PRELIMINARY FIRST DRAFT

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# Food Price Spikes, Price Insulation and Poverty

by

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*Abstract*

The analysis in this paper first considers the impact on world food prices of the changes in protection for staple foods during the 2008 world food price crisis—changes that were generally designed to insulate domestic prices from changes in world prices. We find that this insulation substantially increased world prices for key food crops such as rice, wheat, maize and edible oilseeds. The net effect is to reduce domestic prices in only a few developing countries, while domestic prices were increased in many countries despite attempts to insulate against the price rises. The overall reduction in protection rates in developing countries and shifts in these rates appear to have reduced the poverty increases arising from the initial shocks to world prices. However, the actual poverty-reducing impact of insulation is much less than its apparent impact and there remains a need for very considerable improvements in policy to reduce the impact of higher food prices on the poor.

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## Introduction

Many countries have responded to price spikes such as those of 2008 and 2010–12 by adjusting their agricultural trade barriers in an attempt to insulate their domestic markets from higher international food prices. Martin and Anderson (2012) show that such interventions exacerbate the initial increase in international prices, and that this policy response is completely ineffective when both exporting and importing country groups insulate to the same extent, even though it may appear to each individual country to have been successful. In reality, however, countries intervene to different degrees, and the impact of the initial exogenous (and additional policy-induced) increase in international prices may be redistributed between countries in non-obvious ways.

One view is that countries where the poor are most adversely affected by higher food prices do or should stabilize their domestic prices more than countries where the poor are less vulnerable to food price shocks. If this is the case, most poor people might be protected from the adverse impacts of the initial shock to food prices. If countries where producers and consumers are better able to deal with such shocks end up absorbing larger increases in international food prices the adverse poverty impacts of the original shocks to food markets might be reduced. Such an outcome might be improved by providing the analytical support recommended by Timmer (2010, p2) to policy makers seeking to stabilize domestic prices.

A more pessimistic possibility follows from the observation that many countries that insulate from shocks to world food prices are countries for which the impacts on domestic poverty of higher food prices are relatively minor, or even favorable. While rich countries are well-placed to absorb price shocks because of the small shares of food in the expenditures of their consumers, their producers' access to risk management tools such as futures and options

markets, and their relatively well-developed social safety nets, some high-income countries have used highly-insulating policies such as variable levies. Another pessimistic possibility is that food-exporting countries—in which many poor people are net-selling farmers who would benefit from higher food prices—insulate by introducing export restrictions. In that case such insulating behavior could end up raising their own domestic poverty, in addition to exacerbating poverty among food-deficit households in other countries by pushing international food prices higher. Another pessimistic possibility is that large poor countries—for which insulating policy is more expensive because of the greater effects of their insulation on world prices—might insulate less than would be optimal, and hence experience adverse poverty outcomes.

These examples raise the important question of whether current policies reduce the global poverty impact of higher prices. Only by looking at data on the changes in agricultural distortions during periods of rapid price increases in international prices, and at the impacts of food price changes on poverty in different countries, is it possible to ascertain which of these views is nearer the truth.

While it is important to know whether poverty rises or falls in response to changes in trade policy, the answer to this question is far from sufficient for policy formulation. The most cost-effective policy for dealing with the poverty impacts of price rises is likely to be one—such as a well-targeted social safety net—that deals directly with the problem of poverty vulnerability. If such a policy is not feasible, considerable work is likely to be needed to identify feasible policy options that are more effective than the past policies.

This paper begins by looking at data on the consumption patterns and income sources of low-income households in order to assess which commodities are likely to be important in an analysis of the impacts of changes in commodity prices. It then turns to data on agricultural price

distortions, and in particular on relative movements in domestic and international prices, in order to assess how countries responded to the initial changes in international prices during 2006-08. With these data it uses models to compare the actual changes in domestic prices with those that would have occurred in the absence of price-insulating policies. We then use these price scenarios to assess the impacts of food price changes on poverty both with and in the absence of price-insulating policy behavior. These price scenarios allow us to make a much broader assessment of the impacts of price-insulating behavior on poverty than has previously been available. The final section examines alternative policy measures at unilateral, regional and multilateral levels which—together with complementary domestic measures—might more efficiently reduce the impact of future price spikes on poverty.

***What's important for the poor?***

Our primary interest is the short-run impacts of changes in food prices on the poor. As shown by Deaton (1989), the direct impact of food price changes on the well-being of a particular household depends upon the proportional change in the real price of a particular food times their net purchases of that food. Since food typically makes up a large share of the spending of poor people, we would generally expect that food price changes would have a large impact on the living costs of the poor. However, the vast majority of poor people are rural (three-quarters, according to the World Bank 2007), and most poor people earn their living from agriculture. Hence food expenditure shares alone are insufficient for determining the impact of food price changes on poverty: account also needs to be taken of the shares of household income obtained from the sale of food, and hence the net expenditures on food by the household.

The first two columns of Table 1 report the shares of particular types of food in aggregate food expenditure and in total expenditure by the poor for the 29 developing countries[1] for which we have detailed data on household expenditures and income sources. The final column of Table 1 nets out household production that is sold, and so is the most relevant for present purposes. The bottom row reveals that food accounts for 60 percent of total expenditure of the poor in this sample of developing countries, but it still accounts for 40 percent of net expenditure once the marketed surplus is subtracted. Evidently net buyers of food dominate net sellers among the poor in this group of countries, and in none of these countries are the poor, as a group, net sellers of the listed foods, although there are cases, such as Vietnam, where the poor are net sellers of particular foods.

Table 1 also reveals that rice, wheat and oilseeds are the three dominant traded food products affecting the net food expenditure of the poor. Together with maize (the most heavily traded of the coarse grains) they account for more than two-fifths of the net expenditure of the poor on food. They are also substitutes in production and consumption for other coarse grains and root crops, and are important inputs into livestock production and so indirectly affect international prices of meat, fish and milk products. Hence in what follows we concentrate on what happens in markets for rice, wheat, maize and oilseeds/edible oils.

[1] Albania 2005, Armenia 2004, Bangladesh 2005, Belize 2009, Ivory Coast 2002, Ecuador 2006, Guatemala 2006, Indonesia 2007, India 2004, Cambodia 2003, Sri Lanka 2007, Moldova 2009, Mongolia 2002, Malawi 2004, Nepal 2002, Nigeria 2003, Nicaragua 2005, Niger 2007, Pakistan 2005, Rwanda 2005, Tajikistan 2007, Timor Leste 2001, Tanzania 2008, Uganda 2009, Vietnam 2010, Yemen 2006 and Zambia 2010

**Table 1: Average food expenditures of people living on less than $1.25 per day, weighted average across 29 developing countries, 2002–2010[a]**

| | Average share in the expenditure of the poor | | Average net expenditure share in total expenditure of the poor, % | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | % of food | % of total | Total | India | Bangladesh | Pakistan | Vietnam | Uganda | Tanzania |
| Rice (+ processed) | 24.1 | 14.4 | 8.4 | 14.9 | 4.2 | 1.8 | -8.1 | 0.1 | 2.1 |
| Wheat (+ processed) | 8.2 | 4.9 | 4.1 | 5.2 | 0.6 | 10.7 | 1.3 | 0.1 | 1.5 |
| Maize and other grains | 4.0 | 2.4 | 0.7 | 1.7 | -0.1 | 0.2 | -4.6 | 1.2 | 6.0 |
| Root crops | 3.7 | 2.2 | 0.5 | 1.8 | 1.1 | 1.5 | -4.5 | 1.5 | 0.4 |
| Oilseeds and edible oils | 7.7 | 4.6 | 4.2 | 5.2 | 2.5 | 4.5 | 1.0 | 1.3 | 2.6 |
| Plantains and other fruits | 3.3 | 2.0 | 0.7 | 0.8 | 1.0 | 1.0 | -1.1 | -0.7 | -0.3 |
| Other vegetables | 13.1 | 7.8 | 5.6 | 9.2 | 3.4 | 4.5 | 0.2 | 2.9 | 4.7 |
| Sugar | 4.0 | 2.4 | 2.2 | 2.4 | 0.3 | 4.4 | -0.9 | 2.3 | 3.1 |
| Milk and dairy products | 8.4 | 5.0 | 4.3 | 6.6 | -0.4 | 7.4 | 1.2 | 0.6 | -0.1 |
| Meats | 5.0 | 3.0 | 0.5 | 1.8 | -0.4 | 1.4 | -2.4 | 1.9 | -1.3 |
| Fish and fish products | 4.5 | 2.7 | 1.8 | 1.5 | 4.9 | 0.3 | -2.4 | 2.1 | 3.3 |
| Other processed food | 13.9 | 8.3 | 7.2 | 5.6 | 9.5 | 3.0 | 9.3 | 3.1 | 11.0 |
| Total | 100 | 59.8 | 40.2 | 56.8 | 26.6 | 40.6 | -11.0 | 16.4 | 33.0 |

[a] Averages are weighted averages across 29 developing countries. The $1.25 per day income level includes own-consumption of food. Net expenditure is consumption of food less sales as a share of total expenditure, including own-consumption. For the list of developing countries and their survey dates, see footnote 1 of the text.

### *Price insulation for key food commodities*

The first step in our analysis is to consider the changes in prices of each of these four key food items in each of the sample countries for which we have information on income sources and expenditure patterns. For this, we follow Anderson and Nelgen (2012a, b) in using price changes between 2006 and 2008 for each item. These are shown in Table 2, together with changes in nonfood prices as measured by the non-food component of the consumer price index for each country.

**Table 2: Changes in domestic food and nonfood prices, 2006–8, %**

| | Rice | Wheat | Edible oils | Maize | Nonfood |
|---|---|---|---|---|---|
| Albania | — | 72.3 | 26.0 | 63.8 | 5.8 |
| Armenia | — | 84.5 | — | — | 11.1 |
| Bangladesh | 25.2 | 36.9 | 0.5 | 31.4 | 14.2 |
| Belize | 10.5 | — | 7.5 | 11.7 | 6.5 |
| Cambodia | 45.6 | — | 58.1 | 98.0 | 31.9 |
| Ecuador | 76.4 | 124.5 | 18.5 | 139.8 | 7.4 |
| Guatemala | 75.6 | — | — | 29.6 | 10.9 |
| India | 48.9 | 26.6 | 36.8 | 14.1 | 9.4 |
| Indonesia | 20.8 | — | 54.5 | 57.1 | 4.8 |
| Côte d'Ivoire | 78.8 | — | 46.3 | 39.7 | -0.8 |
| Malawi | 40.4 | 26.3 | 19.7 | 42.6 | 23.7 |
| Moldova | — | 72.8 | 43.3 | 53.6 | 25.2 |
| Mongolia | — | 111.3 | — | — | 22.1 |
| Nepal | 10.7 | 28.0 | 0.1 | 21.6 | 14.9 |
| Nicaragua | 34.1 | — | 7.7 | 41.7 | 14.3 |
| Niger | 26.8 | 28.1 | 27.4 | 28.4 | 4.7 |
| Nigeria | 0.6 | 39.6 | 11.7 | 10.2 | 17.1 |
| Pakistan | -2.6 | -9.3 | -2.3 | -8.2 | 21.1 |
| Panama | 45.5 | — | — | 57.5 | 7.5 |
| Peru | 118.1 | 100.5 | 37.2 | 54.4 | 6.0 |
| Rwanda | -52.7 | 22.3 | 40.1 | 30.5 | 15.3 |
| Sri Lanka | 120.9 | — | 47.0 | 74.7 | 6.8 |
| Tajikistan | -47.9 | 65.8 | — | — | 8.1 |
| Tanzania | 31.8 | — | — | 42.1 | 13.8 |
| Timor-Leste | — | — | — | — | 7.8 |
| Uganda | 36.2 | — | — | 53.5 | 16.3 |
| Viet Nam | 83.1 | — | — | — | 11.1 |
| Yemen | — | 61.3 | — | 50.2 | 15.5 |
| Zambia | 42.7 | 17.8 | 329.3 | 27.7 | 30.6 |

Source: Authors' calculations based on DAI, FAO (producer price data, CPI for all consumption and non-foods, GIEWS) and survey data

The changes in the domestic prices of these four key food items between 2006 and 2008, relative to the nonfood price index, provide the first input into measuring the change in poverty resulting from the changes in real domestic food prices over this period. Our objective is to compare this poverty impact with the poverty impact had many countries *not* insulated their markets from changes in international food prices over this period. To initiate this process, we examine the changes in domestic and border prices for those key food items in between 81 and 102 countries

that together make up more than 90 percent of the world economy for rice, wheat, maize and edible oils.

## Description of key food price changes, 2006–08

For the analysis presented in this paper, we needed data on changes in domestic and world prices of for a set of countries that cover a very large fraction of world consumption, plus estimates of changes in protection in the set of countries for which we have detailed data on production and consumption of each food at the household level. The DAI database (Anderson 2009 and www.worldbank.org/agdistortions) is designed to provide estimates of changes in agricultural distortions in the countries that are most important in influencing world prices, and a selection of countries that are important from the point of economic development and poverty reduction. Because the DAI database did not include data for some of the countries for which we have household data, we supplemented the DAI data with estimates from other sources, particularly the FAO's estimates of domestic prices.

To assess changes in protection at the country level, we consider changes in international, domestic and country-specific border prices of four key food items relative to the most relevant international price for each particular country. Our estimates of the global price changes come from the World Bank's GEM database. Because for most commodities the GEM reports a set of prices for specific varieties (e.g. US Hard Red Winter wheat etc.) we calculate and use simple averages of all available prices.

For domestic prices, we turn to the available DAI and FAO databases which usually contain a single price estimate for most agricultural commodities and countries. For edible oils, where a producer price index was not available, we calculated a weighted price index including several

important oil seeds (soybeans, sunflower, groundnuts, rapeseed) in addition to palm oil. In a very few cases where FAO producer price data were not available, we used the FAO GIEWS database to identify the changes in domestic prices using the most relevant price series available.

***Rice***

Rice prices increased substantially between 2006 and 2008. Table 3 reports that the changes for three international indicator prices averaged close to 120 percent in nominal US dollars. National border price changes (shown in Figure 1) were generally smaller, with the median price increasing by 78 percent. Most of the border price changes that we observe range between 53 and 102 percent. This difference may have a number of sources, including: contractual arrangements that delay adjustments in the prices of traded goods; differences between the types of rice traded and the three internationally quoted types of rice; and freight costs that make the export prices that are quoted internationally more volatile than most border prices.

Changes in domestic prices of rice were generally much more subdued than changes in the border prices. This is also shown in Figure 1. The median price rise was only 44 percent, with half of the price increases in the 30 to 64 percent range. Because domestic prices generally rose less than international prices, we also observe a general reduction in protection[2] with a median change of -18 percent and most countries' protection rates (measured as the change in (1+t), where t is a tariff rate equivalent) changing between -29.5 and 0.6 percent.

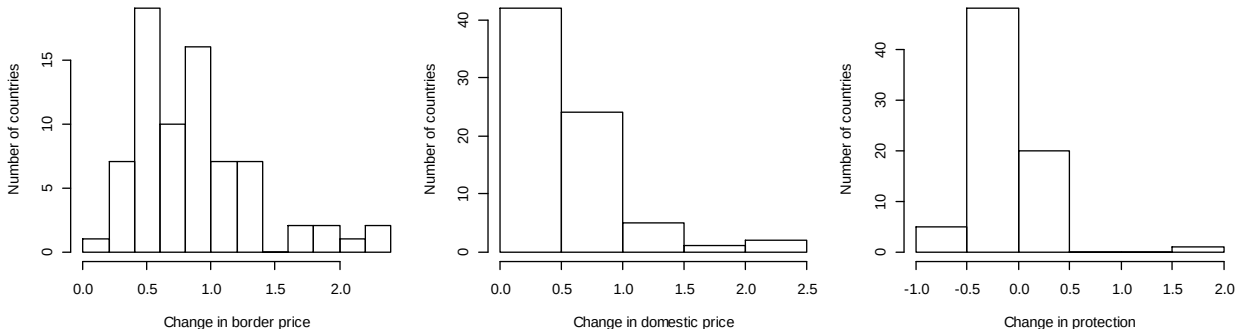
[2] Protection is defined as the ratio of the domestic price to the border price of a like product. If there are no other price-distorting policies than border measures, as assumed here, this is both the farmers' nominal assistance coefficient and an indicator of the distortion to the domestic consumer price. For some countries this indicator may be negative, usually because it is an exporting country with an export restriction although in rare cases it indicates an import subsidy is in place.

**Table 3: Changes in international indicator rice prices between 2006 and 2008**

| | Price 2006, US$/t | Price 2008, US$/t | Change, percent |
|---|---|---|---|
| Rice, Thai, A1.Special | 220 | 482 | 120 |
| Rice, Thailand, 5% broken | 305 | 650 | 113 |
| Rice, Vietnamese, 5% broken | 260 | 567 | 118 |
| Average, unweighted | 262 | 566 | 117 |

Source: World Bank Global Economic Monitor database

**Figure 1: Rice: Distribution of proportional changes in border and domestic prices, and protection 2006–2008**




### *Wheat*

According to the World Bank's Global Economic Monitor database the price of wheat traded internationally increased substantially between 2006 and 2008, with US soft red winter wheat rising by 71 percent and Canadian Western Red Spring wheat rising by 110 percent. Using the data from the FAO database, however, we observe much greater variation in border price changes between countries (Figure 2) with some countries experiencing negligible price change while other countries experienced price increases of over 200 percent; however for a majority of countries the border price of wheat changed between 77 and 119 percent.

Relative to the large increases in the border price of wheat among most countries, we observe much smaller increases in the domestic price during the same period with a median price change of 70 percent and most countries experiencing a price increase between 36 and 103 percent (Figure 2). Because domestic prices changed at very different rates from the border prices, we observe a sharp reduction in protection (Figure 2). The observed median change in the

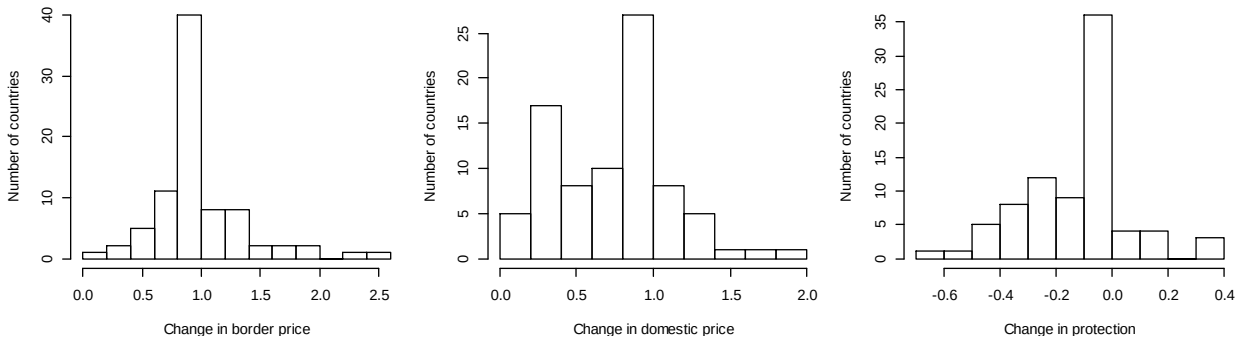
protection index is -0.1 percent, with most of the countries' protection changing between zero and -25 percent.

**Table 4: Changes in international wheat prices between 2006 and 2008**

| | Price 2006, USD/t | Price 2008, USD/t | Change, percent |
|---|---|---|---|
| Wheat, Canada WRS | 217 | 455 | 109.7 |
| Wheat, US, HRW | 192 | 326 | 69.8 |
| Wheat, US, SRW | 159 | 272 | 70.8 |
| Average, unweighted | 189 | 351 | 83.4 |

Source: World Bank, GEM

**Figure 2: Wheat: Distribution of proportional changes in border and domestic prices, and in protection 2006–8**




Source: FAO

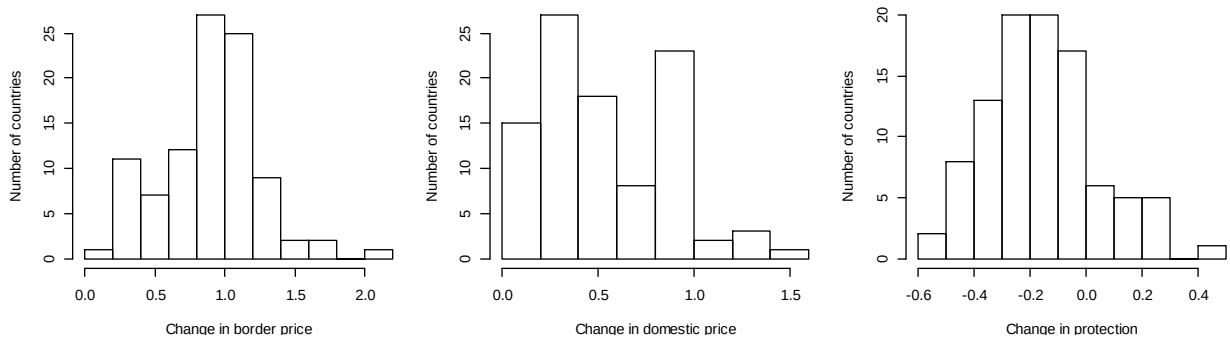
***Maize***

The international price of maize rose by 83 percent between 2006 and 2008 (Table 5). The median change in border prices was 94 percent with 50 percent of all observations between 62 and 108 percent (Figure 3). Domestic prices changed much less with a median price change of 49 percent and most countries experiencing increases in domestic prices between 30 and 86 percent. Corresponding to these differentials between changes in domestic and international prices we observe a general reduction in protection with a median change of -17 percent and the majority of changes between -30 and -9 percent.

**Table 5: Changes in international maize prices between 2006 and 2008**

| | Price 2006, USD/t | Price 2008, USD/t | Change, percent |
|---|---|---|---|
| Maize | 122 | 223 | 83.1 |

**Figure 3: Maize: Distribution of border and domestic prices, and protection changes 2006–2008**




### *Edible oils*

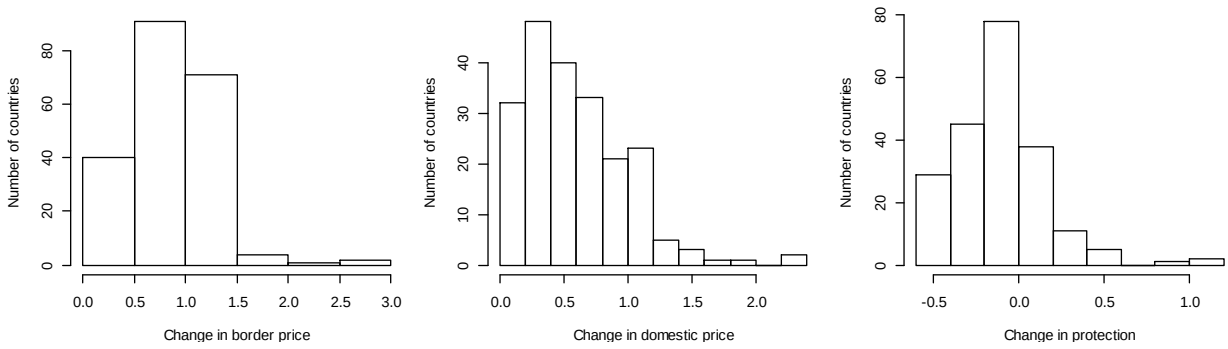
Oilseeds and edible oils are much more complex to monitor than rice and wheat because of the diverse set of commodities involved. To obtain at least a very broad guide on developments in this market, we examine three key oil products—palm oil, palm kernel oil, and soybean oil for to obtain the average changes in international prices shown in Table 6.

In order to measure the changes in domestic and border prices for edible oils, we consider a consumption-weighted price index for palm oil and major oil seeds (soybeans, cottonseed, soybeans, and groundnuts). We report a distribution of so-defined border prices in Figure 4 and find that the median border price change was 85 percent and that the majority of border price changes were between 56 and 110 percent. As with other commodities, domestic prices changed much less (also Figure 4) with a median price change of 54 percent and most of price changes between 29 and 81 percent. We finally observe that the median change in protection was -12 percent with half of the changes falling between -30 and 2 percent.

**Table 6: Changes in international edible oil prices between 2006 and 2008**

| | Price 2006, USD/t | Price 2008, USD/t | Change, percent |
|---|---|---|---|
| Palm oil | 478 | 949 | 98.3 |
| Palm kernel oil | 581 | 1130 | 94.4 |
| Soybean oil | 599 | 1258 | 110.2 |
| Average, unweighted | 553 | 1112 | 101.0 |

**Figure 4: Edible Oils: Distribution of border and domestic prices, and protection changes 2006–2008**




### *Changes in protection in our sample countries*

Where data are available, the 2006-8 changes in protection to key crop products are detailed in Table 7. This table shows the changes in protection for our sample of developing countries as well as five large developing countries for which suitable household data are unavailable. As the table documents, protection in most developing countries fell during the observed period. A few large increases in protection observed especially among African countries (Rwanda, Tanzania and Malawi) seem likely to have been caused by these countries' markets being largely detached from the world market. While these changes in relative prices do not signify a change in trade policy, they mean that these countries were unable to play a role in absorbing shocks to world prices.

Another important observation from Table 7 is that the observed changes in protection among large developing countries not included in our sample are broadly similar to the changes

in protection observed in our sample. The most obvious difference is that protection in China fell for rice only and remained largely unchanged for other crops. We also observe some increases in protection for wheat and oils in Egypt and Russia which are not typically observed in our sample. However, for most countries and commodities outside our sample we observed a decline in protection similar to those observed in our sample.

**Table 7: Observed change in protection ($p_d/p_b$), 2006–08, percent**

| | Rice | Wheat | Maize | Oils |
|---|---|---|---|---|
| Albania | — | -21.5 | -16.5 | -39.2 |
| Armenia | — | 5.2 | — | — |
| Bangladesh | -20.4 | -31.6 | -27.5 | 0.5 |
| Belize | -40.7 | — | -37.3 | -30.1 |
| Cambodia | -26.9 | — | 0.8 | -17.6 |
| Ecuador | 85.4 | -2.9 | 23.5 | 10.1 |
| Guatemala | -8.0 | — | -33.7 | — |
| India | -53.0 | -10.5 | -10.7 | -19.8 |
| Indonesia | -18.4 | — | -25.2 | -29.9 |
| Côte d'Ivoire | -7.0 | — | -13.4 | -17.2 |
| Malawi | 3.5 | -29.6 | 145.6 | -3.1 |
| Moldova | — | -27.0 | -21.4 | 0.4 |
| Mongolia | — | 6.2 | — | — |
| Nepal | -60.5 | -33.2 | -10.7 | -0.2 |
| Nicaragua | -23.7 | — | -26.4 | -26.5 |
| Niger | -7.7 | -6.8 | -14.5 | -7.7 |
| Nigeria | -31.2 | -52.6 | -19.3 | -10.7 |
| Pakistan | -49.3 | -65.7 | -49.8 | -33.8 |
| Panama | -8.7 | — | -22.9 | — |
| Peru | 16.6 | -8.3 | -22.5 | -4.6 |
| Rwanda | -55.7 | -31.6 | 161.1 | -6.3 |
| Sri Lanka | 122.2 | — | 14.7 | 5.1 |
| Tajikistan | -61.7 | -48.7 | — | — |
| Tanzania | 3.8 | — | 183.6 | — |
| Uganda | 5.1 | — | 14.9 | — |
| Viet Nam | -15.9 | — | — | — |
| Yemen | — | -39.9 | -24.0 | — |
| Zambia | -21.5 | -32.2 | 67.7 | 0.0 |
| China | -21.6 | -0.1 | 0.9 | 1.9 |
| Brazil | -37.4 | -23.5 | -36.1 | -52.2 |
| Egypt | -8.8 | 34.4 | -23.2 | 31.0 |
| Philippines | -41.9 | — | -30.6 | -8.9 |
| Russia | -18.1 | 6.7 | -17.5 | 17.6 |

Source: Authors' calculations

## Results

### *Impacts of changing trade restrictions on international prices*

To obtain an indication of the impact of the observed protection changes on domestic prices, we need first to estimate the impact of those changes in trade restrictions on international prices. That involves taking account of the changes in protection in countries that collectively account

for a very large share of world production/consumption. Following Martin and Anderson (2012), we do this using the simplest possible model—a model which assumes that each product is homogeneous and that focuses only on consumption on the assumption that there is limited opportunities for supply response. It also assumes equal demand elasticities across countries. As a cross-check, we repeat the estimation allowing for supply response, with an assumed elasticity of unity, as against a demand elasticity of -0.2.

The resulting estimates of the impacts of the price-insulating behavior on international prices are reported in the first two columns of Table 7, from which it is clear that altering the demand and supply elasticity assumptions makes little difference to the estimates as long as these are uniform across countries. This result is not unexpected given that net trade is a very small share of production and consumption in virtually every country. The results suggest that the aggregate effect of all countries' price-insulating behavior during 2006–08 was to raise prices in the international marketplace of rice by 30 percent, of wheat by 7 percent, of maize by 4–6 percent, and of oilseeds by 10–11 percent.

Using the extremely simple consumption-only model, the increases in world prices are given by minus the weighted average of changes in countries' rates of protection obtained using consumption weights at international prices. If, for instance, all countries reduce the power of the protection rate (1+t) applying in their market, by 10 percent, the world price will rise by 10 percent. This measure allows for a very simple interpretation-- a country that changes its protection by less than the weighted average tariff change will experience a change in domestic prices that is larger than it would have experienced absent insulation by all countries.

The extent of the contribution by each country to the changes to international rice and wheat prices can be seen by the size of each country's shaded rectangle in Figure 5. In this

diagram, the countries whose protection (measured by 1+t) fell by more than the increase in world prices were effective in sheltering themselves from part of the increase in world prices. Those countries where protection fell by less than the increase in world prices experienced an increase in domestic prices greater than in the absence of insulation. Clearly, countries where protection did not change experienced the full increase in world prices-- an increase that results from both the original shock and the compounding effect of price insulation. One other possible outcome—where a country increases its protection during a price spike—is highlighted by the cases of Ethiopia and Tanzania in maize. Outcomes of this type are more likely due to isolation rather than insulation, with domestic prices being determined by domestic supply and demand and rising because of short domestic supplies during a period of high domestic prices. They are retained because the alternative of these countries drawing from world markets would—while relieving the pressure on the domestic market—have placed upward pressure on world markets.

For rice, it appears that China, India and the Philippines reduced their protection enough to have smaller domestic price increases than they would have experienced without intervention by any country. China and India contributed much more to the overall increase in world prices than did the Philippines because of their much greater share in world markets. Figure 5 also shows that China and India contributed much more to the increase in world prices than did any other country—both because of their size and the extent to which they both insulated against the increase in world prices. Other countries, such as Indonesia and Bangladesh insulated themselves to some degree from the increase in world prices—and hence increased the magnitude of the rise in world prices—but not by enough to offset the price-increasing implications of all countries' collective action. For these countries, the domestic price increased more than it would have done in the absence of insulation.

For wheat, the countries that insulated sufficiently that their domestic price rise by less in the absence of insulation appear to have included China, Pakistan, Japan and Iran. While India insulated, it appears not to have done so enough to reduce the increase in domestic prices below the increase that would have occurred in the absence of insulation. For other countries, it appears that the increase in domestic prices was greater than it would have been in the absence of insulation.

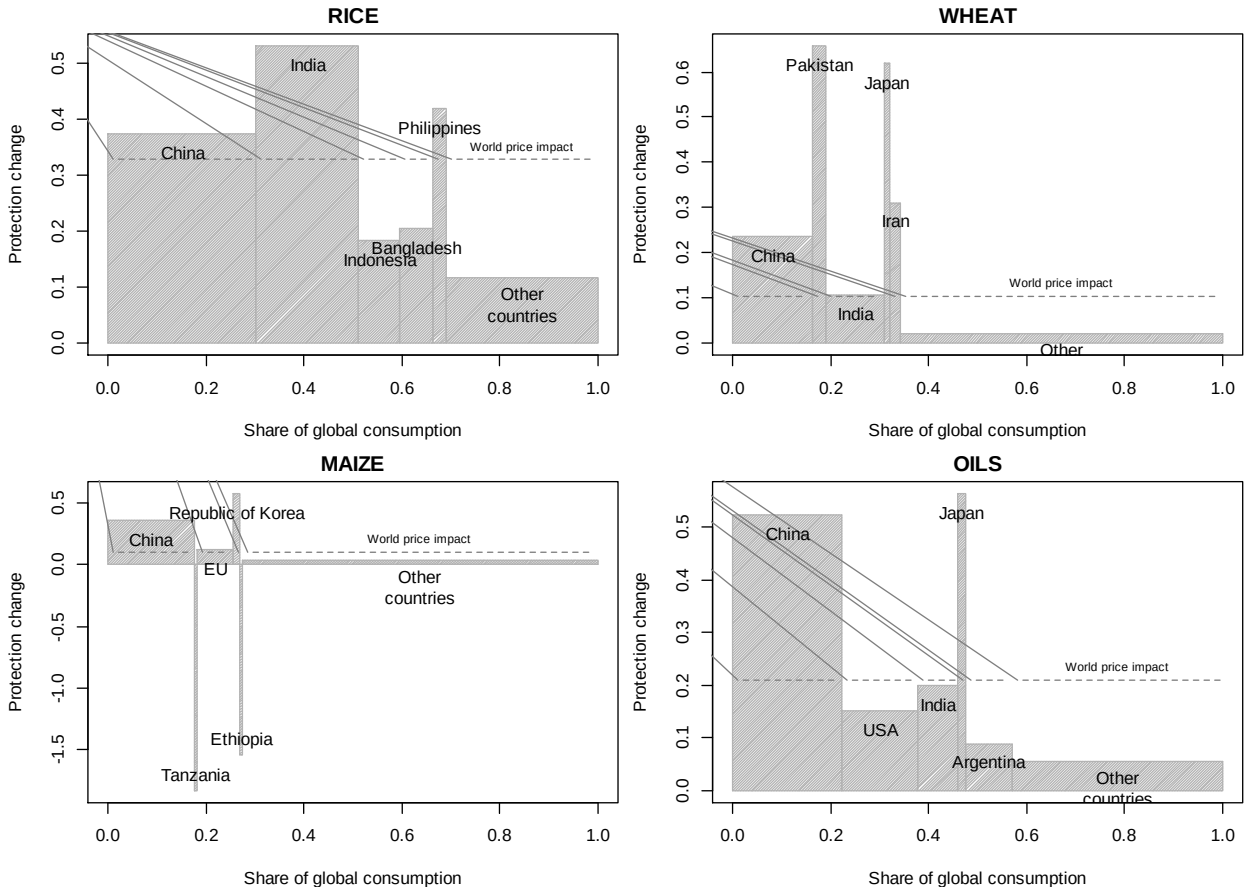
For maize, China, the Republic of Korea and Indonesia appear to have insulated enough to reduce the volatility of their prices relative to the no-insulation scenario. For other countries, it appears that price volatility was greater than it would have been in the absence of intervention. For edible oils, it appears that China and Japan were the two important countries that insulated enough to reduce the volatility of their domestic prices relative to the no-insulation benchmark.

**Table 7: Impacts of price insulation on international prices, %**

| | Assuming no production response, % | Assuming es=1, ed=-0.2 % | Share of consumption covered, % | Share of production covered, % | Number of countries |
|---|---|---|---|---|---|
| Rice | 30.3 | 29.4 | 90 | 92 | 81 |
| Wheat | 7.6 | 6.9 | 96 | 97 | 85 |
| Maize | 6.4 | 4.4 | 94 | 97 | 102 |
| Oilseeds | 9.8 | 11.2 | 94 | 97 | 96 |

Source: Authors' estimates

**Figure 5: Contribution of countries' insulation to global price change**




### *Domestic prices with and without insulation*

We can now estimate the change in domestic prices that would have occurred in each country had it and all other countries not altered the restriction on their international trade in these key

food items. These domestic price changes, reported in Table 8, therefore take into account two separate price impacts: first, is the impact of changing protection which frequently means increasing protection and hence domestic prices relative to the world prices. Second, the abstention from insulation the whole world lowers international prices. Hence a country which would double its protection which would mean doubling its domestic price relative to the international price could experience zero price impact if at the same time international prices halved. In practice, the price impacts across different countries and commodities were more varied, depending on the actual level of insulation and its relative size to the hypothetical change in the international price.

**Table 8: Impact on domestic prices had all countries abstained from insulation, 2006–08, percent**

| | Rice | Wheat | Maize | Oils |
|---|---|---|---|---|
| Albania | — | 14.2 | 7.8 | 30.1 |
| Armenia | — | -14.8 | — | — |
| Bangladesh | -15.5 | 31.0 | 24.1 | -21.3 |
| Belize | 13.4 | — | 43.5 | 13.1 |
| Cambodia | -8.0 | — | -10.7 | -4.0 |
| Ecuador | -63.7 | -7.6 | -27.1 | -28.1 |
| Guatemala | -26.9 | — | 35.8 | — |
| India | 43.3 | 0.2 | 0.8 | -1.4 |
| Indonesia | -17.6 | — | 20.3 | 12.8 |
| Côte d'Ivoire | -27.7 | — | 4.0 | -4.5 |
| Malawi | -35.0 | 27.4 | -63.4 | -18.4 |
| Moldova | — | 22.8 | 14.6 | -21.2 |
| Mongolia | — | -15.6 | — | — |
| Nepal | 70.2 | 34.1 | 0.8 | -20.7 |
| Nicaragua | -11.8 | — | 22.4 | 7.6 |
| Niger | -27.1 | -3.8 | 5.3 | -14.3 |
| Nigeria | -2.2 | 89.1 | 11.6 | -11.4 |
| Pakistan | 32.6 | 161.4 | 79.5 | 19.4 |
| Panama | -26.4 | — | 16.8 | — |
| Peru | -42.3 | -2.2 | 16.1 | -17.1 |
| Rwanda | 51.8 | 31.0 | -65.5 | -15.6 |
| Sri Lanka | -69.7 | — | -21.5 | -24.8 |
| Tajikistan | 75.4 | 74.8 | — | — |
| Tanzania | -35.2 | — | -68.3 | — |
| Uganda | -36.0 | — | -21.7 | — |
| Viet Nam | -20.0 | — | — | — |
| Yemen | — | 49.1 | 18.4 | — |
| Zambia | -14.3 | 32.2 | -46.3 | -20.9 |
| Albania | — | 14.2 | 7.8 | 30.1 |
| China | -14.2 | -10.3 | -10.8 | -22.4 |
| Brazil | 7.4 | 17.2 | 40.8 | 65.5 |
| Egypt | -26.3 | -33.3 | 17.2 | -39.6 |
| Philippines | 15.7 | — | 29.7 | -13.2 |
| Russia | -17.9 | -16.0 | 9.1 | -32.8 |

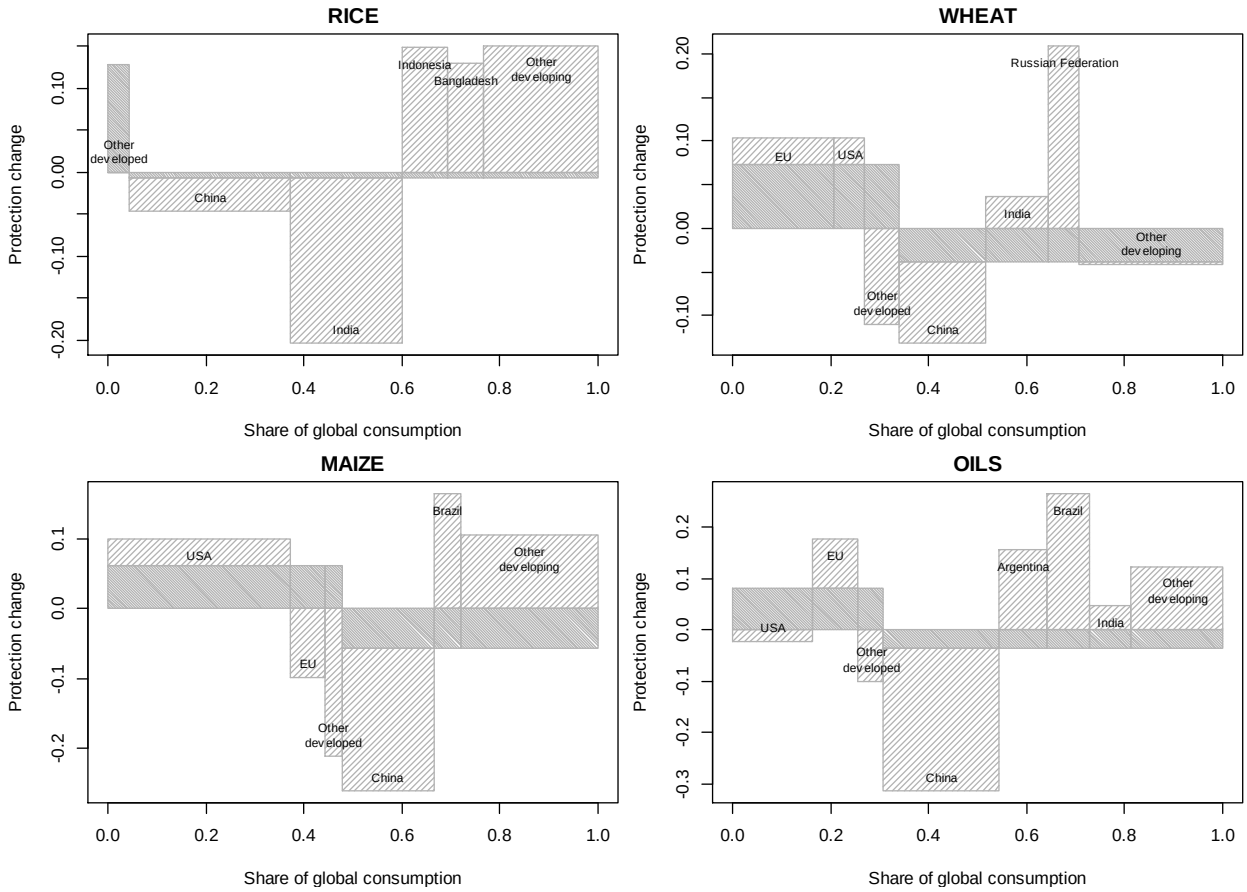
***Distribution of price and poverty changes due to the actions of groups of countries***

As we have shown earlier in this work, different countries applied different changes in protection during the 2006–2008 price surge, with the end result that some countries achieved the desired reduction in the domestic prices while others experienced higher prices than they would have experienced if no one insulated. In other words, some countries, which insulated more vigorously, "exported" price increases to those countries that insulated less and therefore "imported" parts of the price increases. Because these "imports" and "exports" of price increases have important consequences on poverty, it is important to understand how different groups of countries, and especially the poorer ones, handled their own insulation and whether their decisions contributed to more adverse poverty impacts or whether they improved the lives of the poor. In order to facilitate such an analysis, in Figure 6 we show the distribution of price changes due to countries' actions by two views.

First, we consider the impacts of the actions of developed and developing countries acting as two aggregate groups. The lavender set of bars in each subfigure shows the size of the price change transmitted between developed and developing countries. The size of the price change is determined by the consumption share of each group (x-axis) and the size of excess insulation (over the international price change). As we can see, in each case the actions of the developing countries results in lowering their extent of their own price rise at the expense of the developed countries. Only in the case of rice did the impact of the developing countries' actions not lower their own prices much. This is simply because rice consumption in developed countries is a tiny share of world consumption and hence little of the rice price increase could be "exported" from there.

Another important question that can be addressed in our series of charts is the level of coordination among developing countries' own actions. We show this as a set of lightly shaded bars which show how much of the price change was distributed within the group by group member actions. For example, in the case of rice we can see that India and China insulated their markets much more than other developing countries, shifting large price increases onto the shoulders of other developing countries. A similar situation can be observed for the remaining crops, where China alone was successful in lowering the extent of its own domestic price rise but, in doing so, it reduced or cancelled the price-stabilizing efforts of other developing countries.

**Figure 6: The distribution of price changes due to the observed insulation between developed and developing countries (densely shaded) and among major developing and developed countries (lightly shaded boxes)**



***Poverty impacts***

Using our sample of 29 developing countries, we evaluate the poverty impacts of the hypothetical price changes associated with removing the observed levels of price insulation in the period of 2006–2008. To calculate poverty impacts, we follow the methodology of Ivanic, Martin, Zaman (2012) who measure changes in poverty as a change in the number of people living on less than a dollar a day. Following their approach, we also only consider the short-run impact of the changes in food prices on households' agricultural sales and food expenditures. We ignore any quantity adjustments (increases in production or changes in consumption) as well as any impacts of food prices on wage rates.

We compare the base simulation, in which we consider the actual observed levels of insulation, with another simulation in which we assume that all developing countries insulated by the same degree, namely that equal to the average observed developing-country insulation. This counterfactual simulation allows us to see whether the decisions of individual countries helped the poor or made the situation worse for them. Both sets of results are shown in Table 9 in terms of percentage point changes in the initial poverty rates as well as the estimated absolute changes in poverty. Besides showing the estimated poverty changes for each country included in the sample, Table 9 also shows extrapolated poverty impacts for the groups of low- and middle-income countries (weighted) and the estimated total for all developing countries.

The poverty results suggest that the observed level of price insulation helped lower global poverty. Had developing countries abstained from it, poverty would have been higher by 3.7 percentage points globally. That translates to avoiding about 173 million extra people falling into poverty. Most of this impact is due to the vigorous insulation by India and Pakistan, two of the most populous countries in our sample. Had all developing countries insulated identically at the

average level, the removal of this uniform insulation would have still raised poverty by 59 million people. This suggests that not only did the insulation by the developing countries generally help prevent an increase in poverty but the differential actions of individual developing countries roughly doubled the poverty alleviating impact of the insulation.

**Table 9: Changes in poverty due to abstaining from insulation in 2006–08, percent**

| | Observed insulation | | Hypothetical uniform insulation in developing countries | |
|---|---|---|---|---|
| | Change in poverty headcount (%) | Change in number of poor (thousand) | Change in poverty headcount (%) | Change in number of poor (thousand) |
| Albania | 0.3 | 0.0 | 0.1 | 0.0 |
| Armenia | -0.1 | 0.0 | 0.3 | 0.0 |
| Bangladesh | -0.2 | -0.2 | 0.2 | 0.4 |
| Belize | 0.1 | 0.0 | 0.1 | 0.0 |
| Cambodia | 1.2 | 0.2 | -2.0 | -0.3 |
| Ecuador | -0.6 | -0.1 | 0.2 | 0.0 |
| Guatemala | 0.3 | 0.0 | 0.2 | 0.0 |
| India | 4.0 | 47.0 | 1.8 | 20.8 |
| Indonesia | 0.1 | 0.3 | 0.2 | 0.5 |
| Côte d'Ivoire | -1.1 | -0.2 | 0.8 | 0.2 |
| Malawi | -1.4 | -0.2 | 0.2 | 0.0 |
| Moldova | 0.5 | 0.0 | 0.3 | 0.0 |
| Mongolia | -0.7 | 0.0 | 0.5 | 0.0 |
| Nepal | 0.9 | 0.3 | 0.0 | 0.0 |
| Nicaragua | -0.3 | 0.0 | 0.3 | 0.0 |
| Niger | -0.8 | -0.1 | 0.6 | 0.1 |
| Nigeria | 0.4 | 0.7 | 0.5 | 0.7 |
| Pakistan | 12.9 | 22.3 | 0.9 | 1.5 |
| Panama | -0.3 | 0.0 | 0.2 | 0.0 |
| Peru | -0.4 | -0.1 | 0.2 | 0.1 |
| Rwanda | -0.2 | 0.0 | 0.1 | 0.0 |
| Sri Lanka | -2.1 | -0.4 | 0.8 | 0.2 |
| Tajikistan | 4.1 | 0.3 | 1.0 | 0.1 |
| Tanzania | -2.0 | -0.9 | 0.9 | 0.4 |
| Timor-Leste | 0.0 | 0.0 | 0.0 | 0.0 |
| Uganda | -0.1 | 0.0 | 0.2 | 0.1 |
| Viet Nam | 2.4 | 2.1 | -0.5 | -0.5 |
| Yemen | 3.5 | 0.9 | 0.7 | 0.2 |
| Zambia | 0.8 | 0.1 | 0.1 | 0.0 |
| Low-income countries | -0.2 | -1.7 | 0.2 | 1.8 |
| Middle-income countries | 3.7 | 174.4 | 1.2 | 57.1 |
| All developing countries | 3.1 | 172.7 | 1.1 | 58.9 |

Source: Authors' calculations

Two other useful measures presented in Table 10 are partial indicators, not taking into account the effects of insulation on world prices. The first is the impact of observed changes in domestic prices on poverty. This measure suggests that the increases in the prices of the four

products considered in this paper would, using the approaches of this paper, result in an increase of 204 million people living below the $1.25 per day poverty line. The second measure, which we term the apparent poverty reduction from price insulation is the effect of price interventions on poverty assuming that the world price is unchanged by countries' interventions. This measure is 394 million people. It seems likely that policy makers—particularly in small countries—would focus on this measure because it does not require a model of policy choice in the universe of countries, and does not require knowledge of the policy responses being taken by other countries. Unfortunately, as is clear from Table 10, it is a very upward-biased measure of the effectiveness of price insulation.

**Table 10: Partial changes in poverty due to changes in domestic prices and domestic protection in 2006–08, percent (ignoring world price impacts)**

| | Observed changes is in domestic prices | | Abstaining from protection | |
|---|---|---|---|---|
| | Change in poverty headcount (%) | Change in number of poor (thousand) | Change in poverty headcount (%) | Change in number of poor (thousand) |
| Albania | 0.7 | 0.0 | 0.4 | 0.0 |
| Armenia | 0.9 | 0.0 | -0.1 | 0.0 |
| Bangladesh | -0.2 | -0.3 | -0.2 | -0.3 |
| Belize | 0.0 | 0.0 | 1.4 | 0.0 |
| Cambodia | -6.1 | -0.9 | -4.9 | -0.7 |
| Ecuador | 0.8 | 0.1 | -0.3 | 0.0 |
| Guatemala | 0.8 | 0.1 | 0.6 | 0.1 |
| India | 6.7 | 78.1 | 11.0 | 128.9 |
| Indonesia | 0.7 | 1.7 | 0.6 | 1.4 |
| Côte d'Ivoire | 4.7 | 0.9 | 0.6 | 0.1 |
| Malawi | 1.1 | 0.2 | -0.9 | -0.1 |
| Moldova | 2.7 | 0.1 | 1.1 | 0.0 |
| Mongolia | 5.9 | 0.2 | -0.3 | 0.0 |
| Nepal | 0.0 | 0.0 | 2.2 | 0.6 |
| Nicaragua | 0.6 | 0.0 | 0.9 | 0.1 |
| Niger | 1.2 | 0.2 | 0.6 | 0.1 |
| Nigeria | 0.6 | 0.9 | 2.1 | 3.3 |
| Pakistan | -0.8 | -1.4 | 17.0 | 29.5 |
| Panama | 0.4 | 0.0 | 0.1 | 0.0 |
| Peru | 2.8 | 0.8 | 0.0 | 0.0 |
| Rwanda | 0.3 | 0.0 | 0.5 | 0.0 |
| Sri Lanka | 5.2 | 1.1 | -1.6 | -0.3 |
| Tajikistan | 1.1 | 0.1 | 7.0 | 0.5 |
| Tanzania | 1.7 | 0.8 | -1.5 | -0.7 |
| Timor-Leste | 0.0 | 0.0 | 0.0 | 0.0 |
| Uganda | 0.2 | 0.1 | 0.0 | 0.0 |
| Viet Nam | 0.3 | 0.2 | -0.5 | -0.4 |
| Yemen | 4.7 | 1.1 | 4.9 | 1.2 |
| Zambia | 3.4 | 0.4 | 1.4 | 0.2 |
| Low-income countries | 0.2 | 1.3 | -0.1 | -0.8 |
| Middle-income countries | 4.3 | 202.3 | 8.3 | 394.6 |
| All developing countries | 3.6 | 203.7 | 0.7 | 393.8 |

Source: Authors' calculations

## Some Policy Implications

Standard principles of economic policy suggest that the most effective approach to dealing with the poverty consequences of price volatility is through the policy that is targeted most directly to

the problem. This suggests that a social safety net targeted directly to poverty impacts is likely to be better than an indirect policy that operates through the market prices facing all consumers and producers. If, however, pure safety net policies are not feasible to the extent required, it may be important to consider alternative policies.

As has recently been shown by Gouel and Jean (2012), policy makers in small countries where high food prices have adverse welfare impacts have an incentive to use trade policies that insulate their domestic markets from large shocks to world prices. At the global level, such insulating policies are beggar-thy-neighbor because measures—such as export restrictions—that lower domestic prices in a group of collectively-large countries raise world prices. However, Gouel and Jean (2012) find that targeted subsidies to domestic storage yields better outcomes for each individual country—and would clearly do so for the world as a whole.

One potential policy recommendation from the apparent success of some countries in reducing the extent of the increase in domestic prices might be to encourage or assist other developing countries to achieve the same high degree of price insulation. This recommendation would, however, run head-first into the collective action problem. For commodities such as rice, where the market share of developing countries is vanishingly small, equally successful insulation by all market participants is the same as no insulation at all.

Key policy questions are what types of reforms are needed and at what level—national, regional or global—are policy reforms needed. If price stabilization were only attainable through price insulation, if all countries had the same responses to price volatility and all countries were small, then the collective action problem would need to be addressed at regional or global levels. Each country would, unilaterally, have an incentive to insulate to the same degree. Using rational

storage policies as suggested by Gouel and Jean (2012) offers some possibility of diminishing the extent of beggar-thy-neighbor impacts

The Gouel and Jean (2012) result that a combination of insulating trade policies and subsidies to storage in times of domestic surplus provides a potential basis for policy recommendations that would improve on current outcomes. However, this would involve a substantial change in behavior from the policies observed in the 2008 crisis, in which global rice stocks—and stocks in most major developing countries—increased despite extraordinarily high prices.

The result that the largest developing countries tended to insulate their markets more than other countries raises important questions for their policy makers. That this occurred despite a higher cost to these countries than others of unilateral insulating action[3] is something of a puzzle. Are policy makers taking full account of the impact of their actions on world prices? Perhaps part of the explanation is that the largest developing countries have historically been close to self-sufficient, and hence policy makers are not strongly concerned about developing reputations as reliable exporters—a goal that appears to have contributed to a pressure by farm interests against export taxes in countries such as the United States.

At the national level, it appears likely that policies that better take into account the costs of the insulating policies—and use the complementarity between trade and storage policies highlighted by Gouel and Jean (2012) —might help to reduce both the extent of intervention and the adverse impacts on other partners.

At the regional level, there may be scope for policy commitments that reduce the adverse impacts of beggar-thy-neighbor policies. If, for instance, regional groups were able to make

[3] The welfare costs of unilaterally reducing the domestic price to any given extent are higher in a large country than a small country because action by a large country to, say, reduce its domestic price causes the world price to rise and hence increases the welfare cost of achieving any given reduction in the extent of the domestic price spike.

binding commitments to allow exports to flow even during times of shortage, then this may reduce the deep-seated concerns of policy makers in importing countries about the availability of sufficient food in times of crisis.

Countries depending heavily on the world market for food worry they might be vulnerable to export controls or taxes imposed by their suppliers. At the WTO, many importing countries have put forward proposals for disciplining export barriers (Congo 2001, Japan 2000, Jordan 2001, Korea 2001 and Switzerland 2000). Some of these proposals were far reaching: for example, the Jordan proposal was to ban export restrictions and bind all export taxes at zero. The proposal by Japan involved disciplines similar to those on the import side, with export restrictions to be replaced by taxes and export taxes to be bound. Recognizing that importers' concerns about the reliability of supply might inhibit liberalization, some exporting countries have also advocated multilateral restrictions on the right to use export restrictions. In the preliminary negotiations on agriculture held between 1999 and 2001 under Article 20 of the Uruguay Round Agreement on agriculture, the Cairns Group (2000) and the United States (2000) put forward proposals for disciplines on export barriers and/or taxes.

The ability of importing countries to lower protection when prices rise is currently unconstrained by WTO rules, except that countries with low initial tariffs have little scope to reduce their protection when world prices rise. They can, of course, introduce import subsidies, as some countries did in 2008. If exporting countries were restrained in the introduction of export barriers, there may be less need to be concerned about the effects of tariff reductions on world prices.

## Conclusions

In this paper, we have analyzed the distributional and poverty impacts of the food price insulation that was observed in the period of 2006–2008 when prices of many staple food items increased sharply. For four major food items—rice, wheat, maize and edible oils—which comprise nearly half of poor people's diets, we have estimated how much the observed insulating actions of developing countries, taken as a whole and individually, affected international and domestic food prices and how much it alleviated an increase in global poverty.

Most importantly, we find that the observed patterns of price insulation resulted in a rise of international prices which partly offset the benefits of insulation. However, we also find that developing countries as a group insulated more than developed countries. That resulted in parts of the price increases being exported to developed countries. This pattern of insulation applied to all four commodities considered in this study, but in the case of rice, for which developed countries represent only a tiny portion of global consumption, the insulation by developing countries did little to lower their domestic prices. When we consider the poverty impacts of the developed and developing countries' responses with all developing countries assumed acting identically so that their aggregate insulation is the same as observed, we find that they were poverty reducing, lowering global poverty by an estimated 56 million people.

Not only did the observed insulating responses by developing countries result in exportation of higher prices to the developed countries, but a lot of the transfers of higher prices happened also among developing countries themselves. We find that large countries, especially China and India, often insulated much more than the rest of the developing world, which resulted in the domestic prices of such insulating countries being lower at the expense of other developing countries.

Even though the large insulation efforts of some of the largest developing countries, for example India, often lowered their domestic prices at the expense of other developing countries, we find that this was generally good for the poor. When we simulate the impact of removing the actually observed protection changes as opposed to simulating a removal of uniform protection changes among the groups of developed and developing countries, we find that global poverty would fall by about 173 million people.

Based on the presented findings it appears that price insulation observed as a response of many developing countries to the rising food prices generally protected the poor because developing countries, as a group, managed to shift some of the burden of higher prices to the industrial countries. The benefits to the poor in developing countries as a group also appear to have been increased by the actions of some of the largest developing countries; however, it is important to note that these actions resulted in higher poverty among the smaller, yet more vulnerable, low-income developing countries. The effectiveness of price insulation in reducing poverty is much lower than it appears. While the apparent poverty reduction associated with price insulation in 2006-8 was estimated to be 394 million, the actual increase in poverty is estimated using our model at 204 million for the set of commodities considered in this paper.

The fact that the policies implemented in 2008 appear to have reduced poverty leaves room for a great deal of work on approaches that could do better in dealing with this critical problem. The reduction in poverty is much smaller than it might have appeared by comparing the impacts on poverty with those that would have transpired with full transmission of the prices that prevailed. There appears to be considerable scope to improve on the outcome resulting from this set of policy responses by using better policies at national, regional and global levels.

In this analysis, however, we have examined the price effects for just four food items. As well, we have not been able to take account of any indirect effects on poor households that come via factor markets. In agrarian economies with the vast majority of workers employed in agriculture, an increase in farm product prices may raise unskilled wages. That would lower the adverse impact on landless laborers of higher food prices, although we have not found this channel of effect to change the results substantially in earlier work in this vein (Ivanic and Martin 2008; Ivanic, Martin and Zaman 2012).

A particularly important caveat about our results is that they are based on a sample of developing countries which excludes China because of the lack of access to household data for China—the largest developing country representing about a fourth of the population of developing countries. If the poor households in China and other excluded countries are very different from those in our sample i.e. if their distribution or food consumption and production patterns are significantly different, their inclusion in the future could strongly affect the results.

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