Food price and trade policy biases: inefficient, inequitable, yet not inevitable

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April 2012

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Thanks are due to the editor for helpful comments, to Signe Nelgen for empirical research assistance and to the Australian Research Council and Rural Industries Research and Development Corporation for financial support. To be published in the Handbook on Food, Politics and Society, edited by R.J. Herring, London and New York: Oxford University Press, 2012 (forthcoming).
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Farm subsidies have been prevalent on both side of the North Atlantic for decades. Despite their high budgetary cost, society seems willing to tolerate them. Some think of it as justice for those left behind in rural areas by modern urban-based economic growth. Others (most notably in France) see it as a way of preserving the quaint peasant lifestyle they or their forebears left when they moved to the city. It is also argued that such policies help farmers preserve the natural environment in rural areas, provide food security for the nation, and (in countries such as Norway) help to populate and retain social vitality in remote areas.

Laudable though those societal objectives may be, they could be achieved far more effectively and efficiently by direct measures than by farm subsidies. Since that has been demonstrated by many economists (including this one, see Anderson 2000), the arguments won’t be repeated here. Instead, this chapter seeks to show that farm subsidies are just the tip of a huge iceberg of governmental distortions to food markets in high-income countries. Those distortions are predominantly the result of trade policies which, even more than direct subsidies, are not only ineffective and inefficient but are also adding to global inequality and poverty.

Moreover, those policies of high-income countries are only half the problem. The other half comes from governmental distortions to markets for food and other farm products in developing countries. For many decades the latter policies have taxed rather than supported farmers, but an anti-agricultural policy bias can be just as inefficient and inequitable as a pro-farmer policy bias.

Pervasive though these policy biases seem to have been, they are not unchanging. On the contrary, new data reveal that they have evolved in fairly systematic ways as national economies have developed over the past half century. The challenge is to harness that capacity for change and direct it toward growth-inducing policy reforms and institutional innovations that also reduce inequality and poverty and thereby enhance global food security.
The chapter begins by briefly summarizing the history of thought on the role of agriculture in economic development. It then presents evidence from a new study of the evolution of price-distorting policies in both high-income and developing countries. That new empirical study covers 75 countries that account for more than 90 percent of world’s population and agricultural output. It reveals that, among the high-income countries, some have been able to rid themselves of farm subsidies, and some have at least changed their key policy measures to less-inefficient and less-inequitable forms of support. Among developing countries, much of the earlier anti-agricultural bias has been phased out over the past quarter-century. A worrying sign, however, is that agricultural protection has begun to emerge as the more-advanced of those emerging economies industrialize. The third section reports on both the contribution of agriculture to the current global welfare cost of distortions to farm and nonfarm goods markets, and the impact of those distortionary policies on income inequality and poverty. The chapter concludes with an assessment of what might evolve in coming decades, of the alternative measures available for dealing with the perceived problems associated with agriculture’s changing role in economic development, and of their potential for reducing inequality and poverty and enhancing global food security.

Agriculture’s perceived role in development

Post-World War II development economists had a dim view of the contribution that farmers made to modern economic growth. In contrast to the perceived advantages of manufacturing, agriculture was seen as a low-productivity, constant-returns-to-scale activity whose producers were not very responsive to incentives. In addition, the real international prices of farm products were known to be volatile and thought to be in permanent long-term decline (Singer 1950, Prebisch 1950). This led Prebisch and others to argue that developing countries should strive to diversify their economies and reduce their dependence on a small number of primary commodity exports. To do this, they encouraged developing countries to develop their manufacturing sectors through import-substituting industrialization aided by manufacturing protection policies (Prebisch 1959). A corollary to this was the taxation of agricultural exports which, like import tariffs on manufactures, had the perceived additional benefit of raising government revenue in settings where there were still very high costs associated with collecting income or consumption taxes. Agricultural production also was effectively taxed
through requiring farmers to deliver some of their crop to para-statal agencies who paid them below-market prices. Meanwhile, agricultural development economists such as Johnston and Mellor (1961) saw the farm sector’s contributions mainly as a market for manufactures and as a supplier of low-wage labor to non-farm sectors. This view drew on Arthur Lewis’s (1954) closed-economy model, which assumed unlimited supplies of agricultural labor.

An assumption implicit in much of this early thinking was that farmers were not very responsive to price incentives. This assumption was first challenged by T.W. Schultz (1964). He argued that farmers in developing countries were ‘poor but efficient’. He believed that farm output would respond positively to improved incentives, and suggested there would be high returns from removing price distortions and boosting public investment in rural public goods, both physical (e.g. transport and communications infrastructure) and human (e.g. rural health and education, agricultural R&D).

Over time this Schultzian view was embraced, especially as and when economists and then policy makers came to understand the high cost of an anti-agricultural, anti-trade, import-substituting industrialization strategy. By the late 1960s, comprehensive empirical evidence of the huge extent of the distortions to incentives associated with manufacturing protectionism in developing countries had emerged (Little, Scitovsky and Scott 1970, Balassa and Associates 1971). It was already clear that much-faster industrial and overall economic growth was occurring in the few cases where import-substituting industrialization had been replaced by a more open-economy strategy, notably in East Asia. Development economists gradually abandoned their former support for intervention in favor of freer trade and flexible exchange rates, but it took other developing countries a decade or more to heed those policy lessons – prodded from the early 1980s by loans from international financial institutions that were conditional on the adoption of structural adjustment programs.

Meanwhile, the densely populated East Asian economies, like Europe before them, worried that industrialization was eroding their former agricultural comparative advantages and causing farm household incomes to lag behind incomes in the rapidly growing cities. Their policy responses did not focus on ways of boosting farmer productivity; instead they focused on increasingly protecting farmers from import competition (Anderson, Hayami and Others 1986). This occurred despite the clear arguments and evidence presented by D. Gale Johnson in his seminal 1973 book, *World Agriculture in Disarray*, on the costly national economic folly and the international public ‘bads’ – in the form of lower and more volatile international agricultural prices – that such a policy development entails.
Evidence of evolving distortions to agricultural incentives

To gauge how changes in farmer incentives have evolved over time, a recent World Bank study compiled evidence from 75 countries and five decades of policy experience (Anderson and Valenzuela 2008, summarized in Anderson 2009). That study reports a nominal rate of assistance (NRA), defined as the percentage by which government policies have raised producer returns above what they would be without the government’s intervention (or the percentage by which government policies have lowered returns, if the NRA is less than zero). Since farmers are affected by the prices of not just their own outputs but also those of nonagricultural producers who compete with them in the common national markets for mobile labor and capital, the World Bank study also estimates a relative rate of assistance (RRA). The RRA is defined as the percentage by which government policies have raised prices of tradable farm products relative to prices received by producers of non-farm tradable products (most of which are manufactures).

Historically, national nominal rates of assistance to agriculture, and even more so relative rates of assistance, have tended to be higher the higher a country’s income per capita; and RRAs have tended to be negative for developing countries and positive for high-income countries (Anderson 1995). However, since the 1980s the anti-agricultural policy bias in developing countries and the pro-agricultural bias in high-income countries have diminished, so that the two groups’ average RRAs have converged towards zero from the mid-1980s (Figures 1 and 2). The extent and speed of that movement toward zero varies across regions though: among developing countries it has been greatest for Asia and least for Africa, and among high-income countries it has been greatest for the European Union and not at all for other Western Europe apart from the dip in the most recent period (2005-07) when international food prices rose steeply (Figure 3). Australia and New Zealand are exceptional in that they had an anti-agricultural policy bias for most of the 20th century: their manufacturing tariff protection exceeded agricultural supports. Both sectors’ distortions were reduced in the final third of that century and are now close to zero however, not unlike the average developing country (Anderson, Lloyd and MacLaren 2007).

Those averages hide the fact that there is still much variation across developing countries in both the level and rate of change in distortion indicators. National RRA estimates
for 2000-04 varied from around -50 percent for several African countries to nearly 150 percent for a few high-income countries (Figure 4).

Within the agricultural sector of each country, whether developed or developing, there is a wide range of product NRAs (Figure 5). 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).

An important aspect of that dispersion of NRAs is that the agricultural policy regime of each country still tends to have an anti-trade bias. This bias has declined over time for the developing country group, mainly because of cuts in agricultural export taxation and in spite of growth in agricultural import protection. For the high-income group, the anti-agricultural trade bias has shown a lesser decline over time (Figure 6), mainly because the rise and then decline in agricultural export subsidies has been matched by a similar trajectory for import protection.

The fall in assistance to producers of non-farm tradable goods has contributed to just over half the rise in the RRA for developing countries between 1960-84 and 2000-04. 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. Those interventions had all but disappeared by the mid-1990s, however, as part of overall macroeconomic policy reform initiatives.

The phasing out of export taxes by most developing countries, shown in Figure 6(a), is particularly striking. There have been some reversals of that policy reform in a few developing countries though, Argentina being the most important example. Meanwhile, with the growth in assistance to the agricultural import-competing sub-sector of developing countries (upper line in Figure 6(a)), the relative importance of import taxes has increased substantially (Figure 7).

In high-income countries, the growing use of somewhat-decoupled, more-direct income support measures by some high-income countries, and the virtual abolition of all support measures in Australia and New Zealand, contrast with the continuing dominance of border measures of support in East Asia’s high-income countries (Figure 8).

Yet even when decoupled payments are included in total support estimates, 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 globally. Hence
they account 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 (see also
Anderson, Martin and Valenzuela 2006). That is, domestic subsidies to or taxes on
agricultural outputs and inputs make only minor contributions. In particular, subsidies to farm
inputs, and support for public agricultural research, have added little to overall farmer
assistance in high-income countries and have done relatively very little in the past to offset
the effective taxation of agriculture in developing countries, with the important exception of
India (Anderson 2009, Ch. 10). Public agricultural research investments in 2000-04, for
example, amounted to less than 2 percent of the gross value of agricultural output at
undistorted prices in high-income countries and only 1 percent in developing countries
(Arndt 2009, Table 1.11), and similar shared in earlier decades. That is very minor
compared with the percentage NRAs delivered through national governments’ product price
distortions.

**Impacts of distortions on economic welfare, inequality and poverty**

Using the above estimates of price distortions, recent estimates have been made of the
impacts of past reforms and of remaining policies on their global welfare cost, and of the
impact of the current distortion pattern on income inequality and poverty. Consider first the
aggregate economic welfare effects.

**National and global economic welfare effects of price-distorting policies**

Valenzuela, van der Mensbrugghe and Anderson (2009) provide a combined retrospective
and prospective assessment of how far the world had come, and how far it still has to go, in
rectifying the disarray in world agriculture. That is, their economywide modeling exercise
seeks to quantify the impacts both of past reforms and of current policies. It does so by
comparing the effects of the recent World Bank project’s distortion estimates for the period
1980-84 with those of 2004, making use of the World Bank’s global Linkage model (van der
Mensbrugghe 2005) to estimate the effects on individual countries as well as on country
groups and the world as a whole.
Several key findings from that modeling study are worth emphasizing. First, the policy reforms from the early 1980s to the mid-2000s are estimated to have improved global economic welfare by $233 billion per year, and removing the distortions remaining as of 2004 would add another $168 billion per year. This suggests that in a global welfare sense the world moved three-fifths of the way towards global free trade in goods over that quarter century.

Second, developing countries benefited proportionately more than high-income economies (1.0 percent compared with 0.7 percent of national income) from those past policy reforms, and would gain nearly twice as much as high-income countries by completing that reform process (an average increase of 0.9 percent compared with 0.5 percent for high-income countries). Of those prospective welfare gains from global liberalization, 70 percent would come from agricultural and food policy reform. This is a striking result given that the shares of agriculture and food in global GDP and global merchandise trade are only 3 and 6 percent, respectively. The contribution of global farm and food policy reform to the prospective welfare gain for just developing countries is even slightly greater, at 72 percent.

Third, the share of global farm production exported (excluding intra-European Union trade) in 2004 has been slightly smaller as a result of those reforms since 1980-84, because of less farm export subsidies: the 8 per cent share of production exported for agriculture in 2004 contrasts with the 31 per cent share for other primary products and the 25 per cent for all other goods. If the policies distorting goods trade in 2004 were removed, the share of global production of farm products that is exported would rise from 8 to 13 per cent, thereby ‘thickening’ international food markets and thus reducing instability of international prices and the quantities of those products traded.

Fourth, the developing countries’ share of the world’s primary agricultural exports rose from 43 to 55 percent between 1980-84 and 2004, and its farm output share rose from 58 to 62 percent, because of those reforms, with rises in virtually all agricultural industries except rice and sugar. Removing remaining goods market distortions would boost their export and output shares to 64 and 65 percent, respectively. That is, the past and current pattern of price distortions means there has been far more farm production in high-income countries, and less in developing countries, than would have been the case without those distortionary policies in both sets of countries.

Fifth, for developing countries as a group, net farm income (value added in agriculture) is estimated to be 4.9 percent higher than it would have been without the reforms
of the past quarter century, which is more than ten times the proportional output gain for non-agriculture.

**Consequences for income inequality and poverty**

To assess the effects of the world’s agricultural and trade policies as of 2004 on income inequality and poverty within and between individual countries and country groups, Anderson, Valenzuela and van der Mensbrugghe (2010) also use the World Bank’s global Linkage model. Their results suggest that developing countries would gain nearly twice as much as high-income countries in welfare terms if 2004 agricultural and other trade policies were removed globally. In this broad conception of the world as just two large country groups, global trade reform would reduce international inequality. The results also indicate that net farm incomes in developing countries would rise by 5.6 percent, compared with 1.9 percent for non-agricultural value added, if those policies were eliminated. This suggests that inequality between farm and nonfarm households in developing countries would fall. By contrast, in high-income countries net farm incomes would fall by 15 percent on average, compared with a slight rise for real non-farm value added. That means inequality between farm households in developing countries and those in high-income countries would fall substantially. If only agricultural policies were removed, these results do not change much, which underscores the large magnitude of the distortions from agricultural, as compared with non-agricultural, trade-related policies. True, agricultural protection policies may lower the gap between average urban and rural household incomes, but the gains tend to get capitalized into the value of land and so they benefit farm households in proportion to their farm output and land holding – a highly inequitable outcome within rural areas (Johnson 1973, Ch. 9).

That study also reports that unskilled workers in developing countries – the majority of whom work on farms – would benefit most from reform (followed by skilled workers and then capital owners). The average change in the real unskilled wage across developing countries would rise by 3.5 percent. However, the most relevant consumer prices for poor people relate to food and clothing. This includes those many poor farm and other rural households who earn most of their income from their labor and are net buyers of food. Hence deflating by a food and clothing price index rather than the aggregate CPI provides a better indication of the welfare change for those workers. The real unskilled wage across developing countries would rise by 5.9 percent with that deflator. That is, inequality between
unskilled wage-earners and the much wealthier owners of capital (human or physical) within developing countries would fall with full trade reform. So too would the incidence of poverty: under the full merchandise trade reform scenario, there would be 2.7 percent fewer people living on less than US$1 a day in developing countries. Using the more moderate definition of poverty – people living on no more than US$2 per day – the number of poor in developing countries would fall by nearly 90 million compared to an aggregate baseline level of just under 2.5 billion in 2004, or by 3.4 percent.

Anderson, Cockburn and Martin (2010, 2011) report results from ten more-detailed individual country case studies and compare these with the above results from a global model. As with the global modeling, these individual country case studies focus on price-distorting policies as of 2004, but they include more sectoral and product disaggregation than the global models, and they are able to consider multiple types of households and types of labor. The national results for real GDP and household consumption suggest that GDP would increase from full global trade reform in all ten countries, but only by 1 or 2 percent. Given falling consumer prices, real household consumption would increase by considerably more in most cases. Generally these numbers are somewhat larger than those generated by the global Linkage model. When all merchandise trade is liberalized, the poverty reduction ranges from close to zero to about 3.5 percentage points, except for Pakistan where it is more than 6 points. On average nearly two-thirds of the alleviation is due to non-farm trade reform, and the contribution of own-country reforms to the reduction in poverty appears to be equally important as rest-of-world reform.

The estimated poverty alleviation is also sub-divided into rural and urban sources. In every case rural poverty is reduced much more than urban poverty. This is true for both farm and non-farm trade reform, and for own-country as well as rest-of-world reform. Since the rural poor are much poorer on average than the urban poor, this would lead one to expect trade reform to also reduce inequality. That is indeed what the results show for this sample of countries: inequality declines in all three developing country regions following full trade liberalization of either all goods, or just agricultural products, and for both own-country and rest-of-world reforms. The effect of non-farm trade reform on its own is more mixed, providing another reason to urge trade negotiators not to neglect agricultural reform in trade negotiations. Inequality within rural or urban household groupings are not altered very much by trade reform compared with overall national inequality, which underlines the point that
trade reform would tend to mainly reduce urban-rural inequality rather than inequality within regions.

In summary, the benefits for the world’s poor from the full liberalization of global merchandise trade would come more from agricultural than non-agricultural reform; and, within agriculture, more from the removal of substantial support provided to farmers in developed countries than from developing country policy reform. According to the economy-wide model used in Anderson, Cockburn and Martin (2010, 2011), such reform would raise the real earnings of unskilled workers in developing countries, most of whom work in agriculture. Their earnings would rise relative to both unskilled workers in developed countries and other income earners in developing countries. This would thus reduce inequality both within developing countries and between developing and developed countries, in addition to reducing poverty. The studies all find global trade liberalization to be poverty alleviating, regardless of whether the reform involves only agricultural goods or all goods, with the benefit to developing countries coming roughly equally from reform at home and abroad. They also find that rural poverty would be cut much more than urban poverty in all cases.

Policy implications

These empirical findings have a number of important policy implications. First and foremost, the attractive poverty and inequality alleviating effects of unilateral and multilateral trade policy reforms provide yet another argument for countries to seek further liberalization of national and world markets. The potential benefits are generally much greater for global reform than from just own-country reform. The results of this set of studies also show that the winners from trade reform would overwhelmingly be found among the poorer countries and the poorest individuals within these countries. However, even among the extreme poor, some will lose out. Hence the merit of compensatory policies, ideally ones that focus not on private goods but rather on public goods that reduce under-investments in pro-growth areas such as rural human capital formation.

Second, the strongest prospective benefits come from agricultural reform. This underscores the economic and social importance of securing reforms for the agricultural sector in particular, notwithstanding the political sensitivities involved. There are more-direct
and hence more-efficient domestic policy instruments than trade policies for meeting governments’ Millennium Development Goals of poverty, malnutrition and hunger, but generally they are more of a net drain on treasury finances. This is particularly true for governments of low-income countries which still rely heavily on trade tax revenue. One solution for this is to expand aid-for-trade funding as part of official development assistance programs (Hoekman and Wilson 2010). Another is to make (more) use of value added or consumption taxation measures.

Third, most of the national case studies show that domestic reform on its own can be a way of reducing poverty and inequality. This suggests that developing countries should not hold back on domestic reforms while negotiations in the World Trade Organization’s Doha Round and other international forums continue. It also suggests that from a poverty alleviating perspective, developing countries have little to gain, and potentially much to lose, from negotiating exemptions or delays in national reforms in the framework of WTO multilateral agreements.

Most commentators believe that Asia’s developing economies will keep growing rapidly in the foreseeable future provided they remain open and continue to practice good macroeconomic governance. Their growth is expected to be more rapid in manufacturing and service activities than in agriculture. In the more densely populated economies of the region, the growth in labor-intensive and manufactured component exports will be accompanied by rapid increases in the per capita incomes of low-skilled workers (Baldwin 2011). Agricultural comparative advantage is thus likely to decline in these economies (Anderson and Strutt 2012). Whether these economies become more dependent on imports of farm products, however, depends on what happens to their RRAs. The first wave of Asian industrializers (Japan, and then Korea and Taiwan) chose to slow the growth of food import dependence by raising their NRA for agriculture even as they were bringing down their NRA for non-farm tradables, so that their RRA became increasingly above the neutral zero level. A key question is: will later industrializers follow suit, given the past close association of RRAs with rising per capita income and falling agricultural comparative advantage?

The progress of lower-income countries relative to first industrializers can be found by mapping the RRAs for Japan, Korea and Taiwan against real per capita income, and superimposing a graph of the RRAs for lower-income economies onto this. Figure 9 does this, and shows that the RRA trends for China and India (and ASEAN to a lesser extent) over the past three decades are similar to those of richer Northeast Asian countries. True, the
earlier industrializers were not bound under GATT to not raise their agricultural protection, but the WTO legal bindings on China, India and ASEAN also are unlikely to constrain the government very much in the next decade or two. One can only hope that China and South and Southeast Asia will not make use of the legal wiggle room they have allowed themselves in their WTO bindings and follow Japan, Korea and Taiwan into high agricultural protection. If they do, Anderson and Nelgen (2011) estimate that the future cost of agricultural protection policies will rise substantially.

A much more efficient and equitable strategy would be to instead treat agriculture in the same way many developing countries have been treating non-farm tradable sectors in recent decades. That would involve opening the sector to international competition, and relying on more-efficient domestic policy measures to raise government revenue (e.g., income and consumption or value-added taxes) and to assist farm families (e.g., public investment in rural education and health, rural infrastructure, and agricultural research – see Fan 2008). Even if just one-twentieth of the current NRA provided to Asian farmers via farm price-support policies was replaced by agricultural R&D expenditure, that would more than double their current public spending on R&D – and the latter would increase economic welfare whereas price-distortionary policies reduce it. Such a boost to Asian R&D could generate another green revolution of the same order of magnitude of the one in the 1960s, especially if it took full advantage of the new developments in biotechnology (as shown for rice, for example, in Anderson, Jackson and Nielsen 2005). The example of Brazil’s R&D-led agricultural revolution over the past two decades also points the way for others to follow, not only in Latin America but also in Sub-Saharan Africa – where again the potential for yield and food quality improvements via transgenic crop development is enormous (Anderson and Jackson 2005).

In short, the world’s food price and trade policy biases are still very wasteful of resources, they lead to food production occurring in higher-cost settings than is necessary, and they contribute to global poverty, to income inequality between countries, and to income and wealth inequality within rural areas of protective countries. Yet the historical data summarized above indicates that those policy biases have declined somewhat over the past quarter century. Thus even though it may seem like farm subsidies and import protection are fixtures too politically difficult to move, this evidence suggests those measures – like export taxes on farm products in developing countries – are not inevitable.
Unfortunately the same cannot yet be said for policies that insulate domestic food markets from international price fluctuations. While not discussed above (but see Anderson and Nelgen 2012), both high-income and developing countries alter their trade barriers in an attempt to protect consumers from food price spikes. It turns out, though, that both food-surplus and food-deficit countries tend to so respond, and to a similar extent. Hence they tend to cancel out each other’s ability to stabilize their home market – but at the same time they exacerbate the instability in international food prices (Martin and Anderson 2012). Beggar-thy-neighbor food policy actions are thus a long way from being a thing of the past, and are likely to continue until enough countries get together and agree multilaterally to desist from protecting and insulating their domestic food markets.

Appendix: Methodology for measuring distortions to agricultural incentives

A recent World Bank study compiled evidence from 75 countries and five decades of policy experience to gauge how changes in farmer incentives have evolved over time (Anderson and Valenzuela 2008, summarized in Anderson 2009). It reports nominal rates of assistance (NRAs), defined as the percentage by which government policies have raised gross returns to farmers above what they would be without the government’s intervention (or the percentage by which government policies have lowered returns, if NRA is less than zero). If a trade measure is the sole source of government intervention, then the measured NRA will also be the consumer tax equivalent (CTE) rate at that same point in the value chain. But where there are also domestic producer or consumer taxes, or subsidies, the NRA and CTE will not be equal; due to trade measures at least one of them will be different from the price distortion at the border. Both NRA and CTE are expressed as a percentage of the undistorted price. Each industry is classified either as import-competing, or a producer of exportables, or as producing a nontradable. Weighted averages are calculated for both groups of tradables. Any non-product-specific distortions, including distortions to farm input prices, are also added into the estimate for the overall sectoral NRA for agriculture.

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

Farmers are affected not just by the prices of their own outputs but also by those of nonagricultural producers. In other words, 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 proving that in a two-sector economy, an import tax has a similar effect to an export tax. This carries over to a model that also includes a third sector producing only nontradables, to a model with imperfect competition. The model holds regardless of the economy’s size (Vousden 1990, pp. 46-47). If one assumes that there are no distortions in the markets for nontradables and that the value shares of agricultural and non-agricultural nontradable products remain constant, then the economy-wide effect of distortions to agricultural incentives can be captured by the extent to which the tradable parts of agricultural production are assisted or taxed relative to producers of non-farm tradables. By generating estimates of the average NRA for non-agricultural tradables, it is then possible to calculate a Relative Rate of Assistance, RRA, defined in percentage terms as:

\[
RRA = 100\left[\frac{1+NRA_{ag}^t/100}{1+NRA_{nonag}^t/100} - 1\right]
\]

where NRA_{ag}^t and NRA_{nonag}^t are the weighted average percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively. Since the NRA cannot be less than -100 percent if producers are to earn anything, neither can the RRA (assuming NRA_{nonag}^t is positive). And if both of those sectors are equally assisted, RRA is zero. This measure is useful in that if it is below zero, it provides an internationally comparable indication of the extent to which a country’s policy regime has an anti-agricultural bias, and conversely when it is above zero (Anderson et al. 2008).

Another useful stand-alone indicator of price distortions, that also captures the extent of dispersion or variability of the NRA estimates across products within the agricultural sector, is called the welfare reduction index. The cost of government policy distortions to incentives in terms of resource and investment misallocation tend to be greater the greater the degree of substitution in production. To avoid having to examine both the average NRA and its standard deviation, Croser and Anderson (2011) have generated a single index for that purpose. Their index is the percentage trade tax equivalent which, if applied uniformly to all farm goods, would generate the same national economic welfare cost as the actual intra-sectoral structure of price distortions within the agricultural sector of a country.
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Figure 1: Nominal rates of assistance to agriculture in high-income, transition\textsuperscript{a} and developing countries, 1955 to 2004
(percent, 5-year weighted averages, with ‘decoupled’ payments included in the dashed line)

\textsuperscript{a} Denoted by the World Bank as ECA, for (Central and Eastern) Europe and Central Asia.

Source: Anderson (2009, Ch. 1), based on estimates in Anderson and Valenzuela (2008).
Figure 2: Nominal rates of assistance to agricultural and non-agricultural tradable sectors and relative rate of assistance,\(^a\) developing and high-income countries, 1955 to 2004

(percent, farm production-weighted averages across countries)

(a) Developing countries

![Graph showing nominal rates of assistance for developing countries]

(a) High-income countries

![Graph showing nominal rates of assistance for high-income countries]

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

Source: Anderson (2009, Ch. 1), based on estimates in Anderson and Valenzuela (2008).
Figure 3: Relative rates of assistance to agriculture, by region, 1955 to 2007
(percent, farm production-weighted averages across countries)

(a) Developing countries

(b) High-income countries

Source: Anderson (2009, Ch. 1), based on estimates in Anderson and Valenzuela (2008).
Figure 4: Cross-country dispersion in RRAs, 2000-04

(percentage)

Source: Anderson (2009, Ch. 1), based on estimates in Anderson and Valenzuela (2008).
Figure 5: NRAs by product, developing and high-income countries, 1980-84 and 2000-04 (percent)

(a) developing countries
Figure 5 (continued): NRAs by product, developing and high-income countries, 1980-84 and 2000-04 (percent)

(b) high-income countries

Source: Anderson (2010, Figure 2.6), based on estimates in Anderson and Valenzuela (2008).
Figure 6: Nominal rates of assistance to exportable, import-competing and all covered agricultural products,\(^a\) high-income, transition and developing countries, 1955 to 2004 (percent, 5-year weighted averages)

(a) Developing countries

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

\(^a\)Covered products only. The total also includes nontradables. The straight line in the upper segment of each graph is from an ordinary-least-squares regression based on annual NRA estimates.

Source: Anderson (2009, Ch. 1), based on estimates in Anderson and Valenzuela (2008).
Figure 7: Contributions of different instruments to the border component of the welfare reduction index\textsuperscript{a} for developing countries, 1960 to 2004 (percent)

\textsuperscript{a} The welfare reduction index is the percentage trade tax equivalent which, if applied uniformly to all goods, would generate the same welfare cost as the actual intra-sectoral structure of trade distortions.

Source: Derived from estimates reported in Croser and Anderson (2011), based on data in Anderson and Croser (2009).
Figure 8: Contributions of different instruments to the producer component of the welfare reduction index\textsuperscript{a} for various high-income and transition countries, 1980-84 and 2000-04 (percent)

\textsuperscript{a} The welfare reduction index is the percentage trade tax equivalent which, if applied uniformly to all goods, would generate the same welfare cost as the actual intra-sectoral structure of trade distortions.

Figure 9: Relative rate of assistance to agriculture and log of real per capita GDP, large Asian economies, 1955$^a$ to 2004

$^a$ The starting dates are 1965 for India, 1970 for ASEAN and 1981 for China, due to lack of RRA estimates for earlier years for those countries. The GDP per capita data are in 1990 international Geary-Khamis dollars, from Maddison (2003).

Source: Author’s derivation from data in Anderson and Valenzuela (2008).