22	20
Coffee	41	27	na	na	41	27
Livestock products						
Milk	76	69	239	190	200	137
Beef	45	52	128	127	101	93
Pigmeat	81	60	92	77	90	62
Poultry	109	74	164	197	145	134

[a] Deviation is computed as the absolute value of (residual – trend NRA) where trend NRA in each of the two sub-periods is obtained by regressing NRA on time.

[b] Unweighted average of national deviations.

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

Table 7: Coefficient of correlation between regional NRA and international price, 12 key covered farm products,[a] various regions, 1965 to 2007

	Africa	South Asia	South East Asia and China	Latin America	High-income countries	All focus countries[b]
Grains, oils, sugar						
Rice	-0.19	-0.58	-0.51	-0.52	-0.10	-0.16 (0.99)
Wheat	0.01	-0.81	0.09	-0.12	-0.28	-0.41 (0.85)
Maize	-0.20	-0.70	-0.55	-0.04	-0.29	-0.57 (0.71)
Soybean	-0.15	-0.42	0.16	-0.27	-0.07	-0.18 (0.30)
Sugar	-0.57	-0.74	-0.57	-0.40	-0.69	-0.70 (0.99)
Tropical cash crops						
Cotton	0.28	-0.33	-0.16	-0.29	-0.74	-0.57 (0.96)
Coconut	na	-0.16	-0.14	na	na	-0.12 (0.99)
Coffee	-0.35	na	0.02	-0.30	na	-0.28 (0.99)
Livestock products						
Milk	0.19	-0.57	-0.70	0.33	-0.10	-0.31 (0.98)
Beef	0.20	na	0.05	0.55	0.29	0.32 (0.97)
Pigmeat	na	na	-0.53	-0.47	-0.60	-0.76 (0.98)
Poultry	0.59	na	-0.52	-0.78	-0.22	-0.34 (0.87)

[a] Computed using the weighted average regional NRAs and a common international reference price for each product, from World Bank (2008).

[b] Numbers in parantheses are the coefficient of correlation between the unweighted average regional NRAs and CTEs for individual covered products. For all covered products the coefficient is 0.93.

Source: Authors' derivation, using data in Anderson and Valenzuela (2008).

Table 8: Contributions to total agricultural NRA from different policy instruments,[a] by region, 1981-84 and 2000–04
(percent)

	1981-84			2000-04		
Border measures	All developing countries	High-income countries	All focus countries	All developing countries	High-income countries	All focus countries
Import tax equivalent	6	34	18	8	24	14
Export subsidies	1	2	2	1	1	2
Export tax equivalent	-20	0	-13	-3	0	-2
Import subsidy equivalent	-2	0	-2	-1	0	-1
ALL BORDER MEASURES	**-15**	**36**	**5**	**5**	**25**	**13**
Domestic measures						
Production subsidies	1	2	1	1	1	1
Production taxes	-5	0	-3	-1	0	-1
Net subsidies to farm inputs	1	3	2	2	2	2
Non-product-specific assistance (except to inputs)	1	1	1	2	5	3
ALL DOMESTIC PRODUCTION SUPPORTS	**-2**	**6**	**1**	**4**	**8**	**5**
Decoupled payments to farm households	0	6	2	0	11	4
NRA (including decoupled payments)	**-17**	**48**	**8**	**9**	**44**	**22**
Gross subsidy equivalent, in real 2000 US$ billion	***-113***	***223***	***99***	***58***	***173***	***250***
Agric R&D as % of undistorted gross value of prod'n	*0.4*	*0.8*	*0.6*	*0.3*	*1.0*	*0.5*

[a] In the absence of data, we assume the share of input tax/subsidy, domestic production tax/subsidy and border tax/subsidies for non-covered farm products is the same as that for covered farm products. The first period begins in 1981 because that was the first year for which estimates for China are available.

[b] All table entries have been generated by dividing the Gross Subsidy Equivalent of all (including decoupled) measures by the total agricultural sector's gross production valued at undistorted prices.

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008) and agricultural research expenditure data from the CGIAR's Agricultural Science and Technology Indicators website at www.asti.cgiar.org (accessed October 2008).

Table 9: Contributions to CTE on covered agricultural products from different policy instruments, by region, 1981-84[a] and 2000–04

(percent)

	1981-84			2000-04		
	All developing countries	High-income countries	All focus countries	All developing countries	High-income countries	All focus countries
Border measures						
Import tax equivalent	10	46	24	10	32	19
Export subsidies	1	2	1	1	1	2
Export tax equivalent	-22	0	-13	-2	0	-2
Import subsidy equivalent	-3	0	-2	-1	0	-1
ALL BORDER MEASURES	**-14**	**48**	**10**	**8**	**33**	**18**
Domestic measures						
Consumption subsidies	-1	0	-1	-1	-6	-3
Consumption taxes	0	0	0	1	0	1
ALL DOMESTIC CONSUMPTION MEASURES	**-1**	**0**	**-1**	**0**	**-6**	**-2**
TOTAL CTE (covered farm products only)	**-15**	**48**	**9**	**8**	**27**	**16**
Consumer tax equivalent, in real 2000 US$ billion	***-67***	***146***	***73***	***34***	***79***	***125***

[a] This period begins in 1981 because that was the first year for which estimates for China are available.

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008).

Table 10: Contribution to change in RRA since 1984 of NRA for non-farm tradables, by region

(percent)

	Estimated RRA	*Estimated RRA*	*Counter-factual RRA*[a]	*Proportion of RRA change since 1984 due to change in NRA non-ag*
	1960-84	2000-04	2000-04	
Africa	-25.0	-18.0	-17.4	-0.08
LAC	-30.6	-0.5	-15.0	0.48
South Asia[b]	-47.1	3.4	-42.8	0.91
SE Asia + China[b]	-56.7	1.5	-20.9	0.38
Japan, Korea, Taiwan	40.7	136.7	124.3	0.13
Western Europe	46.2	34.9	29.8	-0.46
North America	3.5	15.5	10.5	0.41
Australia/New Zealand	-10.6	-1.4	-15.8	1.57
Developing countries (incl Korea and Taiwan[b]	-47.3	3.1	-22.5	0.51
High-income countries	22.4	32.1	25.7	0.66

[a] The counterfactual RRA is the RRA computed using the 2000-04 NRA for agriculture and the 1960-84 NRA for non-agriculture.
[b] Regional aggregate includes back-casting, which means estimates for China pre-1981 and India pre-1965 are based on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those countries for 1981-89 and 1965-74, 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 1981-89 and 1965-74, respectively.

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008).

Table 11: OLS regression results to explain national average agricultural NRAs, all focus countries, 1955 to 2007

Log(real GDP per capita)	0.207***	-0.943***	-0.943***	-0.989***
	(0.00535)	(0.0614)	(0.0558)	(0.0682)
Log(real GDP per capita) sq.		0.0741***	0.0743***	0.0765***
		(0.00395)	(0.00359)	(0.00432)
Log(Arable land per capita)			-0.204***	-0.211***
			(0.00851)	(0.00931)
TSI,[a] non-farm primary products				0.0508***
				(0.0165)
Constant	-1.356***	2.875***	2.593***	2.805***
	(0.0422)	(0.229)	(0.208)	(0.260)
Observations	2584	2584	2551	2095
Adjusted R^2	0.366	0.442	0.552	0.540

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

[a] Trade Specialization Index = net exports divided by exports plus imports of non-farm primary products.

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008).

Table 12: OLS regression results to explain national average RRAs, focus countries by region, 1955 to 2007

	Asia	Africa	Latin America	High-income countries	All focus countries
Log (Real GDP per capita)	-1.847***	-0.481***	-1.634***	-1.871*	-0.713***
	(0.160)	(0.185)	(0.371)	(1.103)	(0.0657)
Log (Real GDP per capita), sq.	0.157***	0.0448***	0.112***	0.122**	0.0627***
	(0.0114)	(0.0143)	(0.0241)	(0.0580)	(0.00418)
Log(Arable land per capita)	-0.100***	-0.0170	-0.215***	-0.309***	-0.228***
	(0.0236)	(0.0172)	(0.0180)	(0.0179)	(0.00933)
Constant	4.894***	0.948	5.463***	6.897	1.382***
	(0.558)	(0.597)	(1.407)	(5.245)	(0.250)
Observations	405	619	295	872	2336
Adjusted R-squared	0.720	0.069	0.329	0.415	0.592

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.10

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008).

Table 13: Impact of including predicted non-focus NRAs[a] on developing country NRA estimates,[b] 2000-04

(percent)

	Share of focus countries in regional agric output[b]	Share of region in global agric output[b]	Predicted non-focus countries[a] NRA	Focus countries estimated NRA	All countries NRA[e]
	(1)	(2)	(3)	(4)	(5)
SSAfrica + Egypt[c]	92	6	-32	-7	-9
Asia	98	37	-14	12	11
Latin America	80	10	-7	5	3
M. East & N. Africa[d]	0	3	11	na	11
All developing (incl. Turkey)	91	55	-1	9	8

[a] Predictions are generated using the NRA counterparts to the RRA regressions in table 12 above. The aggregate developing country NRA is a weighted average, with weights based on shares in column 2 times 100 minus the shares in column 1.

[b] Weighted averages, using farm production valued at undistorted prices as weights.

[c] The Sub-Saharan African prediction is based on regression results for all focus African countries except South Africa and Egypt.

[d] The focus countries used for predicting the NRA for the developing countries of the MENA region (excl. Egypt) comprises all developing countries including Turkey. The MENA countries for which pertinent data are available are Algeria, Iran, Iraq, Jordan, Lebanon, Libya, Morocco, Oman, Syria, Tunisia and Yemen.

[e] Weighted average of columns 3 and 4, with weights based on shares in column 1.

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008).

Table 14: Product level regressions, 12 key covered products and all focus countries, 1955 to 2007

	Log(Real GDP per capita)	Log(Real GDP per capita) sq.	Log(Arable land per capita)	Exportable dummy[a]	Constant	No. of obs.[a]	Adjusted R^2
Rice	-2.014***	0.156***	-0.392***	-0.727***	5.946***	1281	0.50
	(0.154)	(0.0100)	(0.0222)	(0.0453)	(0.570)		
Wheat	-0.895***	0.0689***	-0.162***	-0.397***	2.730***	1661	0.33
	(0.117)	(0.00735)	(0.0161)	(0.0369)	(0.458)		
Maize	-0.419***	0.0325***	-0.166***	-0.194***	1.261***	1525	0.20
	(0.0943)	(0.00606)	(0.0146)	(0.0294)	(0.356)		
Soybean	0.959***	-0.0425**	-0.548***	-0.127	-5.239***	703	0.31
	(0.344)	(0.0212)	(0.0368)	(0.0892)	(1.365)		
Sugar	-0.925***	0.0781***	-0.239***	-0.450***	2.833***	1648	0.31
	(0.193)	(0.0123)	(0.0277)	(0.0601)	(0.727)		
Cotton	-0.358***	0.0314***	0.00620	-0.276***	0.997***	883	0.23
	(0.0925)	(0.00625)	(0.0164)	(0.0442)	(0.325)		
Milk	-0.879***	0.0844***	-0.356***	-0.401***	1.962	1389	0.32
	(0.301)	(0.0184)	(0.0322)	(0.0847)	(1.203)		
Beef	-0.763***	0.0667***	-0.280***	-0.317***	1.771**	1426	0.43
	(0.205)	(0.0122)	(0.0194)	(0.0467)	(0.849)		
Pigmeat	1.406***	-0.0716***	-0.313***	0.190***	-6.754***	1213	0.28
	(0.211)	(0.0125)	(0.0186)	(0.0445)	(0.885)		
Poultry	-1.693***	0.118***	-0.485***	-0.307***	5.785***	1304	0.29
	(0.351)	(0.0209)	(0.0301)	(0.0795)	(1.460)		

[a] Observations are included only in years when the product is tradable. The constant coefficient refers to importables whereas for exportables the coefficient on the exportables dummy needs to be added to that coefficient for the constant.

Source: Authors' derivation, using distortion data in Anderson and Valenzuela (2008).