Trade Distortions and Food Price Surges

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Prices of grains and other storable commodities are characterized by long periods in the
doldrums, punctuated by short but intense price spikes (Deaton and Laroque 1992). Those
spikes are of concern not least because they can have large impacts on poverty in developing
countries (Ivanic and Martin 2008). The (fortunately) infrequent nature of these price spikes
in recent decades, however, limits the amount of information available for analysis of this
important phenomenon. Accounts of the food price spikes of 1973-74 and 2006-8 (and the
smaller 2010 leap in the price of wheat) have included discussion of a wide range of
contributing factors, including exogenous shocks to supply and to demand, the role of low
stock levels, the role of trade policy responses to the price shocks, and the importance of
speculative behavior in commodity markets.

Many analyses of the size of and contributing causes to the 2006-08 shock have
appeared, including by authors such as Mitchell (2008); Childs and Kiawu (2009); Baffes and
Haniotis (2010); Hochman et al. (2010); Robles, Torero and von Braun (2008); and Slayton
(2009). While many of these studies, and much popular discussion, have acknowledged the
potential importance of trade policy changes on both the export and import side—and
Johnson (1975) emphasized this issue for the 1973-74 price spike--there have been few
attempts to date to quantify the impacts of these trade policy measures on price surges.
Without an assessment of the (potentially important) role of trade policy interventions in
contributing to price spikes, it seems difficult to apportion responsibility for price surges.

It seems clear from accounts of the 2006-8 spike, and the 40 percent surge in wheat
prices in the summer of 2010, that export restrictions (and maybe import subsidies) played an
important role – just as intensified import restrictions and export subsidies played a
significant role in downward price spikes in 1986. However, the relative importance of the
contribution of export restrictions, and of any reductions in import restrictions by food-
importing countries, has not yet been identified to our knowledge. It requires aggregation
across countries if their overall impact on world prices is to be assessed and used to build a
more-complete picture of the determinants of food price surges. In this paper, we address this
question directly for the key commodities of wheat and rice.

The paper begins by considering the impacts of trade policy interventions on
international and domestic food prices in the limiting case where countries seek to completely
offset the impact of changes in the international market on their domestic market. Then in
section 2 we consider the more realistic case where countries seek to only partially insulate their domestic market from changes abroad. Section 3 explores what countries with an aversion to domestic price instability, and an awareness of the costs of being substantially away from international prices in the long run, would do when international prices spike. With this conceptual background, section 4 examines evidence from the two major upward price spikes of modern times—that of 1973-4 and that of 2006-8. Policy implications are drawn out in the final section of the paper.

1. World Price Volatility and Trade Policy—The Extreme Case

Consider a weather- (or financial market-) induced exogenous shock to the global market for a food staple such as rice or wheat. In response to the surge in its international price, assume that exporting countries impose or tighten export restrictions (or lower any export subsidies), and importing countries reduce their tariffs or other import restrictions (or impose or raise any import subsidies) in attempting to reduce the rise in their domestic price. In this section we consider the case where both sets of countries try to use trade policy to completely neutralize the impact of the shock on their domestic markets.

For an individual small exporting country, the effect of the increase in its (explicit or implicit) export tax it is to reduce the domestic price relative to the newly-raised world price. The same effect occurs in a small importing country that reduces its (explicit or implicit) import tariff. If a sufficient number of exporting countries intervene in this way, their export restrictions cause the world price of the good to rise further, thereby reducing the impact of each country’s initial action on its domestic price. This situation is depicted in Figure 1, where the excess supply curve of the exporting country group is ES and the excess demand curve of the importing country group is ED following the exogenous shock but prior to any changes to trade restrictions. If an export tax is then applied, the world price needed to obtain any given level of exports is higher, since part of the export price is paid to the exporting government. This is reflected in the ES curve moving up to ES', the effects of which are to raise the world price from $P_w$ to $P'_w$ and lower the domestic price from $P_w$ to $P_d$.

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1 If quantitative export restrictions were imposed instead, the rights to export become valuable, with the holders of the export rights receiving the benefits that would accrue to the government if an export tax had been used.
In the situation depicted in Figure 1, the exporting country group gains from the improvement in their export price and, even though export prices are higher, production incentives are reduced and consumers have an incentive to increase their demand. The global social cost associated with these incentives is given by the triangle $abc$. That can be subdivided into a loss to private agents in the importing group of area $bcP_w'P_w$, a loss to private agents in the exporting group of area $baP_dP_w$, and a gain to the government or export quota holders in the exporting country group of area $acP_w'P_w$. Whether the exporting countries as a group enjoy a net gain from restricting exports depends on whether the upper rectangle (the terms of trade gain) is larger than the lower triangle (the social cost). Since the social costs rise with the square of the export tax equivalent $(P_w' - P_d)$, while the terms of trade gain is likely to rise linearly with the rate, the benefits to the exporter group will become negative if the export tax rate becomes sufficiently large. By contrast, importing countries unambiguously lose from the export restrictions as they transfer income to the exporter.²

² See Martin (1997) for approaches to measuring this welfare impact.
If policy makers in importing countries were concerned primarily about the level of world prices and the imposition of export restrictions, they might respond by raising tariffs on their imports. However, during episodes of international food price spikes, the response has typically been the opposite: tariffs on food imports are reduced in an attempt to avoid adverse impacts on domestic consumers. This response reduces the cost imposed on the importing country group by its own protectionist barriers. However, it will compound the increase in world prices resulting from the initial price shock and the policy response by exporters. It will also add to the exporter group’s terms-of-trade benefits resulting from the initial upward price shock and from its own imposition of export restrictions.

In Figure 2, exporters attempt to completely offset the impact of the initial increase in the price of the good by shifting the ES curve to ES'. Importers seek to achieve the same insulation by reducing tariffs (or paying import subsidies) so as to shift the ED curve to ED'. As is evident in Figure 2, the combined effect of these policy changes is to leave domestic prices in both importers and exporters at the post-shock level P_w and to raise the international price from P'_w to P''_w. Despite the attempts of both the importer and exporter country groups to fully offset the original increase in price to P_w, domestic prices and quantities unchanged at their post-shock level (P_0 in the Figure). The only effect of these policies is to compound the terms-of-trade shift against the importing country group and in favor of the exporting group, generating a transfer from the former to the latter of (P''_w-P_0).Q in Figure 2 (in addition to that caused by the initial exogenous shock). This is in sharp contrast to a move from autarchy towards free trade, which is able to reduce price risk through diversification of market outlets very substantially since the correlations between commodity output shocks across countries are very limited (Johnson 1975).

The effect of the full insulation policy is a classic collective-action problem akin to that arising when a crowd stands up in a stadium to get a better view. Individual members of the crowd who stand get the same view they would have experienced they remained seated, so nothing has been achieved by standing. The problem cannot be solved unilaterally, as an individual who acts unilaterally against the crowd by not standing gets a worse view than if everyone had remained seated. Only a collective agreement not to stand will allow everyone to avoid the cost of standing while maintaining the original view. In the attempted case of full price insulation, not only is the policy of insulation collectively impotent in stabilizing domestic prices, but it multiplies the variance of the income redistributions associated with terms-of-trade effects by a factor of four. Collective agreements to limit the extent of price
insulating policies—one of the goals of the WTO—could potentially reduce the rather more serious costs associated with greater instability of income associated with changes in world prices of agricultural products.

**Figure 2. Impacts of equal export barrier increases and import barrier reductions**

If exporters and importers remained determined to **fully** offset the impact of the original price shock on their domestic prices, the world would enter an infinite loop. Dissatisfied with the increase in domestic prices resulting from the higher world price and their initial export taxes, exporters would increase their export tax rates further than shown in Figure 2, and importers would further reduce their tariffs. Importers would face greater constraints in following this approach to its logical conclusion because their tariffs would eventually fall to zero, requiring them to introduce import subsidies—and hence to impose greater marginal economic costs on themselves—as they sought to offset the initial price shock. While the introduction of (direct or implicit) import subsidies is not unknown, it is less common in agricultural trade than protection, even during periods of very high food prices (Anderson and Nelgen 2010a). The fact that food price spikes are dramatic but do not lead to unbounded increases in food prices suggests, using *reductio ad absurdum* arguments, that countries do not seek to completely offset the impact of changes in world food prices on their domestic prices.
Another important lesson from Figures 1 and 2 is of the absolute symmetry between insulating actions taken through export restrictions and import barrier reductions. While economists tend to be more critical of the use of export barriers as creating instability in world markets, they frequently applaud import barrier reductions undertaken in the same context. There may be some basis for this support if the reduction is believed to be permanent once undertaken. If, however, it is undertaken purely on a temporary basis, as a way to reduce the instability of domestic prices, the effects on the instability of world prices are clearly quite symmetric. From a policy viewpoint, there remains an important distinction, however, because the multilateral trading system has quite different rules in the two cases (see Bouët and Laborde 2010).

2. World Price Volatility and Trade Policy—Partial Insulation

The empirical evidence based on a large sample of developing countries over the period from 1995 to 2007 (Anderson 2009) using a price comparison methodology (Anderson et al. 2008) indicates that agricultural distortions differ substantially across commodities and countries, with rates for individual commodities changing over long periods and year-to-year changes being negatively correlated with movements in real prices. This evidence suggests that policy makers prefer different trend rates of protection across commodities, and also over time to deal both with the evolution of relative political-economy strengths of different interest groups and with a desire to smooth intertemporal variations in commodity prices and quantities that openness to international markets otherwise would involve.

This preference for policies that insulate domestic prices from short run changes around a desired level that differs from world prices in a way that rewards politically influential interest groups has been represented typically using relatively ad hoc combinations of average protection rates and price insulation coefficients. It seems desirable to be able to specify a welfare function that motivates such policy responses.

An objective function that can represent this type of preference builds on Jean, Laborde and Martin (2010a) and is closely related to Freund and Özden (2008). Suppose that policy makers in a single, small country seek to minimize the following money-metric political-economy welfare loss function:

\[ W = (p - \bar{p})' \alpha (p - \bar{p}) - h'p + e(p,u) - g(p,v) - z_p (p - p^*) \]
where higher values of \( W \) indicate greater costs of deviating from the policy makers’ preferred equilibrium in which domestic prices are aligned to the strength of different interest groups and do not deviation from their desired long-run levels; \( p \) is the domestic price vector; \( \alpha \) is a matrix representing the political-economy costs of deviations from the vector of desired domestic prices under the intervention regime, \( \bar{p} \); \( h \) is a vector of weights that represents the preference for higher, or lower, average domestic prices for individual commodities; \( e \) is the expenditure function; \( g \) is the GDP function representing the value of output in the country; \( z = e - g \) is the net expenditure function, and \( z_p \) is the derivative of this function and hence, by duality, the country’s vector of net imports; and \( p^* \) is a vector of world prices. The \((p - p^*)\) term is a vector of border price interventions such as trade taxes and subsidies or quantitative trade restrictions.

Note that the last three terms of equation (1) are a standard Anderson-Neary balance-of-trade function (Anderson and Neary 2005). If policy makers seek to minimize this function alone, the optimal tariff, \( p - p^* \), will be zero and the balance-of-trade function can be used to measure the cost of deviations from zero tariffs. As shown by Jean, Laborde and Martin (2010b), inclusion of the \( h'p \) term makes the political-economy function consistent with non-zero interventions.

The \( h \) function captures in reduced form a wide range of political-economy incentives for intervention such as the relative ability of particular sectors to lobby for assistance (see Anderson and Hayami 1986; Hillman 1982; Lindert 1991; Anderson 2010). This formulation captures the essence of the policy preference for sector-specific profits in Freund and Özden (2008), in a more general, but less specific, context. It allows factors such as countervailing lobbying by downstream users, and the differential impact of protection on returns to factors emphasized by Anderson (1995), to be taken into account. As shown by Jean, Laborde and Martin (2010a,b), the values of \( h \) can potentially be inferred from information on relative levels of protection\(^3\) across sectors and the price responsiveness of traded quantities.

The first term in equation (1) represents the cost of deviations from average domestic prices. These arise from a range of factors, including the inherent risk aversion of particular groups, and credit market imperfections that make it difficult to smooth consumption in response to income or expenditure shocks. The diagonal elements of this matrix would generally be expected to be positive—since deviations from average domestic prices (which include the effects of the chosen tariff) raise costs to some groups, and hence induce some

\(^3\) In the current context, \( h \) depends on the average rate of protection.
political pain. The off diagonal elements might be positive or negative, depending upon whether changes in other prices alleviate or exacerbate the political pain.

Equation (1) is very similar to the social welfare function in equation (5) of Freund and Özden (2008). One major difference is that our equation (1) is based on deviations from the expected domestic price, rather than a reference price. A second is that equation (1) punishes deviations in either direction from the expected price. A third is that the cost of deviations enters quadratically, rather than linearly. These differences in formulation reflect the particular situation of agricultural commodities, especially in developing countries. The expected price can be seen as a rational expectations counterpart of the reference price in Freund and Özden (2008). With agricultural commodities in poor countries, deviations in either direction from the expected price involve social costs because staple foods make up a large share of the incomes of poor consumers with limited access to credit, as well as being important for the income of some poor producers. In contrast with the puzzling situation in manufactures trade where only anti-trade interventions are frequently observed (Rodrik 1995), we also observe export subsidies and import subsidies in different states of agricultural markets, as well as anti-trade measures such as export and import restrictions. It also seems likely that the costs of being away from the expected domestic price level are increasing in the size of the deviation. One piece of evidence for this hypothesis is the dramatic increase in the incidence of export restrictions and import subsidies when prices increase sharply (World Bank 2008).

If we differentiate equation (1) with respect to prices, we obtain:

\[ \frac{\partial W}{dp} = 2\alpha(p - \bar{p}) - h - z_{pp}'(p - p^*) = 0 \]

This yields:

\[ (p - p^*) = z_{pp}^{-1}(2\alpha(p - \bar{p}) - h) \]

The expected value of \((p - p^*)\) is therefore given by:

\[ E(p - p^*) = (\bar{p} - \bar{p}^*) = -z_{pp}^{-1}h \]

Rearranging (3) and substituting for \(\bar{p}\) from (4), we obtain:

\[ z_{pp}(p - p^*) = 2\alpha(p + z_{pp}^{-1}h - \bar{p}^*) - h \]

which can be rearranged to:

\[ z_{pp}(p - p^*) = 2\alpha(p - p^* + p^* - \bar{p}^*) + 2\alpha z_{pp}^{-1}h - h \]

and

\[ (z_{pp} - 2\alpha)(p - p^*) = 2\alpha(p^* - \bar{p}^*) + (2\alpha - z_{pp}) z_{pp}^{-1}h \]
and finally:

\[(8) \quad (p-p^*) = -(2\alpha - z_{pp})^{-1}2\alpha(p^* - \bar{p}\star) + z_{pp}^{-1}h\]

Equation (8) is difficult to interpret in its general form and, in reality, it seems unlikely that policymakers or analysts would have good information on either the full matrix of slopes of the import demand function, \(z_{pp}\), or penalties, \(\alpha\), for deviations from the average domestic price. In applied work, a popular response to this problem (see Feenstra 1995) is to focus only on the diagonal elements of the relevant matrices. If we do this with equation (8), we are left with a relationship between the price distortion rate and deviations from the average world price of a particular commodity:

\[(9) \quad (p_i - p_i^*) = \frac{2\alpha_i}{(2\alpha_i - z_{ii})}(p_i^* - \overline{p}_i\star) + (\overline{p}_i - \overline{p}_i\star)\]

Since \(\alpha_i\) is positive and \(z_{ii}\) is negative, the coefficient on \((p_i^* - \overline{p}_i\star)\) in equation (9) lies between zero and one. Its (highly plausible) implication is that the higher the world price relative to its trend value, the lower will be the rate of distortion. This coefficient is, in fact, one minus the coefficient of price insulation used by Tyers and Anderson (1992). Equation (9) generates the potentially testable hypothesis that policy makers minimizing an objective function such as equation (1) will adjust their rates of agricultural price distortion to partially offset deviations of world prices from their trend value. This provides a rationale for the popular approach of characterizing policies using simple, apparently ad hoc, approaches such as the elasticity of price transmission.

The extent to which countries can reduce the instability they face by transferring it to other countries will depend on which countries seek to insulate and what reaction other countries make to these insulating policies. Tyers and Anderson (1992) made an ambitious attempt to assess the extent to which the policies adopted by major participants in the world market for grains and other agricultural staples affect the volatility of world market prices, and of domestic market prices. They concluded (1992, p. 227-8) that the coefficient of variation of world prices for food would fall from 34 to 10 if all countries agreed to eliminate their price insulating policies. In most of the 16 developing economies they considered, the coefficient of variation for domestic prices would fall substantially if all countries refrained from using the type of price insulating prices they have used in the past. In a number of these cases, such as Bangladesh, Thailand and South Africa, the reductions in domestic price
instability were estimated to be dramatic, with the coefficient of variation in Bangladesh, for instance, falling from 26 to 8. In the few cases where the coefficient of variation of domestic prices was estimated to rise, the increases were much smaller.

3. Assessing the implications of price insulation in crises

The implications of price insulation can be evaluated for a particular case, or as a change in regime. When considering a particular year, the implications of the regime can be assessed in terms of the change in the power of the tariff,\(^4\) and hence the implications for the relationship between the domestic and international prices of imported goods. When considering the implications of the insulation regime, using the elasticity of price transmission allows the impacts of price insulation for the variability of domestic and world prices to be assessed. Anderson and Nelgen (2010a) use a combination of these approaches to identify the impacts of trade policy in the 1973-74 food price surge.

To assess the implications of a change in protection rates on world prices, we begin with the global market equilibrium condition for a homogenous commodity:

\[
\sum_i S_i(p_i, \lambda_i) - \sum_i D_i(P_i) = 0
\]

where \(S_i\) is the supply in region \(i\); \(p\) is the producer price; \(\lambda_i\) is a production shift variable for that region; \(D_i\) is demand in region (which is assumed to be not subject to shocks from year to year); and \(P_i\) is the consumer price in region \(i\). We assume that \(p_i = (1+t_p)p^*\) where \(t_p\) is the distortion rate between producer prices and world prices, while \(P_i = (1+t_c)p^*\) where \(t_c\) is the distortion rate linking consumer and world prices. Where, as in the application in this paper, we focus only on the impact of pure border measures, it is convenient to use a single variable for the power of the trade tax equivalent, \(T = (1+t)\).

Totally differentiating (10), rearranging it, and expressing the results in percentage change form yields the following expression for the impact of a set of changes in trade distortions on world prices:

\[
T = \left(1 + \frac{1}{\sum_i \frac{\lambda_i}{\lambda_i T}} \right) - \sum_i \frac{\lambda_i}{\lambda_i T}
\]

\(^4\) The power of the trade tax equivalent is \(T = (1+t)\) where \(t\) is the proportional rate of taxation (or, if negative, of subsidization) of imports or exports. Proportional changes in this variable are associated with equi-proportional change in the domestic price relative to the external price.
where $\Delta P$ is the proportional change in the world price; $\xi_i$ is an exogenous stochastic shock to output, such as might result from better or worse weather than average; $\eta_i$ is the elasticity of demand; $\gamma_i$ is the elasticity of supply; $G_i$ is the share at world prices of country $i$ in global demand; and $H_i$ is the share of country $i$ in global production.

As might be expected, equation (11) shows that the impact of a change in trade distortions in country $i$ depends on the importance of the country in global supply and demand, as well as the responsiveness of production and consumption to price changes in the country, as represented by $\gamma_i$ and $\eta_i$. The more responsive are production and consumption in the country, the greater the impact of its trade policy choices on world prices. A notable implication of equation (11) is that a uniform policy response by countries ($\xi_i$ is the same for all countries) will make the elasticities of supply and demand irrelevant to the impact on world prices. This reaffirms the result noted graphically above for completely offsetting response to a price increase: if all countries raise (or lower) their distortion by a uniform amount, the world price will change by an exactly-offsetting amount, leaving domestic prices unchanged.

If we consider the case where protection varies endogenously in response to changes in world prices, trade distortions are no longer an exogenous source of shocks, and world prices will change only in response to exogenous shocks such as weather-induced shocks to output. In this case, the counterpart to equation (11) is:

\[(12)\]

\[\Delta P = \frac{(\sum_i H_i \gamma_i \eta_i)}{\sum_i \eta_i} \Delta \xi_i \]

where $\theta_i$ is the elasticity of transmission from world prices to the consumer price in country $i$; and $\varphi_i$ is the elasticity of transmission from world prices to the domestic producer price.

Where we focus only on trade measures, and these elasticities of price transmission are the same, it is clear that the impact of price insulation on world prices is larger the smaller are the elasticities of transmission. If the elasticity of price transmission is, for instance, 0.5 in all countries (a finding in line with that of Anderson et al. (2010) for key commodities such as rice and wheat), the impact of any exogenous shock on world prices will be twice as large as it would be with full price transmission. In this situation, the variance of world prices will be four times as large as it would be in the absence of price insulation. If all countries used the price transmission elasticity of 0.15 implied by the 85 percent compensating duty provided
under the proposed Special Safeguard Mechanism (Hertel, Martin and Leister 2010), then the impact of any shock on world prices would be magnified by a factor of 6.7, and the variance by a factor of 44.

An individual country may be able to obtain relatively low cost reductions in the variability of its domestic prices by price insulation if other important countries refrain from this practice. The assumption that small vulnerable economies may be able to do this more than other economies presumably underlies many of the proposals for price insulating policies such as the price safeguard proposals of Valdés and Foster (2005). Historically, unfortunately, it has not been small, vulnerable economies that have used such policies the most extensively, but the richest countries such as the European Community with its variable import levies. The Uruguay Round agreement of the WTO attempted to address the problems created by price insulating policies by banning variable import levies and other directly insulating policies, and by counting protection provided by measures involving administered prices under both the market access and domestic support measures. A key question in any empirical analysis of the impacts of price insulation is whether it is used more by developing or industrial countries, and the size of the countries using the measure. If essentially all countries involved in production and trade of a commodity are using such insulating policies, they are likely to be ineffective for stabilizing domestic prices, while creating the redistributive impacts noted earlier in the paper.

4. The Cases of Rice and Wheat

The two commodities that have received the most recent attention because of price surges are wheat and rice. Given the importance of these commodities as staple foods for poor people in different regions, we focus on them in this initial application. Anderson and Nelgen (2010a) also consider the behavior of markets for these commodities in detail for previous price spikes and, to provide a basis for comparison, during relatively normal market conditions. We first review key results from this work as a basis for considering developments during the 2006-8 surge.

Comparing the 1974 and 2008 surges

What can be said about the role of trade measures from a closer examination of periods of extreme international price spikes? The only such periods prior to 2008 in the World Bank’s
distortions database are those around 1974 (an upward price spike) and 1986 (a downward price spike). Recent papers by Anderson and Nelgen (2010a,b) analyze the periods involving two years each side of the spike relative to in-between non-spike periods. A summary of their findings is as follows.

First, they begin by noting that the height and length of the international price spike around 1974 was broadly similar to that around 2008 for the three major cereals and groundnut oil, the staple of many poor people in tropical countries (Figure 2). Second, during the upward price spike years 1972-76, the NRAs for all covered products tend to be below the estimates for the periods either side of the spike, whereas in the mid-1980s when prices spiked downwards they tend to be above the NRAs in the more normal periods either side of that spike. Looking specifically at rice and wheat NRAs they find the same pattern, and it is repeated during the period of rising world prices to 2008 (Table 1).

Third, comparing 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), is easier if the NRA is converted to an NAC (nominal assistance coefficient, defined as 1+ NRA/100). The rice NAC for developing countries fell from 1.03 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 3.06 to 1.26. 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. The NAC falls for wheat were not as severe as for rice, but were still substantial at about one-third: from 1.22 in 1972 to 0.81 in 1974 for developing countries, and from 1.11 to 0.80 for high-income countries over the same 12-month period.

Considering all covered farm products, the NAC for developing countries fell by exactly one-third in the first two years of the 1970s spike 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. The extent of decline in the NACs in the most recent price spike seems to be somewhat less than in the 1970s for those two cereals and not quite as rapid: between 2005 and 2008 the NAC for rice fell just over one-third for high-income countries and halved for developing countries, and for wheat it fell one-third for developing countries and one-sixth for high-income countries (Table 1). That smaller and slower decline is consistent with the fact that there was a smaller proportionate rise in the international prices of those cereals in 2005-08 (Figure 2).
And fourth, Anderson and Nelgen decompose the NRAs into the various border and domestic measures for developing and high-income countries, for all covered products (Table 2). Annual estimates are provided for the upward spike period of 1972-76 and the downward spike period of 1984-88. Export restrictions were the dominant instrument for developing countries in both those periods, becoming more and then less important in the upward spike period of 1972-76, and conversely in the downward spike period of 1984-88. In high-income countries there are virtually no taxes or other restrictions on exports but the export subsidies have followed the same path as import tariffs over those spike periods: U-shaped during the upward spike, inverted U-shaped in the downward spike.

More on the 2006-08 Price Surge

The time profile of the most-recent price surge is depicted in the monthly data from 2001 presented in Figure 3. For rice, it is evident that the world price rose quite steadily from around $200 in 2001 to around $300 in late 2007, but rose spectacularly for a few months before falling back. The price in 2008 was roughly twice as high as for 2007. For wheat, the pattern was quite different, with the price increasing much more in 2007 than was the case for rice, and with the price rise in 2008 being much smaller from the 2007 level. For rice, the marketing years for most major producers and consumers are a calendar year (USDA www.fas.usda.gov/psdonline), and hence correspond well with the FAO measures of world and producer prices, which are also presented on a calendar year basis. For wheat, the marketing year for most countries is closer to July to June, making the match between the calendar year data for producer and consumer prices less tight. Since, however, the marketing data provide weights that are likely to be stable, this is a relatively minor problem.

Prices are now available for sufficient countries to enable at least a preliminary update of the NRAs in Anderson and Valenzuela (2008) for rice and wheat. Those estimates, reported in Anderson and Nelgen (2010b) are based, for high-income countries (including those that recently acceded to the EU-27), on PSE estimates reported in OECD (2010), and for developing countries on FAO and World Bank data sources for producer and border prices, respectively. The developing country estimates are less reliable than the earlier NRA estimates in Anderson and Valenzuela (2008), for several reasons. One is that the developing country coverage is less, because several of those included in the previous study have yet to report recent domestic prices – although most of the significant players are included. Another reason is that, to do the update promptly, the producer prices reported to FAO had to be used
for developing countries rather than more-nuanced price data typically available only in national statistical agencies. To minimize the errors this might introduce, the FAO producer prices in US current dollars were converted into an index set at 100 for 2004, and the 2004 US dollar prices in Anderson and Valenzuela (2008) were updated using the changes in that index for each country through to 2008. Likewise, to overcome delays in reporting export and import volumes and values, from which border prices could be derived, the authors simply used the Thailand 5% broken rice and Canadian wheat prices (from World Bank 2010) to create indexes set at 100 for 2004 for those international prices, and the 2004 border prices in Anderson and Valenzuela (2008) were updated using the changes in each of those indexes through to 2008.

With those updated estimates of agricultural distortions to 2008, we begin by assuming that output cannot respond in the short run, allowing us to focus only on the demand side. Because stocks were reportedly near their minimum level in 2008, we ignore stock adjustments and focus only on consumption. The other simplifying assumption we make is to assume that elasticities of demand for rice, and for wheat, are very similar across countries. Then equation (11) allows us to estimate the contribution to world price changes resulting from changes in trade policies as simply $-\bar{F}$, which is the consumption-weighted global average of the estimated NAC changes. We show these for the three years to 2008, and compare them with those for the 1970s, in the ‘World’ row towards the bottom of Table 2. For rice the annual changes since 2005 are 7, 8 and 37 percent, or an aggregate of 46 percent over the three years. That is, the rice NAC nearly halved between 2005 and 2008, which is almost as much as the decline in 1972-74 (of 58 percent). For wheat, the NAC fall globally was 28 percent over the 2005-08 period, compared with 30 percent in 1972/74.

According to World Bank price data, the world price of rice increased by 127 percent between 2005 and 2008, while the price of wheat increased by 114 percent. In short, these estimates suggest that in 2005-08 more than a third of the observed change in the international price of rice, and roughly one-quarter of the observed change in the international price of wheat, can be explained by the changes in trade policy that countries used in an attempt to insulate themselves from the initial increases in prices of these staple commodities resulting from underlying shocks such as those resulting from factors such as biofuels, income growth, drought and speculation that have been the focus of other work on the recent
price surge. In 2008 alone, the change in protection on rice explains close to forty percent of the 90 percent increase in rice prices observed for that year.

One important and encouraging difference between the 1974 and 2008 price surges is a sharp reduction in the extent of price insulation in the industrial countries. In the case of rice, the nominal assistance coefficient (NAC) for rice declined by 45 percent in the high-income countries between 1973 and 1974, while it fell by only 8 percent between 2007 and 2008. In the case of wheat, the decline in the NAC fell from 28 percent to 12 percent. For rice, the small share of the industrial countries in global production and consumption means that this greater restraint by the industrial countries has a relatively small impact on global price stability. By contrast, the much larger share of the industrial countries in world markets for wheat means that their relatively smaller use of price insulation would likely have a noticeable impact on world prices.

Conclusions

Trade policy changes—and particularly export barrier imposition—are frequently discussed as contributing factors to food price surges. This paper examines the role of trade barriers in contributing to surges. It first highlights the collective action problem associated with the use of these measures as stabilization policies, showing that the use of these measures by all countries is, at best, ineffective in stabilizing domestic prices, while magnifying the income instability associated with exogenous shocks to food markets.

The second section of the paper considers the conventional practice of representing price insulation policies using price transmission elasticities—an approach frequently justified and implemented on purely statistical criteria. We formulate a simple model that can explain the typical pattern of agricultural protection involving non-zero average trade distortions that may differ substantially across commodities, and price insulation that attempts to offset deviations in world prices from their average levels.

In the third part of the paper we develop a simple approach to assessing the impacts of price insulation, and changes in trade policies generally, for the world prices of individual agricultural commodities. In the fourth section, we use this approach to assess the extent to which changes in trade policies contributed to the two key price surges for the key staple foods of rice and wheat. This analysis shows that changes in trade policies contributed very substantially to the increases in world prices of these staple crops in both the 1974 and 2008
price surges. In 2007-8, insulating policies in the market for rice explained almost forty percent of the increase in the world market price for rice.
References


Figure 1: Indexes of real international and producer prices of rice and wheat, developing countries’ unweighted average,\textsuperscript{a} 1972-76 (1972 = 100, based on nominal US dollar prices deflated by the US GDP deflator)

(a) Rice

(b) Wheat

\textsuperscript{a} Countries included are: Argentina, Bangladesh, Brazil, Chile, Colombia, Cote d’Ivoire, Dominican Republic, Ecuador, Ghana, India, Indonesia, Kenya, Korea, Madagascar, Malaysia, Mozambique, Nigeria, Pakistan, Philippines, Senegal, Sri Lanka, Sudan, Taiwan, Tanzania, Thailand, Uganda, Zambia, and Zimbabwe.

Source: Anderson and Nelgen (2010a,b).
Figure 2: 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 2 (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: Anderson and Nelgen (2010a,b) based on World Bank *Pink Sheets* of nominal prices deflated by the Unites States GDP implicit price deflator.
Figure 3. Monthly international prices of rice and wheat, 2001 to August 2010 (monthly averages, nominal SUS/tonne)

Figure 4: Indexes of real international and producer prices of rice and wheat, developing countries’ unweighted average, 2006-2010 (2005=100, based on nominal US dollar prices deflated by the US GDP deflator)

a) Wheat

b) Rice

Table 1: Nominal assistance coefficients, rice and wheat, 1972 to 2008

\[(1 + \text{NRA}/100)\]

(a) Rice

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Source: Anderson and Nelgen (2010b)
Table 2: Percentage annual change in nominal assistance coefficients, 1972-74 and 2005-08

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### Table 2: Percentage annual change in nominal assistance coefficients, 1972-74 and 2005-08

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Source: Anderson and Nelgen (2010b)
Table 3: Contributions to total agricultural NRA\(^b\) from different policy instruments,\(^a\) by region, 1972-76 and 1984-88 (percent)

(a) Developing countries

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(b) High-income countries

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\(^a\) 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.

\(^b\) 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.

\(^c\) 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: Anderson and Nelgen (2010a).