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How Can Trade Improve Food Security in Sub-Saharan Africa?

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Abstract

For decades, earnings from farming in many developing countries, including in Sub-Saharan Africa, have been depressed by a pro-urban and anti-trade bias in own-country policies, as well as by governments of richer countries favoring their farmers with import barriers and subsidies. Both sets of policies reduced global economic welfare and agricultural trade, and almost certainly added to global inequality and poverty and to food insecurity in many low-income countries. Progress has been made over the past three decades in reducing the trend levels of agricultural protection in high-income countries and of agricultural disincentives in African and other developing countries. However, there is a continuing propensity for governments to insulate their domestic food market from fluctuations in international prices, which amplifies international food price fluctuations. Yet when both food-importing and food-exporting countries so engage in insulating behavior, it does little to advance their national food security. This paper argues that there is still plenty of scope for governments to improve economic welfare and alleviate poverty and food insecurity by further reducing interventions at their national border (and by lowering trade costs). It summarizes indicators of trends and fluctuations in trade barriers before pointing to changes in both border policies and complementary domestic measures that together could improve African food security.

How Can Trade Improve Food Security in Sub-Saharan Africa?

International food price spikes since 2008, and government responses to them, have brought food and agricultural price and trade policies back into the global spotlight. Food-importing developing countries have accused agricultural-exporting countries of exacerbating food security concerns by restricting exports, while other exporters fear such restrictions will lead to a retreat from reliance on international markets as food-deficit countries seek greater self-sufficiency when prices return to trend. Meanwhile, food-importing countries have reduced their import restrictions and a few have even subsidized imports of their staple food. The actions of both sets of countries have added to the international food price spikes; and recent research has shown that they have been much less successful in alleviating an increase in poverty in intervening countries than is commonly perceived.

The propensity for governments to insulate their domestic food market from fluctuations in international prices is only one way in which trade policies are used by governments to achieve domestic social or political objectives relating to food consumers and producers. Another is to alter the trend level of domestic prices away from their trend in international markets. For decades, earnings from farming in many developing countries, including in Sub-Saharan Africa, have been depressed by a pro-urban bias in own-country policies, as well as by governments of richer countries favoring their farmers with import barriers and subsidies. The policies of both sets of countries reduced global economic welfare and agricultural trade, and almost certainly added to global inequality and poverty and to food insecurity in many low-income countries.

Certainly progress has been made over the past three decades in reducing the trend levels of agricultural protection in high-income countries and the anti-agricultural and anti-trade policy biases in African and other developing countries. Even so, much scope remains for further reforms, including replacing trade measures with more effective ways of preserving food security when food prices fluctuate. Resistance to further policy reform remains strong though, in part because of a lingering perception by some that long-term national food security requires food self-sufficiency. There is also an inadequate awareness of downsides for countries that (a) use the international market only when there is an unexpected temporary shortfall or surplus of food domestically, or (b) withdraw from exporting when prices spike upwards.

The purpose of this paper is firstly to look briefly at the economic welfare and distributional (including poverty) effects of food trade-related policies, so as to illustrate conceptually how openness to trade can make a positive contribution to food security.[1] The paper then addresses three questions:

- How fully has Sub-Saharan Africa taken advantage of trade opportunities?
- What scope is there for increasing food security in Sub-Saharan Africa through further trade policy reforms?

[1] There is also much scope through trade facilitation initiatives to boost economic welfare through lowering the costs of intra- and inter-national trade (Venables 2004). New evidence reveals that trade costs have fallen much less for farm products than for manufactures since the mid-1990s, and are higher in Sub-Saharan Africa than in any other region (Arvis et al. 2012). However, the present paper leaves this important issue aside and focuses only on governmental barriers to trade.

- What complementary domestic policy reforms would boost gains from trade reform and ensure those gains reduce poverty and food insecurity?

The reason for focusing on Sub-Saharan Africa in particular needs little justification. Currently almost half of the region's population of 900 million is below the Purchasing Power Parity (PPP) $1.25 a day poverty line, and more than two-thirds are below the $2 a day line. The number of ultra-poor (those living on less than $0.63 a day) in the region doubled between 1981 and 1999, and in 2008 the ultra-poverty headcount rate was still stuck at 20 percent despite recent pro-poor growth. Sub-Saharan Africa was thus home to 70 percent of the world's ultra-poor in 2008, up from just 12 percent in 1981 (World Bank 2013). More specifically, the region's share of the world's undernourished people has risen from 17 to 27 percent in the past two decades. More than a quarter of the population is still malnourished (FAO 2012), and the hunger index for the region is now two-fifths above that for the world as a whole, up from one-quarter above in 1990 (IFPRI 2012). Numerous African governments are showing a willingness and capacity to improve this situation through pro-poor economic growth strategies, however, and early indications of success in some countries are encouraging others to strengthen their institutions and reform their policies.

How do trade policy measures affect food security?

Food security is defined by the Food and Agriculture Organization as the condition in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Improving food security requires improving the three interrelated elements of food availability, access and utilization. Subsistence farm households by definition avail themselves of food via self-production. For most people, however, food is most cheaply available in markets. How much access households have to available food supplies depends heavily on their income or assets or other entitlements (e.g. transfers such as remittances). And how well they utilize the food that is accessible to them depends on their knowledge and willingness to ensure a healthy and nutritious diet for all household members. The latter in turn depends on the level of education in the household, particularly of females, which again is closely related to household income and wealth or other entitlements.

Thus food insecurity is a consumption issue that is closely related to poverty and the price of food. From this perspective, any initiative that raises the real incomes of the poor could be food-security enhancing. The issue could be thought of at the macro level of faster economic growth in low-income countries, or at the micro level of raising the real incomes or asset values of the poorest households within a country. In both respects it is helpful to look separately at the impacts of own-country trade-related policies and those of the rest of the world.

Own-country trade policies

For a country too small to influence its terms of trade, any subsidy or tax (or quantitative restriction) on its exports or imports would lower national economic welfare by foregoing some of the gains from production specialization and exchange that trade openness provides. The gains from production specialization can be especially large for the least-developed economies, where there is greater scope to exploit economies of scale, to improve the

competitiveness of domestic markets, to expand the variety of products available, and to raise the quality of goods and services produced. Moreover, there are numerous channels through which trade openness boosts national economic growth: by creating a more-attractive investment climate, by bringing in new ideas and ways of producing, processing, distributing, marketing and financing, and by speeding technological catch-up. Both the static and dynamic gains from trade openness raise real national income. Even if they do not also benefit the poorest households in the country *directly*, the gain in national income provides more wherewithal for the government to assist them *indirectly.* Household assistance could be via social protection instruments such as conditional cash payments. It could also come via public goods such as investments in rural infrastructure to reduce trade costs in, to and from the poorest regions.

In seeking to clarify which types of households would be most likely to gain or lose if a country altered its trade barriers, it is necessary to distinguish between measures aimed at altering the *trend* level of a domestic price away from that in international markets, and those aimed at reducing short-term *fluctuations* in that domestic price around its trend value.

In terms of altering the long-run trend level of domestic food prices, developing countries have tended to confine themselves to export restrictions if they are net food exporters, and to import restrictions if they are food import-dependent. The former measures lower the domestic consumer and producer prices of food, the latter raise them. Thus over the longer term net buyers of food have tended to benefit at the expense of net sellers of food in food-surplus developing countries, and conversely in food-deficit countries.

As for the use of trade measures as domestic food price stabilizers, the most common interventions in developing countries have been to introduce or increase export restrictions and to lower or suspend import restrictions when international food prices spike up, and conversely when international prices slump. These short term market-insulating interventions tend to benefit net buyers of food at the expense of net sellers of food in both food-surplus and food-deficit countries during upward price spike periods, and conversely during low-price periods.

A further consideration has to do with an indirect impact of a price-distorting policy on the incomes of net buyers of food in developing countries. If the trade measure lowers the producer price of food and so discourages farming, the demand for labor on farms falls. If the farm sector uses unskilled labor relatively intensively and that is the country's most abundant factor, that trade measure will lower the nominal wages of unskilled workers not only in farm jobs but also in non-farm jobs – and more so the more agrarian is the economy (i.e., the larger the share of employment in agriculture) and the more flexible is the market for unskilled labor. According to the theorem in Stolper and Samuelson (1941), that policy will also raise the return to relatively scarce human and non-farm capital and so increase income and wealth inequality. Thus, while poor households may benefit on the expenditure side from a measure that reduces the domestic price of food, they could be harmed on the earnings side as sellers of unskilled labor if not also food, thereby making the net effect on their economic welfare uncertain. What is critical, therefore, is not only whether the poor are predominantly net buyers or net sellers of food but also the extent to which their income derives from wages linked to the demand for labor on farms.

Since 70 percent of the US$1 a day poor in Sub-Saharan Africa in 2002 were rural, according to Ravallion et al. (2007), a significant proportion of households that are net buyers of food may still be made worse off by policies that lower rural wages via lowering the domestic

price of farm outputs. Furthermore, many of the poorest urban people were 'pushed' to the city because prices of farm products and/or rural wages were too low for them to be able to remain profitably engaged in their rural homeland. In the absence of policies that depressed the domestic price of food, fewer would have migrated to join the urban poor in the hope of a better income, and more households would have been net sellers of food.

Rest of the world's food trade policies

The food trade policies of the rest of the world can also impact a developing country's poor insofar as they alter the price of food at that country's border. A recent empirical study finds that the net effect of trade policy distortions globally as of 2004 was to lower the international price of food, including key grains (Anderson et al. 2010). Even so, it is an empirical question as to whether that helps or hurts the poor in any developing country where the poor predominantly are net buyers of food. Again this is because (a) the poor may derive a large share of their income from wages linked to the demand for labor on farms, and (b) more households would have been net sellers of food had its price not been depressed by the food trade policies of the rest of the world.

As well as lowering the mean level of international food prices, the combined effect of many countries tending to restrict their food imports and in some cases exports to 'thin' international food markets, makes food prices more volatile. Using a model of world food markets as of 1990, Tyers and Anderson (1992, Table 6.9) found that high-income country policies lowered the volume of international food trade by 25 percent, and that developing countries' policies did so even more, such that the combined effect was to shrink global food trade in 1990 by 56 percent. Such 'thinning' ensures the global food market is very much more susceptible to exogenous global supply or demand shocks. That in turn discourages other countries from making a long-term commitment to engage fully in international food trade.

Turning to trade measures used as domestic food price stabilizers, the most common are increased export restrictions and a lowering of import restrictions when international food prices spike up, and conversely when international prices slump. The governments of both country groups thereby exacerbate the international price change and thus amplify the price shock for countries choosing to not alter their border measures, harming even more their net buyers of food and helping their net sellers of food in the case of upward price spikes, and conversely during low-price periods. However, as Martin and Anderson (2012) make clear, if a similar proportion of the world's exporting and importing countries so alter their border barriers, their impacts on the volume of global trade are offsetting and, as a result, the net impact on their domestic food price is no different than if neither country group altered their trade restrictions.

Many countries that use trade restrictions to achieve a certain (e.g. 100 percent) trend level of food self sufficiency also alter those restrictions if they have an unusually poor or abundant harvest, again seeking to stabilize their domestic market. Such intermittent engagement with the international market has a number of downsides, however. Typically such transactions involve a less-attractive price than for countries that are regular traders. Also, if the international market is facing a similar abundance or shortage at that time, regular trading partners typically will look after each other before turning to the needs of irregular participants.

Why trade measures are n^{th}-best food security instruments

Whether concerned with long-term or short-term food security, trade restrictions are far from first-best policy instruments for a number of reasons. First, they are like explicit trade taxes, which means they impose a price distortion at the same rate on production and consumption simultaneously. If they lower the domestic food price, that may help *some* net food buyers (but not *all* of those whose incomes are closely linked to the demand for farm labor), but at the expense of net sellers. Second, they help net food buyers in proportion to their expenditure on food. That makes them very inefficient transfer instruments: only a fraction of that transfer helps those poor food-insecure households that are net buyers, and it does so at the expense of the poor households that are net sellers of food. Conversely, trade restrictions that raise the domestic food price will help net food sellers but at the expense of net buyers of food, and that help to farmers will be in proportion to their marketed output and so again will be a far larger transfer than is needed for the social protection of just low-income farmers.

With this conceptual background in mind, we turn now to examine empirical evidence on how countries have used trade and trade-related policy instruments to alter both the trends and fluctuations in their domestic prices for food (and other agricultural) products in Sub-Saharan Africa and the rest of the world.

Empirical indicators of national distortions to agricultural prices

To gauge how farmer and consumer prices in high-income and developing countries have evolved relative to international prices since the 1950s, we draw on time series evidence from a recent World Bank study compiled by Anderson and Valenzuela (2008), summarized in Anderson (2009), and updated to 2010/11 by Anderson and Nelgen (2013). These estimates cover 82 countries which together account for more than 90 percent of global agriculture, population, employment, GDP and poverty. Data are available in that compilation for 20 Sub-Saharan African countries, although they are not quite as comprehensive and are less up-to-date than for other regions.

The key indicator of price distortions in that dataset is the nominal rate of assistance (NRA), defined as the percentage by which national government policies raise gross returns to farmers above what they would be without the government's intervention – or lowered them, if NRA<0 (see Anderson et al. 2008 for methodological details). If a trade measure is the sole source of government intervention for a particular product, then the measured NRA will also be the consumer tax equivalent (CTE) rate at that same point in the value chain for that product. (Only where there are also domestic producer or consumer taxes or subsidies will the NRA and CTE no longer be equal and at least one of them will be different from the price distortion at the border due to trade measures, but that is rarely the case in most of the developing countries in this sample.) Since the NRA and CTE are very highly correlated for most products in all countries, attention can focus on estimates of either one of them. Both 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 (with its status sometimes changing over the years), so as to generate for each year the weighted average NRAs for the two different groups of tradables. Weighted averages for product groups are generated using the gross values of production at undistorted prices as weights.

Farmers are affected not just by prices of their own outputs 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 (Lerner 1936; 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:

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

where $NRAag^t$ and $NRAnonag^t$ are the weighted average percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively. If both of those sectors are equally assisted, the RRA is zero; and if it is below (above) zero, it provides an internationally comparable indication of the extent to which a country's policy regime has an anti- (pro-) agricultural bias (Anderson et al. 2008).

In summarizing pertinent empirical findings from that World Bank study, it is helpful to begin with NRA estimates for the farm sector and then turn to RRA estimates.

Trends since the 1950s

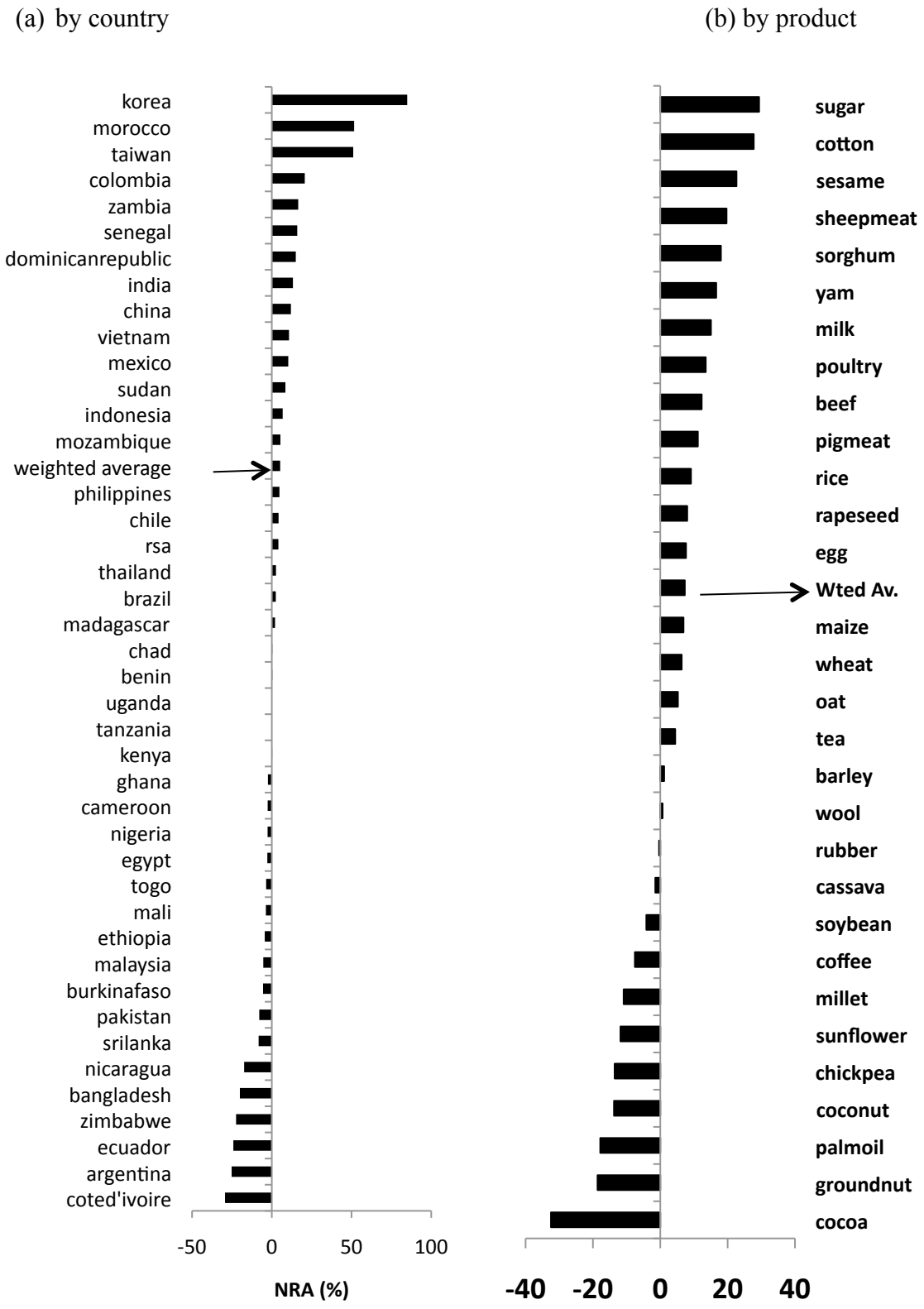
In both Japan and the European Community in the 1950s, domestic prices exceeded international market prices for grains and livestock products by less than 40 percent. By the early 1980s, however, the difference was more than 80 percent for Japan and was around 40 percent for the EC (Anderson, Hayami and Others 1986, Table 2.5). Virtually all of that assistance to Japanese and European farmers in that period was due to restrictions on imports of farm products. Assistance then rose markedly in the mid-1980s, particularly due to the North Atlantic food export subsidy 'war'. This prompted the launch of the GATT's Uruguay Round which eventually led to what became the WTO's Agreement on Agriculture. Producer support in high-income countries has since come down, the NRA average falling from 59 to 26 percent between 1986–88 and 2009–11.

As for developing countries, the database updated by Anderson and Nelgen (2013),[2] which covers 45 developing countries, reveals that there have been substantial reductions also in their distortions to agricultural incentives over the past two to three decades. Progress has not been uniform across countries and regions though, and the reform process is far from complete. More specifically, many countries still have a wide dispersion in NRAs for different farm industries, and continue to have a strong anti-trade bias in the structure of assistance within their agricultural sector; and some countries have "overshot" in the sense that they have moved from having an average relative rate of assistance to farmers that was

[2] A global overview of the results to 2007 is provided in Anderson (2009), and the detailed country case studies are reported in four regional volumes covering Africa (Anderson and Masters 2009), Asia (Anderson and Martin 2009), Latin American (Anderson and Valdés 2008), and Europe's transition economies (Anderson and Swinnen 2008). Background papers and databases, including for the updated estimates by Anderson and Nelgen (2013), are freely available at www.worldbank.org/agdistortions, as are e-book versions of the regional volumes. A comparison of these estimates with the earlier ones by Krueger, Schiff, and Valdés is available in Anderson (2010).

negative to one that is positive, rather than stopping at the welfare-maximizing rate of zero. Moreover, the variance in rates of assistance across commodities within each country, and in aggregate rates across countries, remains substantial (Figure 1).

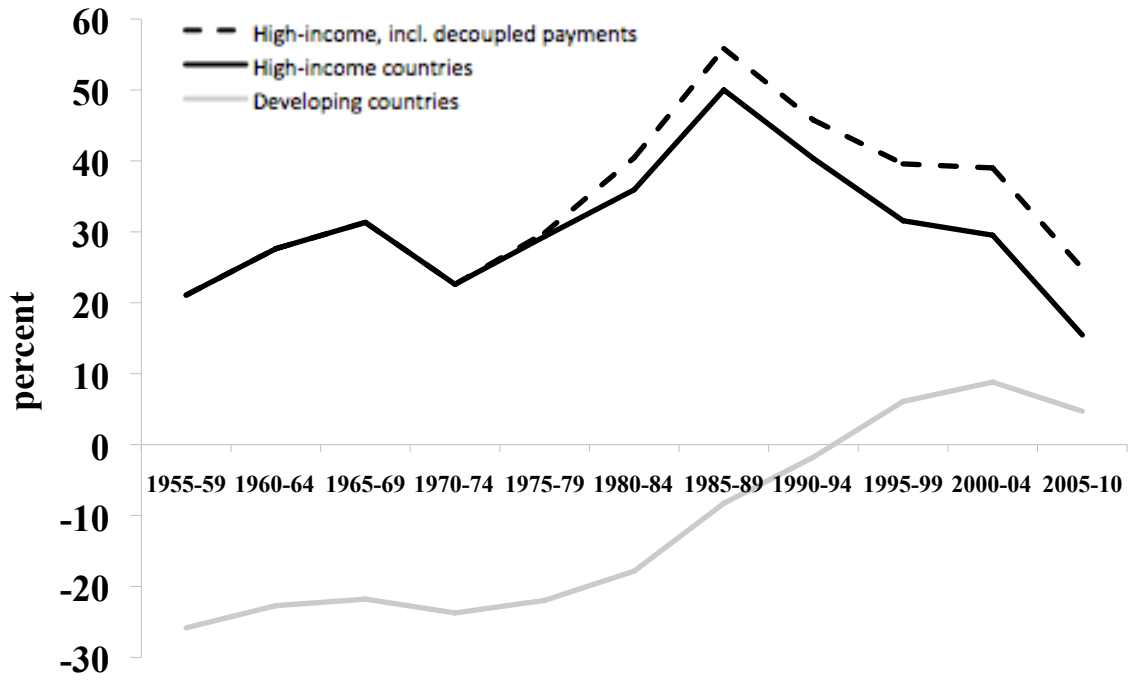
Figure 1: NRAs across developing countries and across products globally, 2005-10



Source: Derived from estimates in Anderson and Nelgen (2013).

A summary of country group results is provided in Figure 2. It reveals that the nominal rate of assistance (NRA) to farmers in high-income countries rose steadily over the post-World War II period through to the end of the 1980s, apart from a dip when international food prices spiked around 1973-74. After peaking at more than 50 percent in the mid-1980s, when international food prices were at a near-record low, the average NRA for high-income countries has fallen substantially. This is so even when the new farm programs that are somewhat 'decoupled' from directly influencing production decisions are included. For developing countries, too, the average NRA for agriculture has been moving towards zero, but from a level of around –25 percent between the mid-1950s and early 1980s. Indeed it 'overshot' in the 1990s by becoming positive, but it is barely half the most-recent average NRA for high-income countries.

Figure 2: NRAs to agriculture in high-income and developing countries,[a] 1955 to 2011



[a] Five-year weighted averages, with decoupled payments included in the dashed line. The non-EU transitional economies of Central and Eastern Europe and Central Asia (ECA) are included in the high-income country group.

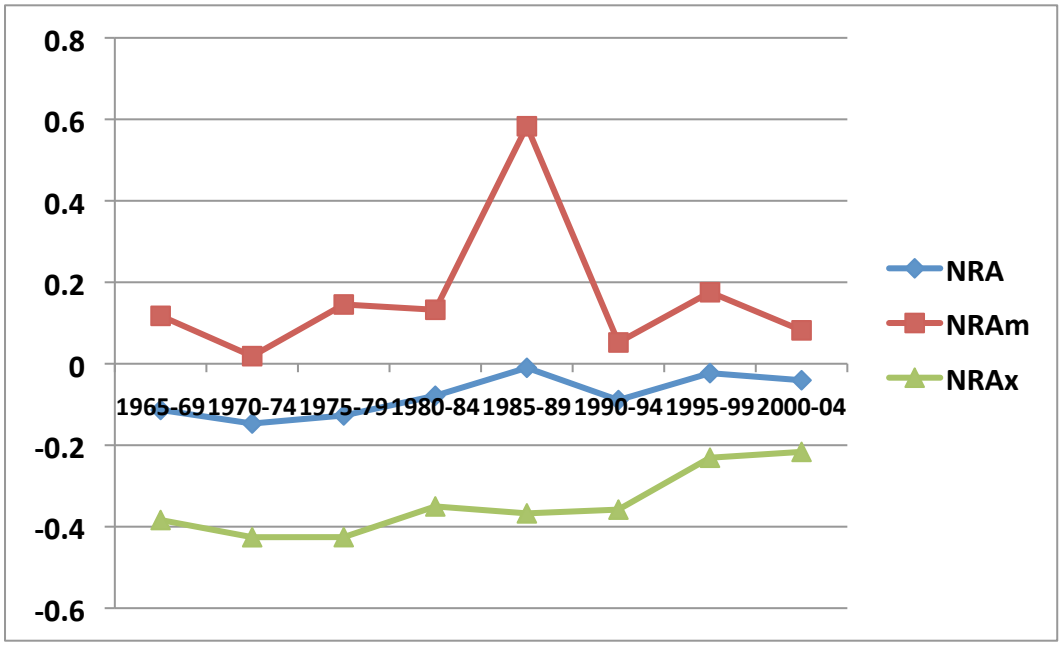
Source: Anderson (2009, Ch. 1), updated from estimates in Anderson and Nelgen (2013).

The average NRAs for country groups conceal the fact that the exporting and import-competing subsectors of agriculture have very different NRAs. While the average NRA for exporters in developing countries has been negative throughout (coming back from –50 percent in the 1960s and 1970s to almost zero in 2000–10), the NRA for import-competing farmers in developing countries has fluctuated around a trend rate that has risen from 10 and 30 percent (and it even reached 40 percent in the years of low international prices in the mid-1980s). The NRA estimates just for Sub-Saharan Africa illustrate starkly this anti-trade bias

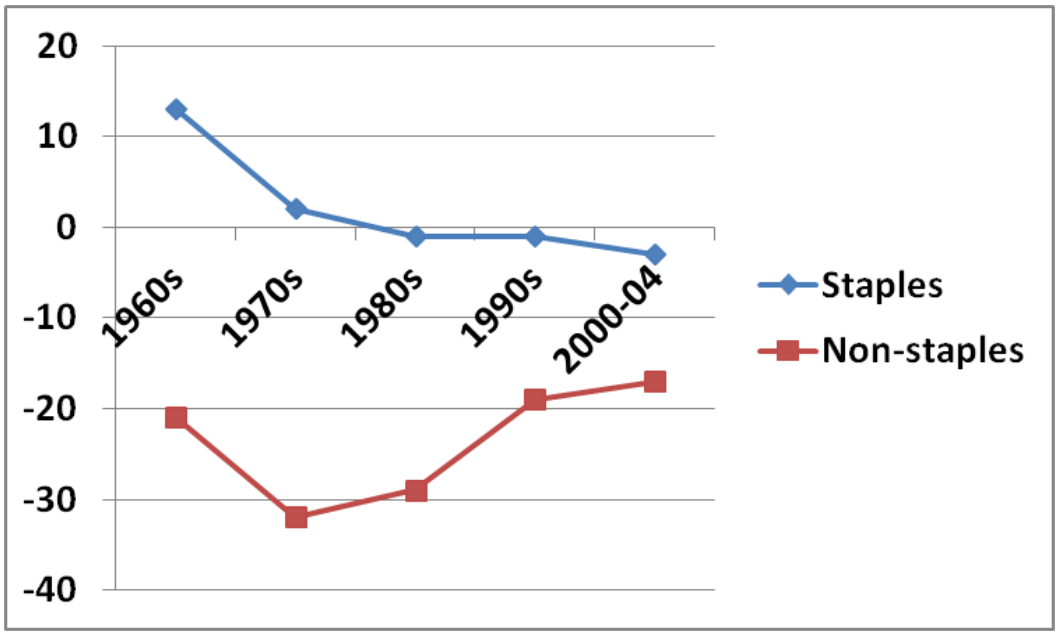
in farm policies (Figure 3). So even though there has been some reduction in the overall bias against farmers, those that are the most internationally competitive are given the least chance to contribute to the region's economies.

Figure 3: Agricultural NRAs for exporting, import-competing and all farm industries, and for staples versus non-staples, Sub-Saharan Africa, 1965 to 2010

(a) NRA, exporting, import-competing and all farm industries



(b) NRA, staples versus non-staples

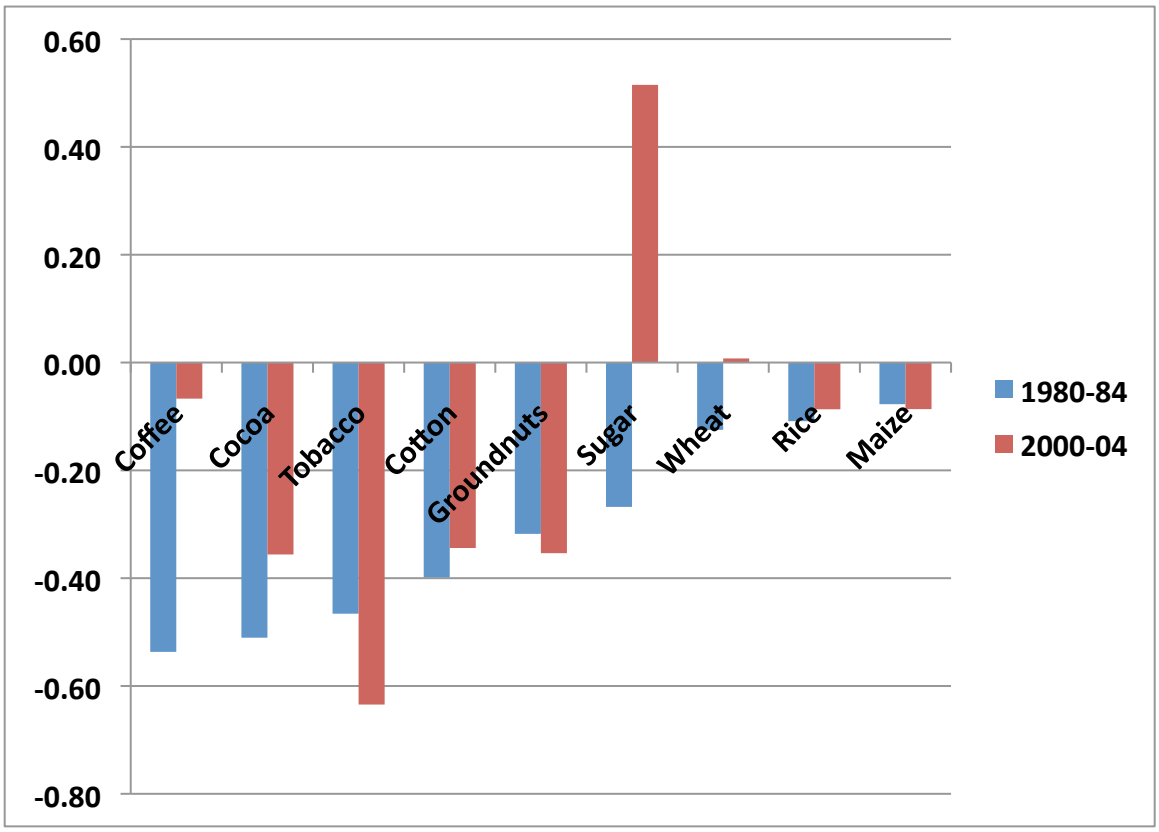


Source: Anderson and Valenzuela (2008)

This suggests that export-focused farmers in African and other developing countries are still discriminated against in two respects: by the anti-trade structure of assistance within their own agricultural sectors, and by the protection still afforded farmers in high-income countries.

That anti-trade bias also reflects the more-general fact that NRAs are not uniform across commodities (Figure 4). This indicates that resources within the farm sector of each country are not being put to their best use (Lloyd 1974). The extent of that extra inefficiency, over and above that due to too many or too few resources in aggregate in the sector, is indicated by the standard deviation of NRAs among covered products in each focus country. This dispersion index has fluctuated between 43 and 60 percent throughout the covered period for both rich and poor countries, and has not diminished as NRAs have approached zero over the past 25 years (Anderson 2009, Table 1.6). The dispersion for Africa is shown in the differences across commodity NRAs even when aggregated for the whole region: Figure 1(b) reveals that tropical cash crops are the most heavily discriminated against in Africa, and grains least so.

Figure 4: Agricultural NRAs by product, Sub-Saharan Africa, 1980-84 and 2000-04

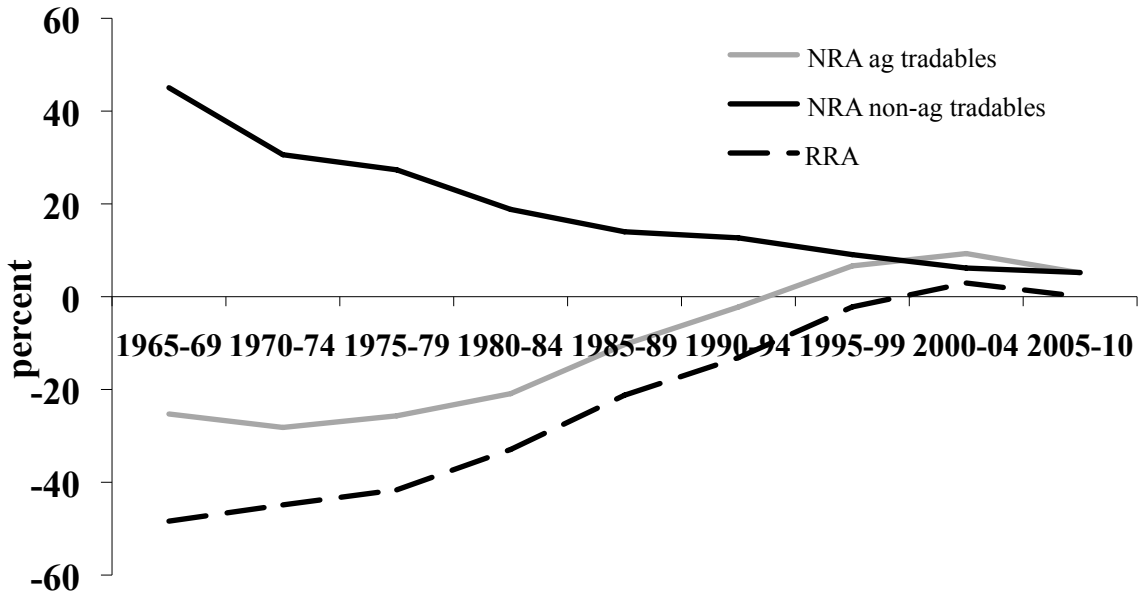


Source: Anderson and Valenzuela (2008)

There is also a very wide dispersion of NRAs across countries still. Figure 1(a) reveals that most of the African countries in this sample were at the low end of the spectrum as of 2005-10.

The improvement in farmers' incentives in developing countries is understated by the sectoral NRA estimates though, because developing countries have also reduced their assistance to producers of non-agricultural tradable goods, most notably manufactures. The decline in the weighted average NRA for the latter, depicted in Figure 5, was greater than the increase in the average NRA for tradable agricultural sectors for the period to the mid-1980s, consistent with the earlier finding of Krueger et al. (1988, 1991). For the period since the mid-1980s, changes in both sectors' NRAs have contributed almost equally to the improvement in farmer incentives. The Relative Rate of Assistance for developing countries as a group went from –46 percent in the second half of the 1970s to just above zero in the first decade of the present century. This increase (from a coefficient of 0.54 to 1.02) is equivalent to an almost doubling in the relative price of farm products, which is a huge change in the fortunes of developing country farmers in just a generation.

Figure 5: Developing countries' NRAs to agricultural and non-agricultural tradable sectors, and RRAs,[a] 1965 to 2011

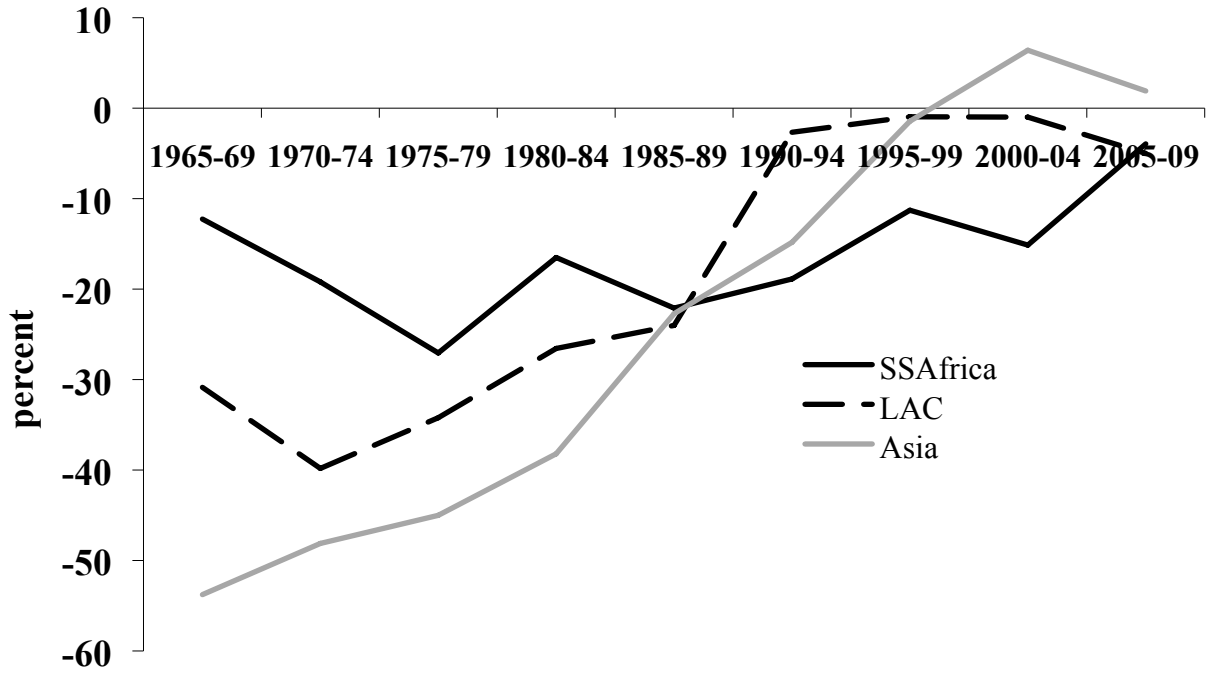


[a] Calculations use farm production-weighted averages across countries. RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$, respectively, are the NRAs for the tradable segments of the agricultural and non-agricultural sectors.

Source: Anderson (2009, Ch. 1), updated from estimates in Anderson and Nelgen (2013).

This improvement in the RRA was most dramatic for Asia and least so for Sub-Saharan Africa (Figure 6). That is, own-country policy discrimination against farmers was reduced quicker in other developing country regions than in Africa, leaving African farmers less internationally competitive now than prior to the 1990s.

Figure 6: RRAs[a] for Sub-Saharan Africa,[b] Asia and Latin America, 1965 to 2010



[a] Calculations use farm production-weighted averages across countries. RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$, respectively, are the NRAs for the tradable segments of the agricultural and non-agricultural sectors.

[b] Excluding South Africa

Source: Anderson (2009, Ch. 1), updated from estimates in Anderson and Nelgen (2013).

Government responses to fluctuations and spikes in international food prices

Fluctuations around trend levels of international food prices always have tended to be transmitted less than fully to national markets. This tendency means the estimated NRA for each product – the percentage by which the domestic price exceeds the border price – also fluctuates from year to year around its long-run trend, and in the opposite direction to the international price. This propensity has not diminished in either developing or high-income countries as part of the trade-related policy reforms that began in the mid-1980s.

To estimate the proportion of any international price fluctuation that is transmitted to domestic markets within twelve months, Anderson and Nelgen (2012) follow Nerlove (1972) and Tyers and Anderson (1992, pp. 65-75) in using a partial-adjustment geometric distributed lag formulation to estimate short-run transmission elasticities for each of nine key traded food products for all focus countries for the period 1985 to 2010. Those elasticity estimates range from 0.73 for soybean down to just 0.43 for sugar. The unweighted average across those nine products is 0.56, suggesting that, within one year, barely half the movement in international prices of primary food products is transmitted to domestic markets on average.

When some governments alter the restrictiveness of their food trade measures to insulate their domestic markets somewhat from international price fluctuations, the volatility faced by other countries is amplified. That reaction therefore prompts more countries to follow suit. The irony is, however, that when both food-exporting and food-importing countries so respond, each country group undermines the other's attempts to stabilize its domestic markets. That is to say, what seems like a solution to each importing country's concern *if it were acting alone* turns out to be less effective, the more exporting countries respond in a similar way – presumably for the same political economy reasons.

To see this more clearly, Martin and Anderson (2012) consider the situation in which, say, a severe weather shock at a time of low global stocks causes the international food price to suddenly rise. If national governments wish to avert losses for domestic food consumers, and they do so by altering their food trade restrictions (e.g., raising export taxes or lowering import tariffs), then only a fraction of that price rise is transmitted to their domestic market. That response raises the consumer subsidy equivalent/lowers the consumer tax equivalent of any such trade measure, and does the opposite to producer incentives, as captured by a fall in the NRA. However, if such domestic market insulation using trade measures is practiced by similar proportions of the world's food-exporting and -importing countries, it turns out to be not very effective in keeping domestic price volatility below what it would be in the international marketplace if no governments so responded. Rather, it is like everyone in a crowded stadium standing up to see better: if people are of equal height, no-one is better off.

Martin and Anderson (2012) also point out that, with the help of some simplifying assumptions, it is possible to get at least a back-of-the-envelope estimate of the proportional contribution of government trade policy reactions to an international price spike such as in 2006-08. Updated estimates for the key grains are 0.40 for rice, 0.19 for wheat, and 0.10 for maize (Anderson and Nelgen 2012). It is possible to apportion those policy contributions between country groups. Table 1 reports the contributions of high-income versus developing countries, and also of grain-exporting versus grain-importing countries. During 2006-08, developing countries were responsible for the majority of the policy contribution to all three grains' price spikes, whereas in 1972-74 the opposite was the case except for rice. As for exporters versus importers, it appears exporters' policies had the majority of the influence, other than for wheat in the 1970s, but importers made a very sizeable contribution as well.

Table 1: Contributions[a] of high-income and developing countries, and of importing and exporting countries, to the proportion of the international price change that is due to policy-induced trade barrier changes, 1972-74 and 2006-08

	TOTAL PROPORTIONAL CONTRIBUTION	High-income countries' contribution	Developing countries' contribution	Importing countries' contribution	Exporting countries' contribution
1972-74					
Rice	0.27	0.04	0.23	0.10	0.17
Wheat	0.23	0.15	0.08	0.18	0.05
Maize	0.18	0.14	0.04	0.06	0.12
2006-08					
Rice	0.40	0.02	0.38	0.18	0.22
Wheat	0.19	0.09	0.10	0.07	0.12
Maize	0.10	0.05	0.05	0.03	0.07

[a] Expressed such that the two numbers in each subsequent pair of columns add to the total proportion shown in column 1 of each row.

Source: Anderson and Nelgen (2012).

It is also possible, in the light of these estimates, to get a sense of how effective changes in trade restrictions were in limiting the rise in domestic prices. The proportional rise in the international price *net of* the contribution of changed trade restrictions, when multiplied by the international price rise, is reported in the second column of Table 2, where it is compared with the proportional rises in the domestic price in the sample countries. The numbers for 2006-08 suggest that, on average for all countries in the sample, domestic prices rose *more* than the adjusted international price change for wheat, and only slightly less for maize and just one-sixth less for rice. These results suggest that the combined responses by governments of all countries have been sufficiently offsetting as to do very little to insulate domestic markets from this recent international food price spike.

Table 2: Comparison of the domestic price rise with the rise in international grain prices net of the contribution of changed trade restrictions, rice, wheat and maize, 2006-08

(percent, unweighted averages)

	International price rise		Domestic price rise		
	Including contribution of changed trade restrictions	Net of contribution of changed trade restrictions	All countries	Developing countries (& SSAfrica, in brackets)	High-income countries
Rice	113	68	56	48 (49)	74
Wheat	70	56	77	65 (91)	81
Maize	83	75	73	62 (62)	82

Source: Anderson and Nelgen (2012)

In the absence of a multilateral agreement to desist from altering trade restrictions when international prices spike up (or down), it is understandable that those governments whose future is at risk when prices spike will want to avert losses to politically significant groups. How that might best be done is discussed toward the end of the next section.

Where to from here?

Further trade policy reform not only would raise the mean level of real incomes, but also would reduce the variance of international food prices by 'thickening' international food markets. According to global economy-wide modelling results reported in Valenzuela et al. (2009), liberalization of remaining trade barriers as of 2004 would raise the share of global farm production exported from 8 to 13 percent.

Furthermore, such reform as of 2004 would have reduced global income inequality and poverty, according to a study using numerous global and national economy-wide models all calibrated to 2004 and incorporating the same World Bank estimates of national price distortions as discussed above (Anderson, Cockburn and Martin 2010, 2011).

Those modelling results relate to the long-run trend in policies, but what about policies to deal with short-run price fluctuations? Did the short-term policy responses to the food price spike in 2008 lead to less people being pushed below the poverty line, for example? A definitive answer is not yet available, but a new study by Anderson et al. (2014) makes use of

household income and expenditure survey data and the methodology in Martin and Anderson (2012) to get at least a partial answer (ignoring responses to the quantities produced and consumed and to wage rates). For a sample of 30 developing countries (including the biggest such as China, India, Indonesia and Nigeria, plus seven other Sub-Saharan African countries), it first identifies what proportion of each nation's households are net buyers of grains and oilseeds. It then examines how much international prices rose during 2006-08, how much domestic prices rose for those products, and how much international prices would have risen had no countries insulated. The results suggest insulation behavior by developing country governments would have prevented an extra 146 million people temporarily falling below the $1.25 a day poverty line *had those government responses had no impact on international food prices*. But, because those actions (and those of high-income-country governments) exacerbated the international price spike, the number of people saved from falling into poverty by that insulating behavior is estimated to be a more modest 57 million. If the study were to have taken into account supply, demand and wage responses, this number would have been even lower – and possibly even negative, had rural wages risen sufficiently in the event of fuller price transmission. Indeed even without a wage adjustment, the number saved from falling into poverty in the sample's eight African countries switches from plus 1 million to minus 1 million, with only Nigeria and Zambia retaining any poverty alleviation (Table 3). That is, Sub-Saharan Africa would probably see less of its people fall into poverty when international food prices spike if all countries agreed to abstain from insulating their domestic markets from international price fluctuations.

Table 3: Estimates of partial impact of grain and oilseed price insulation behavior during 2006-08 on poverty in African and other developing countries

	Change in number of poor **ignoring** int'l price effects (<$1.25/day), thousands	Change in number of poor **including** int'l price effects (<$1.25/day), thousands
Cote d'Ivoire	147	-242
Malawi	-235	-227
Niger	63	-139
Nigeria	1,740	435
Rwanda	16	-21
Tanzania	-776	-923
Uganda	10	-36
Zambia	89	110
Sub-total, above SSA countries	*1,054*	*-1,043*
All other countries	145,246	56,450
World	**146,300**	**57,493**

Source: Anderson et al. (2014)

Looking ahead, the rapid growth of the developing economies' share of global industrial production and exports, led by China, looks like continuing (Hanson 2012; Anderson and Strutt 2013), with the rapid acceleration in supply-chain trade contributing to that trend (Baldwin and Lopez-Gonzales 2013). Industrialization and income growth in those emerging economies is also continuing to drive the strong demand for farm products. Nor is variability in food production and prices expected to subside, thanks to climate change, sporadic and unpredictable government grain stock-holding, and biofuel mandates.[3] One might therefore expect the recent trend and fluctuations of rates of assistance to agriculture to continue. In particular, people and governments in emerging/industrializing economies – especially large ones such as China, India and Indonesia – may well feel more food-insecure as their farm

[3] On the other hand, the rise in the share of global rice production that is traded internationally (from less than 4 percent in 1990 to 6 percent in 2000 and 8 percent in 2007) has helped to make international rice prices less volatile; and the re-emergence of Myanmar into the international rice market is now adding to that trade propensity.

sectors become less competitive while their food and feed demands grow and international food prices continue to fluctuate. Continuing growth in their agricultural protection cannot be ruled out therefore, even if international food prices remain high (Anderson and Nelgen 2011; Anderson et al. 2012). That will raise their domestic prices of foods increasingly above those at their borders,[4] thereby undermining food security for all their households except those that are net sellers of food.

As for fluctuations in NRAs around trend, past behavior leads one to expect both high-income and developing country governments to continue to alter their food trade restrictions so as to insulate their domestic markets somewhat from international food price volatility. For the reasons laid out earlier, this behavior will continue to amplify price fluctuations in the international market and, if both exporting and importing countries continue to respond similarly, such interventions will keep being rather ineffective in preventing fluctuations in domestic food prices. How severe such volatility might be will depend on the size of any unanticipated exogenous shocks to world food markets and the global stocks-to-use ratios of the affected products at the time of any such exogenous shocks (Wright 2011). If stocks were to be very low when harvests failed in significant regions, food price spikes of the magnitude experienced in mid-2008, early 2011 and late 2012 could well be repeated under current policies.

The above empirical evidence supports the view that national trade restrictions add non-trivially to international food price volatility in at least two ways: through 'thinning' international food markets, and through 'insulating' domestic food markets from international price fluctuations. Both policy attributes magnify the effect on international prices of any shock to global food supply or demand.

The solution to the first ('thinning') problem is simply for countries to open further their markets to food trade. The political difficulty and the adjustment costs associated with doing that are minimized if countries can agree to liberalize their food and agricultural markets multilaterally, and to do so at the same time as non-agricultural markets are liberalized. That was what happened in the Uruguay Round, and it is what has been aspired to by members of the World Trade Organization (WTO) via their Doha Development Agenda (DDA). After more than a decade of negotiating, the DDA has come to a standstill. While prospects look dim (see Bureau and Jean 2013), there is still some hope that the talks will be revived. Meanwhile, various plurilateral negotiations on options for regional integration and free-trade areas are under discussion, but the benefits from them are always far smaller than those from a multilateral agreement – and often agriculture is the sector liberalized least.

The optimal global solution to the second ('insulating') problem also involves the WTO. In a many-country world, it is clear from the above analysis that the trade policy actions of individual countries can be offset by those of other countries to the point that the interventions become ineffective in achieving their stated aim of reducing domestic food price volatility. This is a classic international public good problem that could be solved by a

[4] Such a trend is already evident for China: its agricultural NRA rose from -3 to 21 percent between 1999 and 2010 (Anderson and Nelgen 2013, based on PSE estimates by OECD 2012). This has been sufficient to maintain self sufficiency in all key farm products except soybean (whose tariff is bound in the WTO at 3 percent and which mostly goes into livestock feed and so helps maintain apparent self sufficiency in meat and milk). In Indonesia, its agricultural NRA rose from -3 to 27 percent between 1999 and 2010 (Anderson and Nelgen 2013), and in November 2012 a new Food Law was introduced in Indonesia to make food self-sufficiency an even stronger policy goal. In India, its agricultural NRA rose from 8 to 25 percent between 1999 and 2006, before dropping back as export restrictions were introduced to reduce the rise in domestic food prices (Anderson and Nelgen 2013).

multilateral agreement to restrain the variability of trade restrictions. The results summarized in Table 3 suggest Sub-Saharan Africa should support such an initiative.

In the current Doha round of WTO negotiations there are proposals to phase out agricultural export subsidies as well as to bring down import tariff bindings, both of which would contribute to more-stable international food prices. However, proposals to broaden the Doha agenda to also introduce disciplines on export restraints have struggled to date to gain traction.

In the absence of a multilateral agreement to desist from such border interventions, numerous economists have argued that national governments potentially have a role to play in stabilizing their domestic food prices, especially if their country has incomplete capital and insurance markets (e.g., Newbery 1989; Timmer 1989, 2011).

However, as Timmer and others readily acknowledge,[5] actions by governments when markets are volatile are difficult to perfect. Indeed they can be so imperfect as to exacerbate the perceived problem, making government failure worse than market failure. Perhaps that is why a survey of 14 developing countries' policy responses to the food price crisis of 2008 found that domestic grain prices in several African countries rose more – and stayed higher for longer – than international prices (Baltzer 2013).[6]

Even if WTO member countries were to further liberalize their food trade and to bind their trade taxes on exports as well as imports at low or zero levels, there would still be occasions when international food prices spike. Financial instruments are becoming increasingly available for the most-affluent of farmers to use to stabilize their consumption (Byerlee et al. 2006), but they are unlikely to help poor farmers and net buyers of food. This raises the question as to what alternative instruments national governments could use to avert losses for significant (especially poor) groups in their societies from price volatility. To date they have used a wide range of policy instruments, as was clearly revealed in 2008 (Bryan 2013).

The standard advice of mainstream economists is that the most important aspect of food security, namely food affordability for the poor, is best dealt with using generic social safety net measures that offset the adverse impacts of a wide range of different shocks on poor people without imposing the costly by-product distortions that necessarily accompany the use of n^{th}-best trade policy instruments for social protection. Those measures might include targeted income supplements to only the most vulnerable households, and only while the price spike lasts.

This standard answer has often been ignored by developing country governments. One reason is that trade taxes have been a large contributor to treasuries of poor countries (Tanzi 1987; Besley and Persson 2013), so it has been claimed that such payments are unaffordable because of the fiscal outlay involved and the high cost of administering such handouts in poor countries. Recall, however, that in the case of a spike in international food prices, food-importing countries' governments *reduce* their trade tax rates, so even that intervention may strain the budget of many finance ministries. In any case, the option of using value-added

[5] His answer to his question as to "whether this can be done *effectively* and *efficiently* is no, unless the country has planned well ahead for such a contingency and already has an operational food price stabilization program in place" (Timmer 2011).

[6] This is ironic because, at least in the more-rapidly growing countries of Africa, self-assessments reveal many citizens were not feeling less food-secure in 2008: exogenous declines in poverty outweighed the effect of the food price spike (Headey 2013; Verpoorten et al. 2013).

taxes in place of trade taxes to raise government revenue has become a more common practice in even low-income countries over the past decade or two.

Another reason often given for not using generic social safety nets is that "unless the country is already running a cash transfer program to the poor, the emergence of a food price crisis is too sudden for an effective government response" (Timmer 2011). Should a country decide that it could be a cost-effective instrument, however, then it would make sense to put it in place now, before the next crisis hits.

Some also argue that social safety nets have not been able to target accurately the most-needy groups. That criticism, however, applies far more to the use of trade policy instruments to lower loss aversion: low transmission of an upward (downward) spike in international food prices helps net buyers in proportion to expenditure on food (net sellers in proportion to marketed output), and so is regressive. This regressive feature of price stabilization schemes has been shown to apply even in very poor rural areas. Bellemare et al. (2013) examine this issue for Ethiopia and find that it is the large net sellers of food who would benefit most from pure price stabilization.

There is yet another reason why social safety nets are likely to become more commonly used in place of price and trade policy instruments for dealing with food price fluctuations. It has to do with the digital information and communication technology (ICT) revolution. The ICT revolution has made it possible for conditional cash transfers to be provided electronically as direct assistance to even remote and small households, and even to the most vulnerable members of those households (typically women and their young children). This is happening even in settings where few have bank accounts: thanks to the rapid spread of cellphone use, households have a low-cost alternative to a traditional bank account.[7]

Finally on long-run concerns, what if countries are unsatisfied with the contribution of their farmers to national food security, as reflected in food self-sufficiency ratios, or feel their farmers are missing out on the benefits of rapid economic growth and industrialization? Again agricultural import protection measures are far from first-best ways of dealing with

[7] Evidence of the practical workability of such social safety net programs in developing countries is growing rapidly. Skoufias et al. (2010) reveal how well it has worked during a food crisis in the large country of Indonesia. Hoddinott and Wiesman (2010) explore such programs in Mexico and two much smaller and poorer countries, namely Honduras and Nicaragua. Those authors' nuanced study concludes that exposure to these programs raised both the quantity of calories consumed and the quality of the recipients' diets, with the benefits being most pronounced among the poorest households. Adado and Bassett (2012) look further into this issue in six southern African countries: Kenya, Malawi, Mozambique, Namibia, South Africa and Zambia. They too find substantial improvements in the quantity and quality of food consumed by recipients in poor households. They also note that the benefits could be even greater with complementary activities such as nutrition counseling and micro-nutrient supplements. Following a survey of results on consumption from a wide range of Latin American countries plus Cambodia, Fiszbein and Schady (2009, Ch. 4) conclude that conditional cash transfers have had substantial positive impacts on consumption and on poverty alleviation. Prospective offsetting effects that were a source of concern when such programs were created do not appear to have been sufficiently large as to offset the benefits of the transfer. For example, the schemes do not seem to reduce the labour supply of adults or to crowd out private transfers. They do reduce child labour but this has only a modest impact on household income and consumption (see also Edmonds and Schady 2012). And some programs increase productive investment, which boosts and sustains the impact on poverty. The latter is further supported by evidence from Mexico reported in Gertler et al. (2012), who find that one-quarter of cash transfers were invested in productive activities, thereby ensuring sustained higher living standards even after such programs end. Even schemes that are based on communities targeting the poor have been found to not suffer from favouring non-needy friends (Alatas et al. 2012). A caveat of importance in countries suffering from high inflation, however, is to ensure cash transfers are indexed appropriately to prevent undermining their purchasing power. This was a lesson learned during Ethiopia's high-inflation period of 2008 (Sabates-Wheeler and Devereux 2010).

these socio-political concerns. Alternative measures include subsidizing investments in agricultural R&D, in rural education and health, and in roads and other rural infrastructure improvements. If the social rates of return from those investments are currently high and above private rates of returns, as is typically the case in developing countries (Fan 2008; Mogues and Benin 2012; Mogues et al. 2012), expanding such investments will be economically beneficial. So too could be improvements in land and water institutions that determine property rights and prices for those key farm inputs. Such investments and institutional reforms could also be targeted to help developing countries adapt to climate change, the need for which is expected to be especially great in tropical settings (Ahmed et al. 2012; Hertel and Lobell 2012). Almost certainly those reforms would reduce poverty and boost food security in the long run, including through raising net farm incomes while lowering the consumer price of food in towns and cities.

The political challenge of encouraging countries to switch from trade to domestic policy instruments for addressing non-trade domestic concerns is evidently non-trivial. Yet the evidence summarized above shows some reform has been possible during the past three decades. It also appears to have been growth-enhancing in Africa (Anderson and Brueckner 2012), which in turn indirectly contributes to poverty alleviation and food security. With luck, the emergence of new, lower-cost social protection mechanisms involving conditional cash e-transfers might edge governments one more step away from the use of beggar-thy-neighbor trade measures.

References

Adato, M. and L. Bassett. 2012. Cash transfers, food consumption, and nutrition. Ch. 8 in *Social protection and cash transfers to strengthen families affected by HIV and AIDS*, Adato and Bassett, eds. Washington DC: International Food Policy Research Institute.

Ahmed, S.A, N. Diffenbaugh, T.W. Hertel and W. Martin. 2012. Agriculture and trade opportunities for Tanzania: Past volatility and future climate change. *Review of Development Economics* 16(3): 429–47.

Alatas, V., A, Banerjee, R. Hanna, B.A. Olken and J. Tobias. 2012. Targeting the poor: Evidence from a field experiment in Indonesia. *American Economic Review* 102(4): 1206-40.

Anderson, K. (ed.) 2009. *Distortions to agricultural incentives: A global perspective, 1955–2007*. London: Palgrave Macmillan and Washington DC: World Bank.

Anderson, K. 2010. Krueger/Schiff/Valdés Revisited: Agricultural price and trade policy reform in developing countries since the 1980s. *Applied Economic Perspectives and Policy* 32(2): 195-231.

Anderson, K. and M. Brueckner. 2012. *Distortions to agriculture and economic growth in Sub-Saharan Africa.* World Bank Policy Research Working Paper 6206, Washington DC, September.

Anderson, K., J. Cockburn and W. Martin (eds.) 2010. *Agricultural price distortions, inequality and poverty.* Washington DC: World Bank.

Anderson, K., J. Cockburn and W. Martin. 2011. Would freeing up world trade reduce poverty and inequality? The vexed role of agricultural distortions. *The World Economy* 34(4): 487-515.

Anderson, K., Y. Hayami and Others. 1986. *The political economy of agricultural protection: East Asia in international perspective*. London: Allen and Unwin.

Anderson, K., M. Ivanic and W. Martin. 2014. Food price spikes, price insulation and poverty. In *The economics of food price volatility***,** J.-P. Chavas, D. Hummels and B. Wright, eds. Chicago and London: University of Chicago Press for NBER (forthcoming).

Anderson, K., M. Kurzweil, W. Martin, D. Sandri and E. Valenzuela. 2008. Measuring distortions to agricultural incentives, revisited. *World Trade Review* 7(4): 1-30.

Anderson, K. and W. Martin (eds.) 2009. *Distortions to agricultural incentives in Asia*, Washington DC: World Bank.

Anderson, K. and W. Masters (eds.) 2009. *Distortions to agricultural incentives in Africa*. Washington DC: World Bank.

Anderson, K. and S. Nelgen. 2011. What's the appropriate agricultural protection counterfactual for trade analysis? Ch. 13 (pp. 325-54) in *The Doha development agenda: An assessment,* W. Martin and A. Mattoo, eds. London: Centre for Economic Policy Research and the World Bank.

Anderson, K. and S. Nelgen. 2012. Agricultural trade distortions during the global financial crisis. *Oxford Review of Economic Policy* 28(2): 235-60.

Anderson, K. and S. Nelgen. 2013. *Updated national and global estimates of distortions to agricultural incentives, 1955 to 2011*. World Bank, Washington DC, www.worldbank.org/agdistortions.

Anderson, K., G. Rausser and J.F.M. Swinnen. 2013. Political economy of public policies: Insights from distortions to agricultural and food markets. *Journal of Economic Literature* 50(2): (forthcoming).

Anderson K. and A. Strutt .2013. Emerging economies, productivity growth, and trade with resource-rich economies by 2030. *Australian Journal of Agricultural and Resource Economics* 57(3): (forthcoming).

Anderson, K., and J. Swinnen (eds.) 2008. *Distortions to agricultural incentives in Europe's transition economies*. Washington DC: World Bank.

Anderson, K. and A. Valdés (eds.) 2008. *Distortions to agricultural incentives in Latin America.* Washington DC: World Bank.

Anderson K. and E. Valenzuela. 2008. *Estimates of global distortions to agricultural incentives, 1955 to 2007*. World Bank, Washington DC, accessible at www.worldbank.org/agdistortions.

Anderson K., E. Valenzuela and D. van der Mensbrugghe. 2010. Global welfare and poverty effects: The linkage model results. Ch. 2 in *Agricultural price distortions, inequality and poverty,* K. Anderson, J. Cockburn and W. Martin, eds. Washington DC: World Bank.

Arvis, J.-F., Y. Duval, B. Shepherd and C. Utoktham. 2012. *Trade costs in the developing world: 1995 – 2010*. ARTNeT Working Paper 121. Bangkok: UN ESACP, accessible at www.unescap.org/tid/artnet/pub/wp.asp

Baldwin, R.E. and J. Lopez-Gonzales. 2013. Supply-chain trade: A portrait of global patterns and several testable hypotheses. CEPR Discussion Paper 9421. London.

Baltzer, K. 2013. *International to domestic price transmission in fourteen developing countries during the 2007-08 food crisis*. WIDER Working Paper 2013/031. Helsinki: United Nations University.

Bellemare, M.F., C.B. Barrett and D.R. Just. 2013. *The welfare effects of commodity price volatility: Evidence from rural Ethiopia.* Mimeo. Cornell University.

Besley, T.J. and T. Persson. 2013. *Taxation and development*. CEPR Discussion Paper 9307, London. (Forthcoming in *Handbook of Public Economics,* A. Auerbach, R. Chetty, M. Feldstein and E. Saez, eds. Amsterdam: Elsevier.)

Bryan, S. 2013. *A cacophony of policy responses: Evidence from fourteen countries during the 2007/08 food price crisis*. WIDER Working Paper 2013/29. Helsinki United Nations University.

Bureau, J-C. and S. Jean. 2013. Trade liberalization in the bio-economy: Coping with a new landscape. *Agricultural Economics* 44(S): (forthcoming).

Byerlee, D., T.S. Jayne, and R.J. Myers. 2006. Managing food price risks and instability in a liberalizing market environment: Overview and policy options. *Food Policy* 31(4): 275–87.

Edmonds, E.V. and N. Schady. 2012. Poverty alleviation and child labor. *American Economic Journal: Economic Policy* 4(4): 100-24.

Fan, S. 2008. *Public expenditures, growth, and poverty in developing countries: Lessons from developing countries.* Baltimore MD: Johns Hopkins University Press.

FAO. 2012. *The state of food insecurity 2012.* Rome: FAO.

Fiszbein, A. and N. Schady (with F.H.G. Ferreira, M. Grosh, N. Kelleher, P. Olinto and E. Skoufias). 2009. *Conditional cash transfers: Reducing present and future poverty*. Policy Research Report. Washington DC: World Bank.

Gertler, P., S. Martinez and M. Rubio-Codina. 2012. Investing cash transfers to raise long-term living standards. *American Economic Journal: Applied Economics* 4(1): 164-92.

Hanson, G.H. 2012. The rise of middle kingdoms: Emerging economies in global trade. *Journal of Economic Perspectives* 26(2): 41-63.

Headey, D.D. 2013. The impact of the global food crisis on self-assessed food security. *World Bank Economic Review* 27(1): 1-27.

Hertel, T.W. and D.B. Lobell. 2012. *Agricultural adaptation to climate change in rich and poor countries: Current modeling practice and potential for empirical contributions*. GTAP Working Paper No. 72. West Lafayette: Purdue University.

Hoddinott, J. and D. Wiesmann. 2010. The impact of conditional cash transfer programs on food consumption. Ch. 11 in *Conditional cash transfers in Latin America,* M. Adato and J. Hoddinott (eds.). Baltimore MD: Johns Hopkins University Press.

IFPRI. 2012. *Global hunger index.* Washington DC: IFPRI.

Krueger, A.O., M. Schiff and A. Valdés. 1988. Agricultural incentives in developing countries: Measuring the effect of sectoral and economy-wide policies. *World Bank Economic Review* 2(3): 255-72.

Krueger, A.O., M. Schiff and A. Valdés. 1991. *The political economy of agricultural pricing policy, volume 1: Latin America, volume 2: Asia, and volume 3: Africa and the Mediterranean,* Baltimore MD: Johns Hopkins University Press for World Bank.

Lerner, A. 1936. The symmetry between import and export taxes. *Economica* 3(11): 306–13.

Lloyd, P.J. 1974. A more general theory of price distortions in an open economy. *Journal of International Economics* 4(4): 365-86.

Martin, W. and K. Anderson. 2012. Export restrictions and price insulation during commodity price booms. *American Journal of Agricultural Economics* 94(2): 422-27.

Mogues, T. and S. Benin (eds.) 2012. *Public expenditures for agricultural and rural development in Africa*. London: Routledge.

Mogues, T., B. Yu, S. Fan and L. McBride. 2012. *The impacts of public investment in and for agriculture: Synthesis of the existing evidence*. Discussion Paper 01217. Washington DC: International Food Policy Research Institute.

Nerlove, M. 1972. Lags in economic behaviour. *Econometrica* 40(2): 221-52.

Newbery, D.M. 1989. The theory of food price stabilisation. *Economic Journal* 99: 1065-82.

OECD (Organisation for Economic Co-operation and Development). 2012. *Producer and Consumer Support Estimates*, online database accessed at www.oecd.org.

Ravallion, M., S. Chen and P. Sangraula. 2007. New evidence on the urbanization of poverty. *Population and Development Review* 33(4): 667-702.

Sabates-Wheeler, R. and S. Devereux. 2010. Cash transfers and high food prices: Explaining outcomes on Ethiopia's productive safety net programme. *Food Policy* 35(4): 274-85.

Skoufias, E., S. Tiwari and H. Zaman. 2010. *Can we rely on cash transfers to protect dietary diversity during food crises? Estimates from Indonesia*. Policy Research Working Paper 5548. Washington DC: World Bank.

Stolper, W.F. and P.A. Samuelson. 1941. Protection and real wages. *Review of Economic Studies* 9(1): 58-73.

Tanzi, V. 1987. Quantitative characteristics of the tax systems of developing countries. In *The theory of taxation for developing countries,* D. Newbery and N. Stern, eds. London and New York: Oxford University Press.

Timmer, C.P. 1989. Food price policy: The rationale for government intervention. *Food Policy* 14(1): 17-27.

Timmer, C.P. 2011. Managing price volatility: Approaches at the global, national, and household levels. Stanford Symposium Series on Global Food Policy and Food Security in the 21st Century. Stanford: Center on Food Security and the Environment.

Tyers, R. and K. Anderson. 1992. *Disarray in world food markets: A quantitative assessment*. Cambridge and New York: Cambridge University Press.

Valenzuela, E., D. van der Mensbrugghe and K. Anderson. 2009. General equilibrium effects of price distortions on global markets, farm incomes and welfare. In *Distortions to agricultural incentives: A global perspective, 1955-2007,* Anderson, K. (ed.). London: Palgrave Macmillan and Washington DC: World Bank.

Venables, A.J. 2004. Small, remote and poor. *World Trade Review* 3(3): 453-57.

Verpoorten, M., A. Arora, N. Stoop and J. Swinnen. 2013. Self-reported food insecurity in Africa during the food price crisis. *Food Policy* 39(1): 51-63.

Vousden, N. 1990. *The economics of trade protection*. Cambridge and New York: Cambridge University Press.

World Bank. 2013. *PovCal*, Washington DC: World Bank, accessed at http://econ.worldbank.org/povcalnet.

Wright, B.D. 2011. The economics of grain price volatility. *Applied Economic Perspectives and Policy* 33(1): 32–58.