



Centre for International  
Economic Studies

**Discussion Paper  
No. 1015**

**How do governments respond to food  
price spikes?  
Lessons from the past**

**Kym Anderson and Signe Nelgen**

*May 2010*

**University of Adelaide  
Adelaide 5005 Australia**

## CENTRE FOR INTERNATIONAL ECONOMIC STUDIES

The Centre was established in 1989 by the Economics Department of the Adelaide University to strengthen teaching and research in the field of international economics and closely related disciplines. Its specific objectives are:

- to promote individual and group research by scholars within and outside the Adelaide University
- to strengthen undergraduate and post-graduate education in this field
- to provide shorter training programs in Australia and elsewhere
- to conduct seminars, workshops and conferences for academics and for the wider community
- to publish and promote research results
- to provide specialised consulting services
- to improve public understanding of international economic issues, especially among policy makers and shapers

Both theoretical and empirical, policy-oriented studies are emphasised, with a particular focus on developments within, or of relevance to, the Asia-Pacific region. The Centre's Acting Director is Dr Ernesto Valenzuela (ernesto.valenzuela@adelaide.edu.au).

Further details are available from:

CIES  
School of Economics  
Adelaide University  
SA 5005 AUSTRALIA  
Telephone: (+61 8) 8303 5672  
Facsimile: (+61 8) 8223 1460  
Email: cies@adelaide.edu.au

Most publications can be downloaded from our Home page:  
<http://www.adelaide.edu.au/cies/>

ISSN 1444-4534 series, electronic publication

# How do governments respond to food price spikes? Lessons from the past

Kym Anderson  
University of Adelaide and CEPR  
[kym.anderson@deliaide.edu.au](mailto:kym.anderson@deliaide.edu.au)

and

Signe Nelgen  
University of Adelaide  
[signe.nelgen@googlemail.com](mailto:signe.nelgen@googlemail.com)

May 2010

This is a product of a World Bank research project on Distortions to Agricultural Incentives. The authors are grateful for helpful comments from workshop participants, and for funding from World Bank Trust Funds provided by the governments of the Netherlands (BNPP) and the United Kingdom (DfID) and from the Australian Research Council. The views expressed are the authors' alone and not necessarily those of the World Bank and its Executive Directors, nor the countries they represent, nor of the institutions funding this research.

**Corresponding author:** Kym Anderson, School of Economics, University of Adelaide, Adelaide, SA 5005, Australia; Phone +61 8 8303 4712, Fax +61 8 8223 1460, email: [kym.anderson@adelaide.edu.au](mailto:kym.anderson@adelaide.edu.au)

## **Abstract**

Food prices in international markets spiked upwards in 2008, doubling or more in a matter of months. Evidence is still being compiled on policy responses over the following two years, but new time series estimates of government intervention for the previous five decades allow insights into past policy responses to price fluctuations and spikes. This paper reviews the distortionary impacts of policies used by governments attempting to stabilize their domestic food markets. It then focuses on policy responses in the mid-1970s, as reflected in various annual indicators of distortions to producer and consumer incentives, before drawing out some policy lessons.

**Keywords:** Commodity price stabilization policies, Domestic market insulation, Distorted incentives, Agricultural and trade policies, Trade restrictiveness indexes

**JEL codes:** F14, Q17, Q18

# How do governments respond to food price spikes? Lessons from the past

Kym Anderson and Signe Nelgen

## 1. Introduction

Food prices in international markets spiked upwards in 2008, doubling or, in the case of rice, trebling in a matter of months. The magnitudes of the price rises, and the speed of their subsequent fall back to trend, were similar to those experienced in 1974. Figure 1 shows real international prices for the five years around the earlier and most-recent spikes for three key grains and for groundnut oil (which also is an important food staple in numerous low-income countries). On both occasions, the rising price generated panic buying by individual households, especially of rice in Asia, which exacerbated the international price spike. Both episodes also lead to urban food riots in numerous low-income countries, and in some instances to a change in government. It is understandable that in such settings governments feel the need to be seen to be doing something to lessen the impact on those adversely affected in their country.

[Inset Figure 1 about here]

Evidence is still being compiled on policy responses in 2008-10, but how have governments responded in the past, and in particular how did policies react to that mid-1970s price spike? The next section of the paper briefly reviews the domestic market insulation impacts of agricultural policies used in the past by governments attempting to stabilize their domestic food markets. Those impacts include protecting producers in times of downward international price spikes (as in 1986) as well as protecting consumers in periods of upward price spikes – in each case at the expense of the other domestic group who otherwise would

have benefitted from the price movement. The main section then examines in detail the policy responses as reflected in various annual indicators of distortions to producer and consumer incentives during the years 1972 to 1976. The final section of the paper draws together some policy lessons from this evidence of past government responses to food price spikes. In particular, it draws attention to the fact that when many countries seek to reduce gyrations in their domestic food markets by altering trade restrictions at their national border, such actions are collectively self-defeating: they reduce the role that global trade can play in dampening fluctuations in international prices, and they prolong the adjustment process.

## **2. Past domestic market stabilization efforts**

Governments of almost all countries deliberately seek to reduce fluctuations in domestic food prices and in the quantities available for local consumption. There is a huge analytical literature on the economics of such price stabilization efforts. Its connection with trade policy was highlighted by Johnson (1975) immediately following the upward spike in world food prices in 1973-74. His analysis of grain prices suggested that if free trade in grain was in place in 1975, prices would be so much less variable – because trade could mitigate local supply variability – that only negligible quantities of carryover/storage would be profitable. A subsequent study of global food trade provided complementary results: using a stochastic model of world markets for grains, livestock products and sugar, Tyers and Anderson (1992, Table 6.14) found that instability of international food prices in the 1980s was three times greater than it would have been under free trade in those products.

Such government intervention is in response to lobbying efforts from and society's concern for groups destined to otherwise lose from exogenous shocks (Thompson et al. 2004, Freund and Ozden 2008) – although it needs to be kept in mind that stabilizing prices is not

the same as stabilizing real incomes of the target households. An additional justification sometimes given for such intervention in poor countries is that credit markets are underdeveloped, or inefficient because of local monopoly lenders, so low-income consumers and producers have difficulty smoothing their consumption over time as prices fluctuate.

However, it is difficult for governments to stabilize even prices, let alone incomes for target households. Indeed, more than sixty years ago Hayek (1945) warned that such intervention is likely to lead to government failure that could reduce welfare more than the cost of the market failure it seeks to overcome, given the high cost of the information needed to do it well. The extensiveness of that required information is made clear in the seminal theoretical study by Newbery and Stiglitz (1981), and by the study of storage in particular by Williams and Wright (1991).

One way countries try to achieve their stabilization objectives is by varying the restrictions on their international trade in food according to seasonal conditions domestically and changes in prices internationally. Effectively this involves exporting domestic instability and not importing instability from abroad. A simulation exercise by Tyers (1991) suggests that between three-fifths and three-quarters of the global cost of OECD agricultural protection is due to the insulating component of high-income countries' policies. That practice has continued unabated despite the signing of numerous multilateral and preferential trade-liberalizing agreements over the past two decades.

Another indication of how much governments are intervening for stabilization purposes is provided by annual estimates of national nominal rates of assistance (NRAs). A NRA captures the extent to which the domestic producer price differs from the most comparable international price at a country's border. NRAs have been measured for all major farm products in more than 70 countries from the mid-1950s to 2007 in a recently completed study summarized in Anderson (2009). That study provides an ideal annual database for

analysing government responses to food price spikes, which is fully detailed in Anderson and Valenzuela (2008).

As a prelude to looking at those distortion estimates, it is illustrative to compare the movements in their two components, namely domestic and border prices. Pursell, Gulati and Gupta (2009), for example, report pertinent prices for rice in India which reveal that the Indian government has been able to maintain an almost-constant real domestic rice price for decades despite huge fluctuations in the international price of rice. Similar if less-complete attempts have been made by most governments of South and Southeast Asia and in parts of Sub-Saharan Africa where rice is also a key food staple (Figure 2). As a result, especially since Asia produces and consumes four-fifths of the world's rice (compared with about one-third of the world's wheat and maize), this market-insulating behavior of Asian and to a lesser extent African policy makers means that very little rice production has been traded internationally: less than 7 percent in 2000-04 (and less than 5 percent pre-1990), compared with 14 and 24 percent for maize and wheat. This insulating behavior of governments also means international prices are much more volatile for rice than for those other grains, as is evident for the two periods shown in Figure 1.

[Inset Figure 2 about here]

To get a sense of how much this practice varies across products, and whether it has changed much since policy reforms began around the mid-1980s, Table 1 reports the average across countries of the percentage point deviation each year of national NRAs for 12 key farm products around their trend value for the sub-periods before and from 1985. For most products that indicator is lower in the latter period, the exceptions being rice, wheat and (at least in developing countries) soybean. Rice had one of the smaller average deviations in the earlier period, but by the latter period rice shared the honour of the largest deviations with sugar and milk. Despite the general decline in deviations from trend, those annual percentage



point deviations since 1985 have been several times the average percentage NRA for the world as a whole (compare the final two columns of Table 1).

[Inset Table 1 about here]

That NRAs tend to be above trend in years of low international prices and conversely in years when international prices are high is clear from Table 2, which shows the extent of the negative correlation between the NRAs for various products and their international price. That coefficient globally and in high-income countries is negative for all but beef, and even in the various developing country regions it is negative in all but one-quarter of the cases. For almost all of those 12 products the (negative) regional correlation is highest for the South Asian region. Among the developing countries it is again rice, sugar and milk that have the highest correlation coefficients.

[Inset Table 2 about here]

The proportional deviation of the international price of a farm product from its long-run trend value each year turns out to be highly significant when added to equations aiming at explaining NRA differences in the Anderson and Valenzuela (2008) database for those 12 products over the full time series from 1955 to 2007. The other prospective explanatory variables are per capita income, an index of agricultural comparative advantage (farm land per capita) and a dummy for distinguishing export industries. Anderson et al. (2010) show that the price deviation variable is highly significant for the three grains, sugar, cotton and coffee, but is not significantly different from zero for non-staple livestock products and soybean.

Yet another way of capturing this insulation phenomenon statistically is to estimate the elasticity of transmission of the international product price to the domestic market. Following Tyers and Anderson (1992, pp. 65-75), a geometric lag formulation is used by Anderson et al. (2010) to estimate elasticities for each product for all focus countries for the

period 1985 to 2007. The average of estimates for the short run elasticity range from a low of 0.3 for sugar and milk to 0.5 for rice, wheat and pigmeat, 0.6 for cotton, cocoa, maize and poultry, and 0.7 for beef, soybean and coffee. The unweighted average across all of those 12 key products is 0.54, suggesting that within the first year little more than half the movement in international prices is transmitted domestically. Even the long run elasticity appears well short of unity after full adjustment: the average of the elasticities for those 12 products across the focus countries is just 0.69.

### **3. Changes in the extent of distortions during the food price spike of the mid-1970s**

We turn now to the responses to the most extreme food price spike prior to 2008, focusing on the five years around 1974. The effects of government actions are reflected in the movement of domestic relative to international prices and thus in estimated NRAs. These are reported in Appendix Table B for the three key grains, for the important food staple of groundnut oil, and for all farm products for which estimates are available in Anderson and Valenzuela (2008). In the case of rice, for example, the NRA for developing countries as a group was 7 percent in 1972, but it fell to -27 percent in 1973 and -55 percent in 1974 before recovering slowly to -24 percent in 1975 and -8 percent in 1976.

#### ***3.1 Nominal assistance coefficients***

To compare the extent of the fall and rise of food prices in developing countries with that in high-income countries (where assistance rates are much higher), it is easier if the NRA is converted to an NAC (nominal assistance coefficient, defined as  $1 + \text{NRA}/100$ ). The rice NAC for developing countries fell from 1.07 in 1972 to 0.45 in 1974, which is similar proportionally to the fall for high-income countries, whose NAC also more than halved over

that short period, from 2.65 to 1.24 (Table 3). That means rice was still protected in high-income countries even in 1974 ( $NAC > 1$ ), whereas in developing countries its domestic price averaged less than half the international price in that year.

[Inset Table 3 about here]

The NAC falls for wheat were not as severe as for rice, but were still substantial: from 1.24 in 1972 to 0.71 in 1973 for developing countries, and from 1.05 to 0.88 for high-income countries over the same 12-month period. For maize the NACs fell even less than for wheat, bottoming out a year later at 30 percent lower for developing countries and one-eighth lower for high-income countries. And the fall was smaller again for groundnut oil.

Considering all covered farm products, the NAC for developing countries fell by exactly one-third in the first two years before rising by almost the same amount in the subsequent two years. This was a little more than twice the extent of the fall and recovery for high-income countries, and is due mainly to Asia's developing countries (see bottom segment of Table 3). What is remarkable is that these U-shaped paths over that 5-year period for this large sample of 75 countries are the mirror image of the inverted U-shaped paths of the international prices shown in Figure 1. This is so even if the depths of the former are not quite as big as the heights of the latter in proportional terms – confirming that there is at least some transmission of the international price changes to domestic markets.

Table 4 reports for comparison the regional NRAs and regional consumer tax equivalents (CTEs) of agricultural policies. These two indicators are almost identical for high-income countries, reflecting the fact that most of the farm price distortions are coming from border measures in those countries. For developing countries, however, the CTEs are one-tenth lower initially than the NRAs (or rather their coefficient counterparts are), and they are negative on average, meaning consumers were paying less than they would under free

markets. However, note that the CTEs for developing countries decline less than do their NRAs by 1974, before rising back to slightly above their pre-shock level by 1976.

[Inset Table 4 about here]

### ***3.2 Welfare and trade reduction indexes***

The cost of government policy distortions to incentives in terms of inefficiency of resource use and consumer spending tends to be greater the greater the variation of NRAs and CTEs across industries/products within the agricultural sector. It is helpful to have a single indicator of the overall welfare effect of each country's regime of agricultural price distortions in place at any time, so as to be able to trace its path over time and make cross-country comparisons. To that end, the family of indexes first developed by Anderson and Neary (2005) under the catch-all name of trade restrictiveness indexes has been drawn upon to generate indicators of distortions imposed by each country's agricultural policies on its economic welfare, and also on its agricultural trade. Lloyd, Croser and Anderson (2010) define and estimate a Welfare Reduction Index (WRI) and a Trade Reduction Index (TRI) for the same 75 countries as included in this paper, taking into account the fact that for some covered products the NRA and CTE differ. As their names suggest, each of these two new indexes captures in a single partial equilibrium indicator the direct welfare- or trade-reducing effects of distortions to consumer and producer prices of covered farm products from all agricultural and food price and trade policy measures in place. Specifically, the WRI (or TRI) is that ad valorem trade tax rate which, if applied uniformly to all farm commodities in a country that year would generate the same reduction in economic welfare (or trade) as the actual cross-commodity structure of agricultural NRAs and CTEs for that country, other things equal.

The WRI measure reflects the partial equilibrium welfare cost of agricultural price-distorting policies better than the NRA because it recognizes that the welfare cost of a

government-imposed price distortion is related to the square of the price wedge. It thus captures the disproportionately higher welfare costs of peak levels of assistance or taxation within the farm sector, and is larger than the mean NRA/CTE and is positive regardless of whether the government's agricultural policy is favouring or hurting farmers. In this way the WRI and TRI go somewhat closer to what a computable general equilibrium can provide in the way of estimates of the welfare and trade (and other) effects of the price distortions captured by the product NRA and CTE estimates – and they have the advantage over a computable general equilibrium model of providing an annual time series.

Summaries of those two indexes are provided for the major regions in the lower half of Table 4. In 1972 the WRI was almost 50 percent for developing countries and almost 60 percent for high-income countries. Over the subsequent two years, that index went down by nearly one-third in high-income countries but hardly changed for developing countries – even though the NAC for developing countries fell by one-third. Almost the same is true for the TRI: no change for developing countries, but a big drop (a halving) for high-income countries. This suggests for developing countries that the dispersion of NRAs among farm industries increased in individual developing countries, for example because NRAs for export industries became more negative to a greater extent than NRAs for import-competing farm industries became less positive. For high-income countries, if most of the assistance for farmers is provided by import restrictions such as variable levies to stabilize domestic prices, one would expect those levies to be reduced as international prices rise.

### ***3.3 Contribution of different policy instruments to the aggregate indicators***

To test the possibility in the previous sentence, it is necessary to attribute each industry's NRA and CTE to a particular set of policy instruments. This is done in Table 5(a) for developing countries and Table 5(b) for high-income countries. The latter shows that in the

mid-1970s import restrictions were indeed the dominant form of assistance to farmers in high-income countries, with domestic and export subsidies accounting for less than one-sixth of the total NRA. Between 1972 and 1974 it was both import restrictions and export subsidies that contributed to the fall in the NRA for high-income countries, as they did to its subsequent rise.

[Inset Table 5 about here]

For developing countries, by contrast, domestic price-depressing policies – especially export taxes – were the dominant policy instrument in 1972, although import restrictions and domestic producer subsidies played non-trivial roles as well. By 1974, though, import restrictions and domestic subsidies had been mostly suspended while the absolute contribution to the total NRA from export taxes and import subsidies hardly changed on average. As a result, the NRA for developing countries fell from 3 percent to -29 percent over those two years, before rising back to an average of almost zero again by 1976.

The contribution to the CTEs by different instruments was fairly similar to that for NRAs and so is not shown, but they are almost as important as the NRAs in terms of their contribution to the WRI and TRI. To attribute those index values to different policy instruments requires doing it separately for the producer and consumer sides of the market: each instrument share is computed by first converting the index percentage to constant 2000 \$US billions by multiplying it by the average value of production or consumption for that instrument group at the country level, and then dividing the dollar amount for each instrument by the country average value of production or consumption. The weighted average of the production and consumption components could give an overall attribution, but for the sake of transparency they are shown separately in Tables 6 and 7.

[Inset Tables 6 and 7 about here]

For high-income countries, their WRI fall of one-third and the halving of their TRI by 1974 are virtually all due to import measure changes, and the contribution from the consumption side is only a little greater than that from the production side. By 1976, however, both the WRI and TRI had risen by more than they had fallen in the previous two years, and both production and consumption of farm products in high-income countries were more distorted immediately after than before the price spike.

For developing countries, the situation summarized in Tables 6 and 7 is more complex. First, because the export tax instrument dominated in 1972 for developing countries, the contribution to both indexes from the production side is greater than from the consumption side. Second, even though their average WRI and TRI did not increase by 1974, each of the two component parts did and especially on the production side. And third, those increases are all due to increases in export restrictions and some import subsidies and are despite substantial falls in the contributions from import restrictions.

#### **4. Lessons from the past**

Clearly a lot happened to global agricultural market distortions during the brief spike in international prices of farm products in the mid-1970s. By way of summary, the key points that emerged from the above analysis are the following:

- The magnitudes of the price rises in 1973-74, and the speed of their subsequent fall, were very similar to those experienced in 2006-10;
- National NRAs tend to be above trend in years of low international prices and conversely in years when international prices are high;

- The NAC for developing countries fell by exactly one-third between 1972 and 1974 before rising by almost the same amount in the subsequent two years, which was slightly more than twice the extent of the NAC fall and recovery for high-income countries;
- By contrast, the WRI (TRI) went down by almost one-third (nearly halved) in high-income countries but hardly changed for developing countries between 1972 and 1974 – even though the NAC for developing countries fell by one-third, suggesting that the dispersion of NRAs among farm industries increased in individual developing countries;
- Between 1972 and 1974 it was both import restrictions and export subsidies that contributed to the fall in the NRA for high-income countries, as they did to its subsequent rise;
- For developing countries, where export taxes were the dominant policy instrument in 1972 (although import restrictions and domestic producer subsidies played non-trivial roles as well), their import restrictions and domestic subsidies were mostly suspended by 1974 while the absolute contribution to the total NRA from export taxes and import subsidies hardly changed over those two years;
- For high-income countries, their WRI fall of one-third and the halving of their TRI by 1974 are virtually all due to import measure changes, but by 1976 both the WRI and TRI had risen by more than they had fallen in the previous two years, indicating that agriculture in high-income countries was more distorted immediately after than before that mid-1970s price spike.

These findings for the mid-1970s, together with the broader findings in Section 2 of a tendency for governments to use border measures to reduce the variability of domestic food



prices in general, are not dissimilar to what appeared to be the case in the most recent food price spike – although the data are not yet available to confirm that anecdotal impression.

That beggar-thy-neighbor dimension of each government's food policies ought to be of concern. It is worrying because it reduces the role that trade between nations can play in bringing stability to the world's food markets: the more countries insulate their domestic markets, the more other countries perceive a need to do likewise, exacerbating the effect on world prices such that even greater changes in each nation's NRAs are desired. By increasing the volatility of world markets as they seek to reduce domestic volatility, such actions by national governments are collectively self-defeating. Clearly there is scope for multilateral agreement to desist. The World Trade Organization (WTO) is the most obvious place to seek restraints on varying trade restrictions (exports as well as imports), but the initial responses to proposals along these lines in the WTO's current Doha round of trade negotiations has been at best cool to date. It remains to be seen whether, over time, responses become warmer or even cooler with the expected increase in volatility of international food markets as climate change adds to the frequency of extreme weather events around the world.

## References

Anderson, J.E. and J.P. Neary (2005), *Measuring the Restrictiveness of International Trade Policy*, Cambridge MA: MIT Press.

Anderson, K. (ed.) (2009), *Distortions to Agricultural Incentives: A Global Perspective, 1955-2007*, London: Palgrave Macmillan and Washington DC: World Bank.

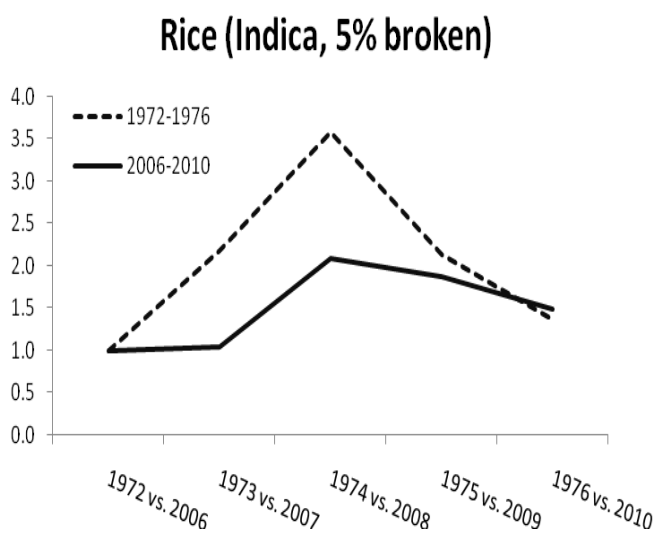
Anderson, K. (ed.) (2010), *The Political Economy of Agricultural Price Distortions*, Cambridge and New York: Cambridge University Press (forthcoming).

- Anderson, K., J.L. Croser, D. Sandri and E. Valenzuela (2010), “Agricultural Distortion Patterns Since the 1950s: What Needs Explaining”, Ch. 2 in Anderson (2010).
- Anderson, K., J. Cockburn and W. Martin (eds.) (2010), *Agricultural Distortions, Inequality and Poverty*, Washington DC: World Bank.
- Anderson, K. and J.L. Croser (2009), *National and Global Agricultural Trade and Welfare Reduction Indexes, 1955 to 2007*, database available at [www.worldbank.org/agdistortions](http://www.worldbank.org/agdistortions)
- Anderson, K. and W. Martin (eds.) (2009), *Distortions to Agricultural Incentives in Asia*, Washington DC: World Bank.
- Anderson, K. and E. Valenzuela (2008), *Global Estimates of Distortions to Agricultural Incentives, 1955 to 2007*, data spreadsheets at [www.worldbank.org/agdistortions](http://www.worldbank.org/agdistortions)
- Freund, C. and C. Ozden (2008), “Trade Policy and Loss Aversion”, *American Economic Review* 98(4): 1675-1691, September.
- Hayek, (1945), ‘On the Use of Information in Society’, *American Economic Review* 35(4): 519-30, September.
- Johnson, D.G. (1975), “World Agriculture, Commodity Policy, and Price Variability”, *American Journal of Agricultural Economics* 57(5): 823-28, December.
- Lloyd, P.J., J.L. Croser and K. Anderson (2010), “Global Distortions to Agricultural Markets: New Indicators of Trade and Welfare Impacts, 1960 to 2007”, *Review of Development Economics* 14(2): 141-60, May.
- Newbery, D.M.G. and J.E. Stiglitz (1981), *The Theory of Commodity Price Stabilization: A Study in the Economics of Risk*, London: Oxford University Press.
- Pursell, G., A. Gulati and K. Gupta (2009), “India”, Ch. 10 in Anderson and Martin (2009).

- Thompson, S.R., P.M. Schmitz, N. Iwai and B.K. Goodwin (2004), ‘The Real Rate of Protection: The Income Insurance Effects of Agricultural Policy’, *Applied Economics* 36: 1-8.
- Tyers, R. (1991), “On the Neglect of Dynamics, Risk and Market Insulation in the Analysis of Uruguay Round Food Trade Reforms”, *Australian Journal of Agricultural Economics* 35(3): 295-313, December.
- Tyers, R. and K. Anderson (1992), *Disarray in World Food Markets: A Quantitative Assessment*, Cambridge and New York: Cambridge University Press.
- Williams, J.C. and B.D. Wright (1991), *Storage and Commodity Markets*, Cambridge and New York: Cambridge University Press.

Figure 1: Indexes of real international prices of rice, wheat, maize and groundnut oil, 1972-76 (1972 = 100) and 2006-10 (2006 = 100)

(a) Rice



(b) Wheat

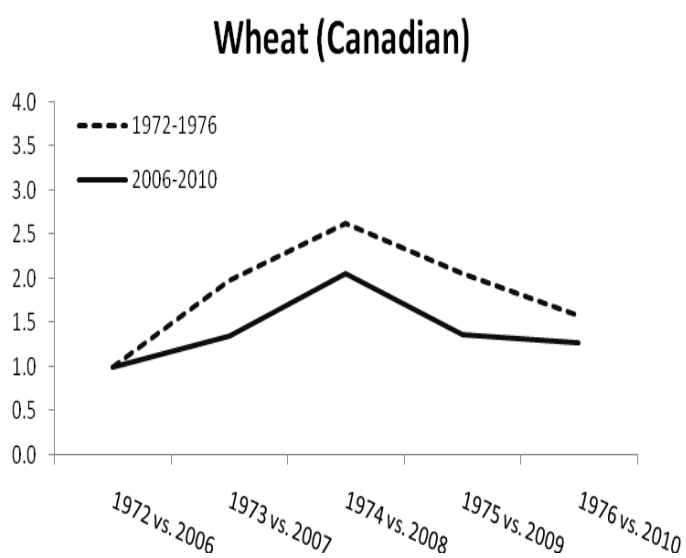
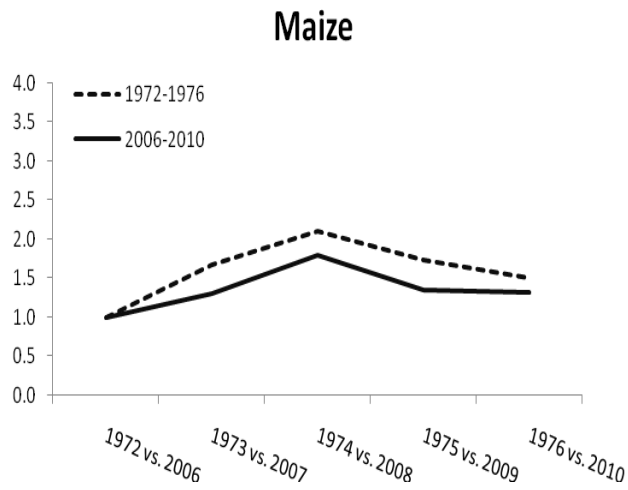
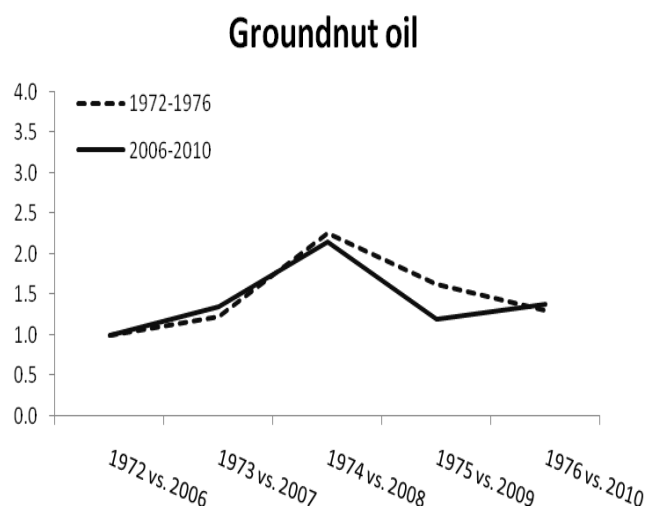


Figure 1 (continued): Indexes of real international prices of rice, wheat, maize and groundnut oil, 1972-76 (1972 = 100) and 2006-10 (2006 = 100)

(c) Maize



(d) Groundnut oil

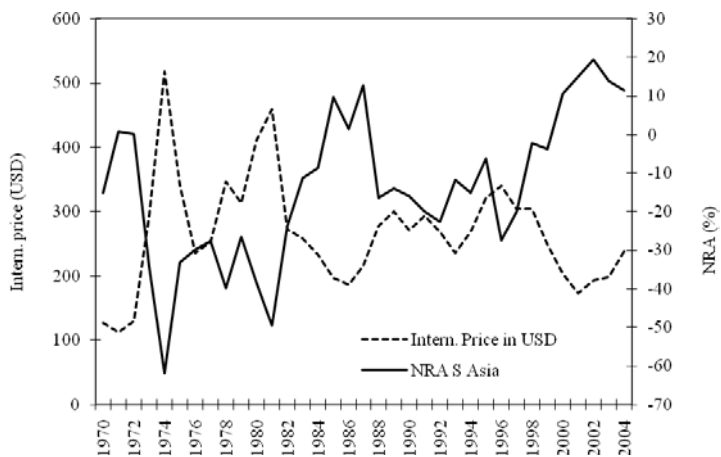


Source: Authors' derivation drawn from World Bank *Pink Sheets* of nominal prices deflated by the United States GDP implicit price deflator (see Appendix Table A).

Figure 2: Rice NRAs and international rice price, South and Southeast Asia, 1970 to 2005

(left axis is int'l price in current US dollars, right axis is weighted average NRA in percent)

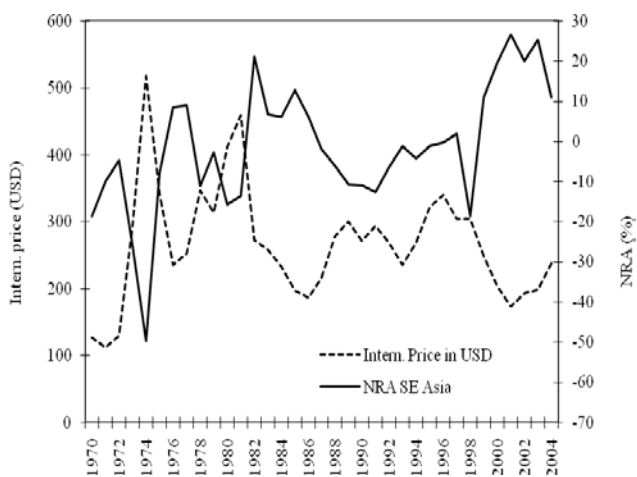
(a) South Asia



Correlation coefficient is -0.79

Note: Countries included are Bangladesh (except for 1970-73), India, Pakistan, Sri Lanka.

(b) Southeast Asia



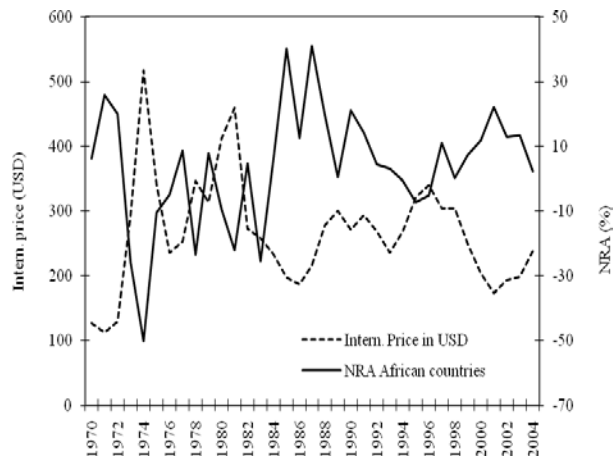
Correlation coefficient is -0.56

Note: Countries included are Indonesia (except for 1970-74), Malaysia, Philippines, Thailand and Vietnam (except for 1970-85).

Figure 2 (continued): Rice NRAs and international rice price, South and Southeast Asia, 1970 to 2005

(left axis is int'l price in current US dollars, right axis is weighted average NRA in percent)

(c) Sub Saharan Africa



Correlation coefficient is -0.72

Note: Countries included are Cote d'Ivoire, Ghana (except for 1983), Madagascar, Mozambique (except for 1970-75, 1997-98, 2002-04), Nigeria, Senegal, Tanzania (except for 1970-75), Uganda, Zambia.

Source: Authors' compilation based on data in Anderson and Valenzuela (2008).

Table 1: Deviation of national NRA around its trend value,<sup>a</sup> 12 key covered farm products,<sup>b</sup> developing, high-income and all focus countries, 1965-84 and 1985-2004

(NRA percentage points)

	Developing countries		High-income countries		All focus countries		Global NRA average, % <sup>c</sup>
	1965-1984	1985-2004	1965-1984	1985-2004	1965-1984	1985-2004	1985-2004
<b>Grains, oils, sugar</b>							
Rice	32	64	66	229	37	103	28
Wheat	33	47	80	91	56	65	18
Maize	36	33	53	58	43	41	7
Soybean	46	117	75	61	56	94	3
Sugar	53	66	179	173	132	116	42
<b>Tropical cash crops</b>							
Cotton	38	33	42	28	35	32	-5
Coconut	22	20	na	na	22	20	-21
Coffee	41	27	na	na	41	27	-12
<b>Livestock products</b>							
Milk	76	69	239	190	200	137	88
Beef	45	52	128	127	101	93	43
Pigmeat	81	60	92	77	90	62	3
Poultry	109	74	164	197	145	134	21

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

<sup>b</sup> Unweighted average of national deviations.

<sup>c</sup> For comparative purposes, the weighted average NRA is shown for all focus countries for the latter period.

Source: Anderson et al. (2010).



Table 2: Coefficient of correlation between regional NRA and international price, 12 key covered farm products,<sup>a</sup> various regions, 1965 to 2007

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

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

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

Source: Source: Anderson et al. (2010).

Table 3: Nominal assistance coefficients<sup>a</sup> for rice, wheat, maize, groundnuts and all farm products, key country groups, 1972 to 1976

	(percent)				
	1972	1973	1974	1975	1976
<b>Rice</b>					
Asia (excl. Japan)	1.07	0.72	0.43	0.76	0.92
Africa	0.98	0.61	0.36	0.60	0.82
Latin America	1.00	1.04	0.84	0.90	0.98
All developing countries	1.07	0.73	0.45	0.76	0.92
High-income countries	2.65	1.84	1.24	1.72	2.33
<b>Wheat</b>					
Asia (excl. Japan)	1.31	0.72	0.83	0.97	0.94
Africa	1.19	0.85	0.67	0.87	1.00
Latin America	0.89	0.59	0.57	0.93	1.02
All developing countries	1.24	0.71	0.75	0.95	0.96
High-income countries	1.05	0.88	0.88	0.97	0.93
<b>Maize</b>					
Asia (excl. Japan)	1.52	1.17	1.04	0.82	1.03
Africa	1.03	0.90	0.69	0.83	0.92
Latin America	1.06	0.89	0.81	0.85	0.84
All developing countries	1.18	0.98	0.83	0.83	0.92
High-income countries	1.13	1.06	1.00	1.03	1.04
<b>Groundnut oil</b>					
Asia (excl. Japan)	1.08	1.00	1.00	0.69	0.86
Africa	0.51	0.46	0.48	0.53	0.57
Latin America	na	na	na	na	na
All developing countries	0.92	0.88	0.78	0.63	0.75
High-income countries	na	na	na	na	na
<b>All farm products</b>					
Asia (excl. Japan)	1.18	0.90	0.69	0.87	1.04
Africa	0.83	0.75	0.70	0.80	0.79
Latin America	0.73	0.69	0.58	0.65	0.85
All developing countries	1.01	0.83	0.67	0.82	0.96
High-income countries	1.32	1.19	1.14	1.25	1.36

<sup>a</sup> Nominal assistance coefficient,  $NAC = 1 + NRA/100$

Source: Authors' compilation based on data in Anderson and Valenzuela (2008)

Table 4: NRAs, CTEs, WRIs and TRIs, all covered farm products, by region, 1972 to 1976

	1972	1973	1974	1975	1976
<b>NRA (%)</b>					
Asia (excl. Japan)	18	-10	-31	-13	4
Africa	-17	-25	-30	-20	-21
Latin America	-27	-31	-42	-35	-15
All developing countries	1	-17	-33	-18	-4
High-income countries	32	19	14	25	36
<b>CTE (%)</b>					
Asia (excl. Japan)	-5	-32	-28	-8	1
Africa	-9	-18	-25	-13	-6
Latin America	-19	-26	-35	-28	-9
All developing countries	-9	-28	-29	-12	-2
High-income countries	32	18	14	26	36
<b>WRI (%)</b>					
Asia (excl. Japan)	47	48	46	50	41
Africa	55	52	53	48	49
Latin America	38	41	52	49	27
All developing countries	47	47	48	49	40
High-income countries	59	43	41	51	72
<b>TRI (%)</b>					
Asia (excl. Japan)	29	25	24	36	25
Africa	19	18	23	25	31
Latin America	21	25	33	33	16
All developing countries	25	24	25	34	24
High-income countries	27	18	13	24	36

Source: Authors' compilation based on data in Anderson and Valenzuela (2008)

Table 5: Contributions to total agricultural NRA<sup>b</sup> from different policy instruments,<sup>a</sup> by region, 1972-76 (percent)

	1972	1973	1974	1975	1976
<b>(a) Developing countries</b>					
<b>Border measures</b>					
Import tax equivalent	22	2	2	8	6
Export subsidies	4	0	0	1	1
Export tax equivalent	-26	-18	-24	-22	-9
Import subsidy equivalent	-6	-5	-5	-2	-1
<b>ALL BORDER MEASURES</b>	<b>-22</b>	<b>-21</b>	<b>-28</b>	<b>-16</b>	<b>-4</b>
<b>Domestic measures</b>					
Production subsidies	26	7	1	1	1
Production taxes	-1	0	-3	-3	0
farm input net subsidies	0	0	0	1	1
Non-product-specific (NPS) assistance except to inputs	0	0	0	0	0
<b>ALL DOMESTIC PRODUCTION MEASURES</b>	<b>25</b>	<b>7</b>	<b>-1</b>	<b>-1</b>	<b>2</b>
<b>TOTAL NRA (including NPS and decoupled payments)</b>	<b>3</b>	<b>-14</b>	<b>-29</b>	<b>-17</b>	<b>-2</b>
<i>Producer subsidy equivalent, in real 2000 US\$ billion</i>	<i>7</i>	<i>-43</i>	<i>-141</i>	<i>-72</i>	<i>-9</i>
<b>(b) High-income countries</b>					
	1972	1973	1974	1975	1976
<b>Border measures</b>					
Import tax equivalent	25	18	15	21	30
Export subsidies	4	2	1	2	2
Export tax equivalent	0	-1	0	0	0
Import subsidy equivalent	-1	-3	-3	-1	-1
<b>ALL BORDER MEASURES</b>	<b>27</b>	<b>17</b>	<b>13</b>	<b>22</b>	<b>31</b>
<b>Domestic measures</b>					
Production subsidies	1	1	0	1	1
Production taxes	0	0	0	0	0
farm input net subsidies	0	0	0	0	0
Non-product-specific (NPS) assistance except to inputs	1	0	1	1	1
<b>ALL DOMESTIC PRODUCTION MEASURES</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>TOTAL NRA (including NPS and decoupled payments)</b>	<b>29</b>	<b>18</b>	<b>13</b>	<b>24</b>	<b>32</b>
<i>Producer subsidy equivalent, in real 2000 US\$ billion</i>	<i>125</i>	<i>114</i>	<i>89</i>	<i>137</i>	<i>173</i>

<sup>a</sup> In the absence of data, it is assumed the share of input tax/subsidy, domestic production tax/subsidy and border tax/subsidy payments for non-covered farm products are the same as those for covered farm products.

<sup>b</sup> All entries have been generated by dividing the producer subsidy equivalent of all (including NPS and ‘decoupled’) measures by the total agricultural sector’s gross production valued at undistorted prices.

<sup>c</sup> All entries have been generated by dividing the consumer tax equivalent of all measures by the total consumption value (at the farmgate level, valued at undistorted prices).

Source: Authors’ compilation based on data in Anderson and Valenzuela (2008)

Table 6: Contributions to Welfare Reduction Index for covered products by different policy instruments, by region, 1972 to 1976 (percent)

(a) Production side of economy

	<b>High-income countries</b>					<b>Developing countries</b>				
	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>
<b>All measures</b>	46	34	31	41	60	42	47	55	53	38
<b>Border measures</b>	46	32	31	41	58	38	44	44	43	35
Export tax	0	1	1	0	0	16	31	34	28	18
Export subsidy	6	3	1	3	3	3	1	0	1	1
Import tax	39	25	24	37	53	15	4	3	11	13
Import subsidy	1	3	5	1	2	4	8	7	3	2
<b>Domestic taxes &amp; subsidies</b>	0	2	0	0	2	4	3	11	10	3
Production tax on output	0	0	0	0	0	2	1	10	8	1
Production subsidy on output	0	2	0	0	2	0	0	0	0	0
Farm input net subsidies	0	0	0	0	0	2	1	1	1	1

(b) Consumption side of economy

	<b>High-income countries</b>					<b>Developing countries</b>				
	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>
<b>All measures</b>	<b>51</b>	<b>37</b>	<b>34</b>	<b>47</b>	<b>67</b>	<b>39</b>	<b>52</b>	<b>45</b>	<b>45</b>	<b>35</b>
<b>Border measures</b>	<b>51</b>	<b>37</b>	<b>34</b>	<b>47</b>	<b>67</b>	<b>39</b>	<b>51</b>	<b>44</b>	<b>43</b>	<b>35</b>
Export tax	0	1	0	0	0	11	37	30	24	15
Export subsidy	5	2	1	2	3	3	1	0	1	1
Import tax	44	30	27	43	63	21	4	3	14	16
Import subsidy	2	4	6	1	2	5	9	10	4	3
<b>Domestic taxes &amp; subsidies</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>
Consumption tax	0	0	0	0	0	1	1	1	1	0
Consumption subsidy	0	0	0	0	0	0	0	0	0	0

Source: Authors' compilation based on data in Anderson and Valenzuela (2008).

Table 7: Contributions to Trade Reduction Index for covered products by different policy instruments, by region, 1972 to 1976  
(percent)

(a) Production side of economy

	High-income countries					Developing countries				
	1972	1973	1974	1975	1976	1972	1973	1974	1975	1976
<b>All measures</b>	<b>24</b>	<b>16</b>	<b>12</b>	<b>22</b>	<b>32</b>	<b>22</b>	<b>20</b>	<b>28</b>	<b>37</b>	<b>25</b>
<b>Border measures</b>	<b>24</b>	<b>16</b>	<b>12</b>	<b>22</b>	<b>32</b>	<b>22</b>	<b>24</b>	<b>27</b>	<b>33</b>	<b>25</b>
Export tax	0	1	0	0	0	15	29	32	26	17
Export subsidy	-4	-2	-1	-2	-2	-2	-1	0	-1	-1
Import tax	29	20	17	24	35	13	3	2	10	11
Import subsidy	-1	-3	-4	-1	-2	-3	-8	-7	-3	-2
<b>Domestic taxes &amp; subsidies</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>-4</b>	<b>1</b>	<b>4</b>	<b>0</b>
Production tax on output	0	0	0	0	0	0	1	1	4	0
Production subsidy on output	0	0	0	0	0	0	-5	0	0	-1
Farm input net subsidies	0	0	0	0	0	0	0	0	1	1

(b) Consumption side of economy

	High-income countries					Developing countries				
	1972	1973	1974	1975	1976	1972	1973	1974	1975	1976
<b>All measures</b>	<b>28</b>	<b>19</b>	<b>13</b>	<b>25</b>	<b>38</b>	<b>20</b>	<b>30</b>	<b>21</b>	<b>30</b>	<b>23</b>
<b>Border measures</b>	<b>28</b>	<b>19</b>	<b>13</b>	<b>25</b>	<b>38</b>	<b>21</b>	<b>30</b>	<b>21</b>	<b>30</b>	<b>23</b>
Export tax	0	1	0	0	0	10	36	28	22	14
Export subsidy	-3	-2	-1	-2	-1	-2	-1	0	-1	-1
Import tax	33	23	18	28	41	17	3	3	13	13
Import subsidy	-1	-4	-5	-1	-2	-4	-9	-9	-4	-3
<b>Domestic taxes &amp; subsidies</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Consumption tax	0	0	0	0	0	0	0	0	0	0
Consumption subsidy	0	0	0	0	0	0	0	0	0	0

Source: Authors' compilation based on data in Anderson and Valenzuela (2008).

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

(Rs/tonne in 1981 prices)

Source: Pursell, Gulati and Gupta (2009).



Appendix Table A: International grain and groundnut oil prices, 1972-76 and 2006-10

(constant 2000 US\$/mt, using the US GDP price deflator)

	Wheat (Canadian)	Rice (Indica, 5% broken)	Maize	Groundnut oil	US GDP deflator
1972	239	434	188	1433	0.297
1973	474	944	316	1760	0.310
1974	628	1554	397	3237	0.333
1975	493	928	327	2336	0.367
1976	378	597	284	1882	0.394
2006	186	261	105	831	1.167
2007	250	272	137	1129	1.198
2008	382	546	187	1791	1.190
2009 <sup>a</sup>	255	492	141	1003	1.180
2010 (Jan. to March) <sup>a</sup>	237	388	138	1152	1.180

<sup>a</sup> US GDP chained price index is 1.000 for 2000, from the US Department of Commerce's Bureau of Economic Analysis ([www.bea.gov/national/Index.htm](http://www.bea.gov/national/Index.htm)). It is provisional for 2009 and assumed to be unchanged for the first 3 months of 2010.

Source: Current prices are from the World Bank, *Commodity Price Data* (Pink Sheets, see <http://go.worldbank.org/5AT3JHWYU0>)

Appendix Table B: Nominal rates of assistance to rice, wheat, maize and groundnut oil, various countries, 1972 to 1976

	(percent)				
<b>(a) Rice</b>	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>
Australia	15	6	15	23	26
Bangladesh			-26	105	-5
Brazil		19	-3	-4	1
Colombia	-5	-38	-50	-37	-20
Cote d'Ivoire	17	55	-21	34	70
Dominican Republic	13	-26	-9	-4	-6
Ecuador	8	-31	-38	-26	7
Egypt	-33	-62	-77	-64	-27
EU 9	-31	-61	-55	-19	0
Ghana	5	-38	-58	-30	0
India	0	-34	-67	-58	-36
Japan	257	169	39	94	175
Korea	88	11	-44	-4	48
Madagascar	-1	-51	-64	-32	-31
Malaysia	19	-3	-23	-17	74
Nigeria	87	-4	-33	8	103
Pakistan	6	-62	-68	-59	-46
Philippines	23	-39	-53	-29	0
Portugal	37	-16	-39	-12	0
Senegal	29	-26	-60	5	42
Spain	-47	-71	-65	-21	-18
Sri Lanka	3	42	-22	-12	-16
Taiwan	2	-24	-25	-15	3
Thailand	-22	-21	-52	-40	-21
Uganda	35	54	70	77	83
United States	0	0	0	0	0
Zambia	-59	-54	-30	-11	-24
<i>Asia (excl. Japan)</i>	7	-28	-57	-24	-8
<i>Africa</i>	-2	-39	-64	-40	-18
<i>Latin America</i>	0	4	-16	-10	-2
<i>All developing countries</i>	7	-27	-55	-24	-8
<i>High-income countries</i>	<b>165</b>	<b>84</b>	<b>24</b>	<b>72</b>	<b>133</b>

Appendix Table B (continued): Nominal rates of assistance to rice, wheat, maize and groundnuts, various countries, 1972 to 1976

	(percent)				
<b>(b) Wheat</b>	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>
Argentina	-30	-42	-63	-36	-40
Australia	12	-10	-8	-2	3
Austria	9	-28	-23	-9	-19
Bangladesh			39	140	-6
Brazil	4	-30	5	39	81
Canada	3	3	3	3	3
Chile	-6	-68	-39	-35	-23
Colombia	40	-6	-14	13	11
Egypt	-24	-35	-48	-32	-22
EU 9	-2	-30	-23	-9	-16
Finland	34	6	11	48	37
India	41	0	0	0	-3
Japan	97	-8	-75	-85	4
Kenya	-20	-52	-49	4	-2
Korea	26	-20	-31	-20	-4
New Zealand	11	11	11	11	11
Pakistan	7	-69	-57	-14	-13
Portugal	59	-10	-26	-8	4
South Africa	87	7	-3	24	38
Spain	-10	-31	-32	-2	-16
Sudan	-29	-43	-51	-21	-11
Sweden	-12	-36	-33	-9	-18
Taiwan	65	8	-6	0	29
Turkey	-8	-56	-22	-24	2
United States	21	7	1	1	1
Zambia	-68	-54	-44	-34	-30
Zimbabwe	47	16	-23	-20	-28
<i>Asia (excl. Japan)</i>	<i>31</i>	<i>-28</i>	<i>-17</i>	<i>-3</i>	<i>-6</i>
<i>Africa</i>	<i>19</i>	<i>-15</i>	<i>-33</i>	<i>-13</i>	<i>0</i>
<i>Latin America</i>	<i>-11</i>	<i>-41</i>	<i>-43</i>	<i>-7</i>	<i>2</i>
<b><i>All developing countries</i></b>	<b><i>24</i></b>	<b><i>-29</i></b>	<b><i>-25</i></b>	<b><i>-5</i></b>	<b><i>-4</i></b>
<b><i>High-income countries</i></b>	<b><i>5</i></b>	<b><i>-12</i></b>	<b><i>-12</i></b>	<b><i>-3</i></b>	<b><i>-7</i></b>

Appendix Table B (continued): Nominal rates of assistance to rice, wheat, maize and groundnuts, various countries, 1972 to 1976

	(percent)				
	1972	1973	1974	1975	1976
<b>(c) Maize</b>					
Argentina	-28	-25	-28	-45	-58
Australia	0	0	0	0	0
Austria	103	27	-2	17	25
Brazil	20	-5	-12	0	-5
Cameroon	0	0	0	0	0
Canada	4	3	2	2	2
Chile	-9	31	-48	-51	-19
Colombia	-3	-12	-35	-30	-25
Ecuador	83	39	39	52	57
Egypt	-8	-19	-28	-13	-15
EU 9	73	19	2	22	39
Ghana	38	-16	-23	-14	2
India	106	55	28	-31	0
Indonesia	-22	-5	-22	-24	-3
Kenya	0	-8	-26	3	7
Madagascar	0	0	0	0	0
Nigeria	287	108	66	122	256
Pakistan	19	-41	-44	-11	-24
Philippines	43	-8	-3	6	22
Portugal	47	0	-22	30	30
South Africa	7	-25	-38	-31	-29
Spain	65	19	-15	30	33
Thailand	5	-8	-2	-5	-3
Uganda	0	53	0	0	0
United States	6	4	0	0	0
Zambia	-42	-40	-46	-64	-32
Zimbabwe	-42	-40	-46	-49	-60
<i>Asia (excl. Japan)</i>	52	17	4	-18	3
<i>Africa</i>	3	-10	-31	-17	-8
<i>Latin America</i>	6	-11	-19	-15	-16
<b><i>All developing countries</i></b>	<b>18</b>	<b>-2</b>	<b>-17</b>	<b>-17</b>	<b>-8</b>
<b><i>High-income countries</i></b>	<b>13</b>	<b>6</b>	<b>0</b>	<b>3</b>	<b>4</b>

Appendix Table B (continued): Nominal rates of assistance to rice, wheat, maize and groundnuts, various countries, 1972 to 1976  
(percent)

<b>(d) Groundnut oil</b>	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>
Ghana	0	0	0	0	0
India	8	0	0	-31	-14
Nigeria	-59	-63	-35	-10	-10
Senegal	-39	-53	-64	-45	-39
Sudan	-54	-60	-63	-58	-50
Uganda	0	0	0	0	0
Zambia	-67	-64	-68	-76	-55
Zimbabwe	-68	-72	-70	-74	-79
<i>Africa</i>	<i>-49</i>	<i>-54</i>	<i>-52</i>	<i>-47</i>	<i>-43</i>
<b><i>Developing countries</i></b>	<b><i>-8</i></b>	<b><i>-12</i></b>	<b><i>-22</i></b>	<b><i>-37</i></b>	<b><i>-25</i></b>

Note: Included EU 9 countries are: Denmark, France, Germany, Ireland, Italy, Netherlands, and the United Kingdom. NRAs are weighted using national values of production at undistorted prices as weights.

Source: Authors' compilation based on data in Anderson and Valenzuela (2008)