

**Food reserves in developing countries:
Trade policy options for improved food security**

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Executive summary

Agricultural prices, along with the prices of primary commodities in general, have been both high and volatile over 2006-11. Whereas the rise in food prices is fairly general, the increase in volatility is confined to grains and some vegetable oils. However, these are exactly the food products which are of concern when discussing food security.

These developments impact particularly acutely on poor and other vulnerable non-farm households who devote a high proportion of their incomes to the purchase of food. At the same time, the terms of trade of many Low Income Countries (L.I.C.s) are little changed or have tended to improve as many of these countries have benefited from comparable rises in their own export crops or mineral resources. This suggests that, for many L.I.C.s, the problem is more one of what government should do about food security rather than how the international community should fund food security.

Over part decades, governments and international organizations have employed a range of policies to address high or volatile food prices. It is useful to distinguish, at least conceptually, between international policies, employed by the international community to lower prices or to reduce volatility, and national policies, employed by national governments to lower the impact of world prices on either their entire populations or on vulnerable groups within the country.

The food security debate is often posed as a choice between trade and stocks, but this is misleading since the two strategies can be complementary. Countries need to achieve a balanced food security policy. In general terms, food importing countries will need to rely on a mixture of variable import tariffs and export taxes, together with a food security stock. The precise nature of the balance will depend on the country's normal food balance, its grain staple, transport costs and the correlation between its supply and demand shocks and those in the rest of the world. Asian rice-producing and consuming countries, many of which have managed to achieve a good balance between trade and stocks, have typically done this using relatively light government interventions and procurements allowing an efficient private sector to prosper.

By contrast with Asia, the formal grains sectors in many African L.I.C.s are dominated by government, the World Food Programme (W.F.P.) and other agencies. There is a widespread view that food markets function poorly and that crisis management therefore falls entirely on the shoulders of governments and the agencies. The Asian experience indicates that these concerns are excessive, and the private sector can play a substantial role both in crisis

avoidance and crisis response. It is important that the governments and the agencies work toward increasing this capacity. One should look for improved communication and consultation between government and the private sector. Because contractual performance can be problematic in crisis situations, there is a potential intermediation role for W.F.P. or other agencies which complements their current role in direct provision of food.

It is useful to distinguish humanitarian stocks from food security stocks on the basis that the former are targeted specifically at vulnerable groups whereas the latter are directed towards overall availability and the general level of prices in local markets. Provided the target group is narrowly defined and the assistance is efficiently managed to minimize leakages, humanitarian stocks will be relatively robust in relation to the crowding out concerns which apply to wider national food security stocks. They will also involve a much more limited financial commitment. The danger is that targeting is imprecise, that the target group is wide and that there is significant leakage into local markets. If this turns out to be the case, well-intentioned programmes, even when genuinely motivated by humanitarian concerns, may undermine market mechanisms. The main impact of poorly designed and executed programmes are likely to be on the distribution of food across households rather than on the overall level of availability. It is therefore essential that any humanitarian stock programme is well designed and efficiently executed.

The international agencies have recently launched a joint P.R.E.P.A.R.E. proposal for regionally based emergency humanitarian stocks. The proposal is a useful starting point for discussion but it is unbalanced in its current form – it focuses entirely on crisis response without considering how crisis incidence may be reduced and it pays scant attention to the potential role of the private sector. The proposal should be welcomed but also remitted for further consideration.

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1. Introduction

Agricultural prices, along with the prices of primary commodities in general, have been both high and volatile over 2006-11. These developments impact particularly acutely on poor and other vulnerable non-farm households who devote a high proportion of their incomes to the purchase of food. In this paper I look at both international and national policies which address the resulting food security concerns.

The background to the paper is provided in section 2. I look at food price developments since 2005 focusing on grains prices (section 2.2). I note that for many Low Income Countries (henceforth L.I.C.s)¹, the terms of trade have not deteriorated since many countries have benefited from comparable rises in their own export crops or resources (section 2.3). I also consider possible explanations for the claimed imperfect functioning of L.I.C. food markets (section 2.4). This all sets the scene for the food security discussion.

Governments and international organizations have employed a range of policies to address high or volatile food prices. It is useful to draw a two way distinction:

- a) International policies: these are policies employed by the international community to lower prices or to reduce volatility. These include trade agreements, such as the International Wheat Agreements (I.W.A.s), a possible international stockpiling arrangement or controls or limitations on activities on futures markets. I also briefly discuss the possible elimination of biofuels mandates and subsidies.
- b) National policies: policies employed by national governments to lower prices or to reduce volatility. National policies include food security stocks, export bans, variable export taxes or import tariffs, measures taken at the national level against speculation and direct price controls.

Section 3 of the paper deals with international policies. The objective of these policies is generally to reduce either the level or the variability of prices on world markets. The topics considered are comprise the elimination of biofuel mandates (section 3.1), multilateral contracting, along the lines of the I.W.A.s (section 3.2), international stockpiling (section 3.3) and enhanced regulation of grains futures markets (section 4). In general terms, I remain

¹ See <http://data.worldbank.org/about/country-classifications>

sceptical that the policies considered, in each case for different reasons, will be effective in obtaining the desired volatility or price level reductions. Section 3.5 looks (more favourably) at recent proposals to increase the transparency both of the physical grains markets and commodity futures markets.

In section 4 I turn to nationally based food security policies, some of which I see as more likely to be effective. The main instruments available are commercial policy (variable export taxes or import tariff and export restrictions, section 4.2) and food security stocks (section 4.3). The suitability of the various instruments will depend on the country's normal food balance (section 4.1) together with transport access. The two decades prior to 2008 saw a shift away from national food stocks towards trade-based policies but this tendency has moved into reverse over the past four years as food importing countries have found markets closing against them just when they need them most. I argue that trade-based policies and national stocks should generally be seen as complementary policies and not as alternatives (section 4.4). The widespread resort of grains-exporting countries to restrictions and even bans has led to calls for actions of this sort to be more clearly regulated by the World Trade Organization (W.T.O.) I argue that action is therefore desirable with the objective of limiting use of controls (section 4.5). All of these policies should be seen within a general objective of improving the functioning of L.I.C. food markets to reduce the likelihood of food crises (section 4.6).

Suppose a crisis does occur. Section 4.6 considers the possible role of humanitarian stocks, targeted at a narrowly defined group of vulnerable households in well-defined crisis situations. While food security stocks will tend to crowd out private storage and will hence be a costly form of intervention, a well designed and efficiently implemented humanitarian stock programme will have a much more limited market impact and will be financially less onerous. However, if poorly designed or inefficiently implemented, such programmes will generate arbitrary redistributions while contributing little to food availability. In the light of these considerations, the P.R.E.P.A.R.E. proposal, set out as Appendix E of F.A.O. *et al.* (2011) is a half full, but therefore also a half empty, glass – sensible in terms of crisis response while doing nothing to improve market functioning and hence lower the probability of crisis incidence (section 4.7).

2. Background

2.1. High prices or volatile prices?

An initial issue is whether we should be concerned by the level or the volatility of prices. These concepts are often confounded in popular discussion. Volatility refers to the variability of a price. As a matter of logic, it is possible for prices to be high but show little variability or to be low but variable. In practice, price levels and volatilities tend to be positively associated, in part because a low carryover from the past will reduce current availability (current production plus lagged carryover), exerting upward price pressure, and will reduce the possibility of using inventory to meet positive demand or negative supply shocks, thereby increasing volatility (Gilbert and Morgan, 2010). Typically, therefore, when prices are high they are also volatile.

High food prices erode the living standards of non-farm households. Volatile food prices result in these households becoming vulnerable to such erosion. This erosion can be substantial for poorer households for whom food expenditure is the major budget item – a household with daily income at the poverty level of \$1.25 per capita, spending 50% of its income on food and facing a 50% increase in food prices, will require a post-increase income of \$1.56 per capita to purchase its original basket of goods. In most developing countries a large proportion of households will be only modestly above the poverty line and hence rises in prices of staple foods can substantially increase poverty. Volatile food prices are therefore of concern because they create the risk that more households will be brought below the poverty level.

Volatility also imposes costs throughout the food supply chain. In principle, volatility might be offset by hedging on futures markets. However, such markets may either not exist or may not be appropriate for many L.I.C. food crops. Even where markets do exist, L.I.C. farmers, farmer associations and cooperatives are likely to find it prohibitively costly to access these markets (Dana and Gilbert, 2008). Farmers therefore have difficulty in knowing whether high prices at the time of planting will be maintained at harvest and have difficulty in judging when it is best to sell their produce. Supply chain intermediaries, who bear greater risk, will also face access problems. Nationally-based intermediaries will find themselves disadvantaged relative to their multilateral competitors (Gilbert, 2009). Because

intermediation costs are higher, farmers receive a lower proportion of f.o.b. prices and consumers pay a higher margin over f.o.b.

Households will be affected differently according to their circumstances. Farm households will benefit from rises in world food prices and poor farm households may do so sufficiently to lift them out of poverty. Since changes in food prices tend to be correlated with changes in the prices of non-food commodities, such as tropical export crops and metals, the same may be true of households engaged in these commodities – coffee or cocoa farmers and artisanal miners. While the overall effects of rising food prices may be complicated, the incidence will be adverse on urban households and landless rural households.²

This discussion indicates that high and volatile food prices will impact most acutely on poor and other vulnerable non-farm households. While such households will be found in all economies, they will be particularly numerous in the poorest economies. For this reason, I focus on the impact of food price volatility on L.I.C.s.

2.2.Price developments since 2005

World prices of grains and vegetable oils, which had generally been flat over the first half of the initial decade of the century, rose sharply from 2006-07. Figure 1 shows these rises for maize, palm oil, rice, soybeans and wheat over the period crop year 1990/91 – 2010/11. The prices are deflated by the US Producer Price Index (all items) and normalized at 1999/2000 = 100.³ The price rises were substantial with palm oil, rice and wheat doubling in price in 2007/08 relative to the 1999/2000 base and maize and soybeans increasing by more than three quarters. Except in the case of rice, prices in 2010/11 have equalled or exceeded their 2007/08 peaks.

It is also apparent from Figure 1, that both currently and at their 2007/08 peak, real prices are at approximately the same level as in the late nineteen nineties.⁴ A much longer

² A reviewer has suggested that farm households also fail to benefit from higher prices since they are obliged to sell immediately after the harvest. It is correct that many households do sell a proportion of their crop in this way to meet urgent cash requirements. However, high prices will be reflected in early as well as in late season prices and will reduce the quantities that farmers need to sell early.

³ Source: IMF, *International Financial Statistics*. 2010/11 figures are October-June.

⁴ Palm oil prices have exceeded their 1990s levels in 2011. In deflating food prices by the U.S. P.P.I., I am effectively comparing these prices with the general level of wholesale prices. Deflation by consumer prices might give qualitatively different results but these will be country specific and there

perspective shows all five prices to be lower in real terms in 2007/08 than in the mid and late nineteen seventies.

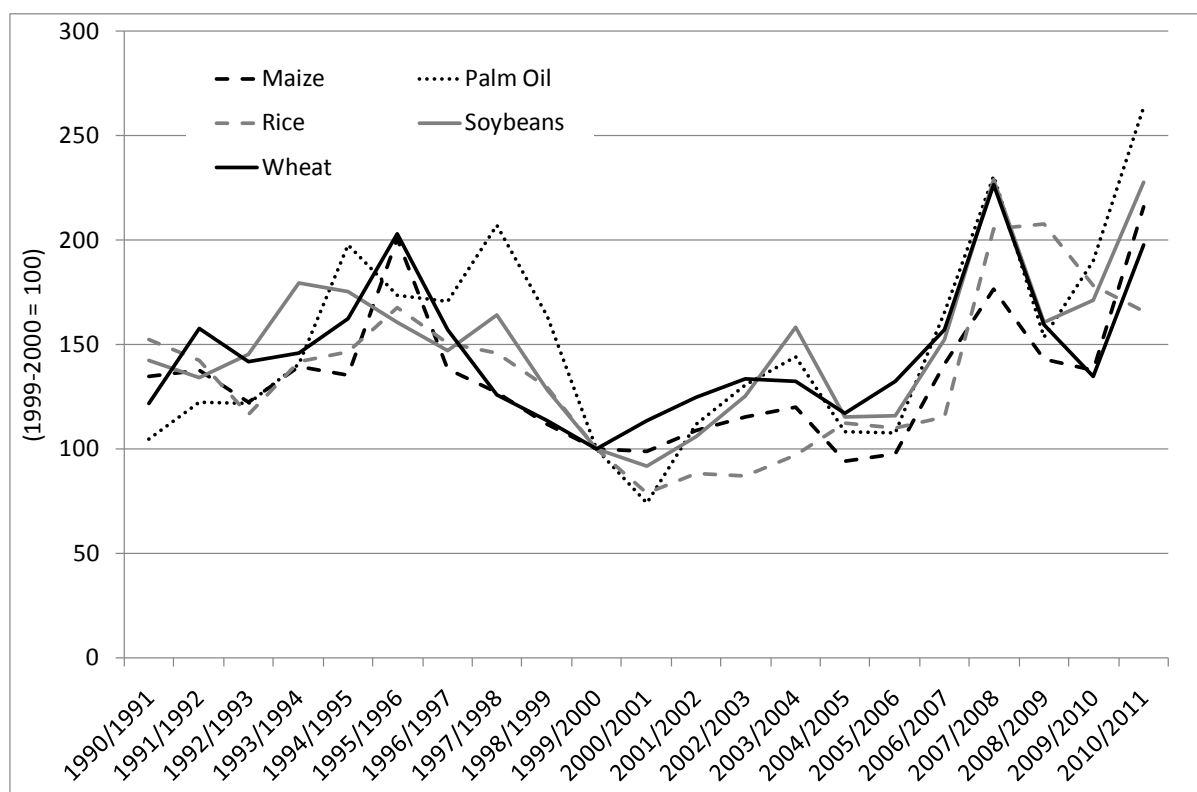


Figure 1: Real prices, 1990/91 - 2010/11

Furthermore, although prices were variable over 2006/07-2009/10, this has also been true of previous high volatility episodes. It is well known that periods of high volatility tend to bunch together. Table 1 compares volatilities over the most recent high volatility period (the four crop years 2006/07 to 2009/10) with that in the previous six crop years, over which time prices were very stable, and also with the high volatility period around the nineteen seventies commodity price boom (the four years 1971/72 to 1974/75).⁵ Volatility was around twice as high for the three grains over 2006/07 to 2009/10 compared with 1999/2000 to 2005/06 but comparable with, or only modestly higher, than in the earlier high volatility period. In the case of palm oil and soybeans, the increase in volatility in 2006/07 to 2009/10 was less dramatic and these resulting levels were lower than those

is no reason to take the U.S. Consumer Price Index (C.P.I.) as representative even of other developed economies. Developing country C.P.I.s are not always available over long periods of time and, in any case, it makes little sense to deflate food prices by a C.P.I. which has a high food content.

⁵ Volatilities are calculated as the standard deviations of monthly nominal returns (changes in the logarithms of monthly average prices) within each crop year averaged over crop years.

experienced in 1971/72 to 1974/75. These results accord with those reported by Balcombe (2009), Gilbert and Morgan (2010) and Huchet-Bourdon (2011).

Table 1					
Volatilities (selected years)					
	Maize	Palm Oil	Rice	Soybeans	Wheat
1971/74 – 1974/75	22.4%	38.9%	22.7%	34.0%	33.7%
1999/2000 – 2005/06	15.8%	23.3%	11.5%	19.9%	16.2%
2006/07 – 2009/10	28.5%	31.8%	28.0%	24.7%	32.4%
Intra-crop year volatilities of nominal returns at an annual rate averaged over crop years.					

As noted, volatility is positively associated with price levels. Taking the forty year period 1970/71 to 2009/10, the correlations range from 0.17 for rice to 0.63 for soybeans.⁶ Perhaps less obviously, high volatility is associated with high cross-commodity correlations: averaging volatilities across the five commodities, this shows a correlation of 0.42 with the intra-crop year cross-correlations of the five commodities.⁷ Price co-movement therefore tends to increase in periods of high volatility. We therefore tend to see periods in which food prices in general are high and volatile. This was true of the period from the end of 2006 as it was in the first half of the nineteen seventies.

These numbers demonstrate that, although the prices of food commodities were both high and volatile over the period from the end of 2006, neither the levels nor the variability of these prices was historically unprecedented. The shock of high and volatile prices is to be seen in the context of the low and stable prices over the so-called Great Moderation and the likely impact of these developments on attainment of the Millennium Development Goals.

2.3. Food prices and the terms of trade

Economists often measure the overall impact of changes in world prices on a particular country by the terms of trade, defined as the ratio of the country's export to its import

⁶ Maize 0.22, palm oil 0.24, wheat 0.42.

⁷ The ten cross-commodity correlations are averaged for each crop-year. The correlation of this average correlation with the average deflated price is also positive at 0.25. High cross-commodity return correlations are indicative of common demand shocks – see Gilbert (2010).

prices. If food prices had risen in isolation, they would have implied a deterioration in the terms of trade of food importing countries.

There are practical problems in measuring the terms of trade for developing countries. Products only have uniquely defined prices in economics text books. In practice, even narrowly defined products will be bought and sold at different prices depending on precise grades or product specifications, the quantity and location of the transaction and delivery conditions and the bargaining power of the parties involved. This makes it problematic to obtain a practical measure corresponding to the theoretical concept.

There are two approaches. First, trade statistics, such as those for agricultural goods in FAOSTAT, provide estimates of both the dollar value and the quantities of imports and exports of narrowly defined products. These data allow one to infer unit values (the ratio of dollar values to quantities) which may be interpreted as the prices which, when multiplied by the reported quantities, generate the reported dollar values. There are well-known problems with these methods. First, they fail to take into account quality-improvements in manufactured goods with the result that unit values tend to exaggerate the extent of price increases. For L.I.C.s, who import most manufactures, this will lead to a general tendency to over-estimate the decline in the terms of trade over time (Lipsey, 1994). Second, reported values may reflect the effects of hedging, transfer pricing and other practices (some legal and some illegal) which distort unit values away from the original prices they are supposed to represent.

The second possibility is to use world prices. These are well-defined for most primary products, including food products, but do not necessarily relate closely to the prices particular countries pay when importing or receive when exporting. Furthermore, clearly defined world prices are only available for primary products, but even in these cases, they may not accurately reflect the prices at which countries trade. In part, this can be because of grade and quality differences, in part because transport costs may drive a wedge between a country's fob prices and world prices and in part because the supposed world price does not move closely with the prices which countries pay for food imports – see Gilbert (2011a) in relation to the world rice price.

Table 2:					
Changes in price indices and primary terms of trade, selected Low Income Countries, 2005 – 2008 and 2010					
	Price indices			Terms of trade	
	All imports	Food imports	All exports	raw	adjusted
Percentage change 2005 - 2008					
Benin	50.5%	38.4%	36.7%	- 9.2%	- 14.2%
Kenya	38.2%	53.6%	38.6%	- 8.3%	- 10.1%
Malawi	44.9%	51.8%	34.6%	- 7.1%	- 13.1%
Nepal	45.4%	53.7%	33.6%	- 8.1%	- 13.2%
Percentage change 2005 – 2010H1					
Benin	32.0%	24.8%	46.0%	10.6%	1.9%
Kenya	23.8%	39.7%	39.3%	12.5%	7.6%
Malawi	30.8%	29.8%	52.4%	16.6%	2.7%
Nepal	30.2%	37.0%	43.5%	10.2%	0.9%
<p>The first four columns of the upper panel of the table report the changes in the price indices from 2005 (year average) to 2008 (year average). The lower panel reports the changes to 2010 (January-June average). Column 4 reports the same changes for a primary terms of trade index defined as the ratio of the primary export (column 3) to primary input (column 1) indices. Column 5 adjusts these estimates to take into account lack of balance between import and export values based on average trade values over 2006-08. Source: Gilbert (2010, Table 1, exert).</p>					

In Gilbert (2010b), I used this second procedure to consider the primary terms of trade, being the ratio of primary export to primary import prices calculated as base-period value-weighted averages of world prices for 67 major primary commodities, for four L.I.C.s – Benin, Kenya, Malawi and Nepal. These figures are reproduced in Table 2. The final, adjusted, column adjusts the crude measure to take into account the fact the value of primary imports exceeds the value of primary exports and supposes no change in the balancing flows. Over the four year period 2005-08, the four countries saw increases in import prices ranging from 38% (Kenya) to 51% (Benin) but export prices also increased by between 34% and 39%.⁸ The resulting terms of trade deterioration was therefore a more

⁸ Weights are import and export value shares averaged over 2004-06 – see Gilbert (2010c) for methodology and data sources.

modest 10% (Kenya) to 14% (Benin). Furthermore, this deterioration had been reversed by mid-2010 as import prices fall back but export prices continued to rise.

The implication is that high food prices over the period from 2006 have not, in general, translated into an adverse movement in the terms of trade for L.I.C.s. This is because the rise in agricultural prices has happened at the same time, and for some of the same reasons, as the rise in energy and metals prices. L.I.C.s have low manufacturing exports and rely on primary exports, together with remittances and overseas assistance, to cover their imports. Many L.I.C.s have therefore benefited as much or more, at the aggregate level, from rising export prices as they have suffered from rising import prices.⁹

The fact that the terms of trade have moved relatively little over the most recent years does not imply that high and volatile food prices have had no effect since the incidence or rising export prices will generally have been different from that of rising import prices. Furthermore, the trajectories of the prices consumers in different L.I.C.s were required to pay may have differed significantly from those of world prices (Gilbert, 2011a). What the result does imply is that aggregate measures of well-being can conceal the impact of high food prices on vulnerable groups. It follows that policy should be more concerned with the form and direction of assistance than with the level of resources provided. It also indicates that governments will not inevitably lack the funds to deal with food security and in this respect the FAO-OECD-coordinated policy report may be over-pessimistic (FAO *et al*, 2011, paragraph 127).

2.4.How well do food markets function?

The answer to this question is fundamental to any policy discussion. If food markets generally function well there will be little need for major interventions and policy should focus on the exceptions, whether in terms of households for whom, the periods of time when, or the countries or regions where market functioning is poor. If food markets

⁹ The terms of trade are a very imperfect welfare measure. They do not take into account movements in the prices of non-traded goods (including staple foods) or of goods which are not traded at current border prices. In both these cases, the resulting redistribution of welfare is internal to the country – but that is not to imply that it is unimportant. Neither do they take into account the incidence of price changes across households which may be quite different for imported and exported goods.

generally fail to function well, either at a world level, or L.I.C.s, or at particular periods of time, such as in a crisis, then more substantial interventions are justified.

The question decomposes into three sets of sub-questions:

- i) How well do international grains markets function?
- ii) How efficiently are prices transmitted to LICs and other developing countries? Do price shocks get amplified or attenuated in transmission? Are they able to successfully insulate themselves from shocks in the world market?
- iii) How well do domestic markets for grains and other subsistence foods function in L.I.C.s and other developing countries? How practicable is it for either government or the private sector to gain access to additional grains in a crisis?

These are large questions and it should be no surprise that the answers differ across foods and across countries.

I examined the first question in Gilbert (2011a) and also, in the same chapter, looked at pass-through over the period 2005-09 to the six developing countries considered above in Table 2. I concluded that the world maize (corn) market appeared to function very efficiently generating clear price signals which were transmitted to developing country markets except where these countries chose to insulate themselves from the world markets and had the means to do this. (This was notwithstanding the price and other differences between yellow and white maize). Rice was at the other extreme – world market prices tended to reflect developments in rice producing and consuming countries and not to lead and inform the markets in these countries. I found wheat to be an intermediate case. Strong varietal and regional differences make it difficult to define an informative world wheat price making it difficult in turn to know what, if anything, is being transmitted.

It is the functioning, of mis-functioning, of domestic food markets which has the greatest policy relevance. Evidently, outside of war and famine situations, markets do function in the sense that farmers are able to sell food, consumers are able to buy food, and intermediaries are able to do both. Furthermore, in a large number of developing countries, prices show a high degree of national integration in the sense that, despite regional differentials, prices do

tend to move together across the country (Gilbert, 2010c). Concerns therefore relate to the *ex ante* adequacy of storage and the consequences of any *ex post* inadequacy in a food shortage situation. I discuss storage issues in section 4.3 and market responses to crisis situations in section 4.6.

3. International policies to address food price volatility

Governments and international organizations have employed a range of policies to address high or volatile food prices. The following way classification may be helpful:

- a) International policies: these are policies employed by the international community to lower prices or to reduce volatility. These include trade agreements, such as the I.W.A.s, a possible international stockpiling arrangement or controls or limitations on activities on futures markets. I also discuss the possible elimination of biofuels mandates.
- b) National policies: policies employed by national governments to lower prices, to reduce volatility or to protect vulnerable households. National policies include food security stocks, export bans, variable export taxes or import tariffs, measures taken at the national level against speculation and direct price controls.

This section of the paper deals with international policies leaving national policies to section 4.

3.1. Biofuels mandates

A number of commentators have argued that the demand for food commodities as biofuel feedstocks, in particular corn, sugar and vegetable oils, has both added to overall and imported energy price volatility from into grains markets by increasing the correlation between agricultural prices and the oil price – see Schmidhuber (2006). Mitchell (2008) suggested that biofuels demand was responsible for the largest part of the rise in food prices but resisted the temptation to quantify this share. A number of governments, including the U.S. government, mandate production of a proportion of petrol (gasoline) from renewable resources and also subsidize this conversion. The perception that biofuels demand is driving up food prices has resulted in the widely voiced contention that governments should lift biofuel mandates and remove the associated subsidies. The E.U. has already substantially reduced its biofuel mandates,

Biofuels are a new phenomenon and insufficient data points on biofuels production are available to enable to allow direct computation of the price impact of this addition to demand. Instead, we need to look for indirect evidence. In a World Bank working paper, Mitchell (2008) concluded that, although the 2006-08 increase in food prices was caused by “a confluence of factors”, the most important of these was the large increase in U.S. and E.U. biofuels production. However, his argument was largely residual – biofuels were seen as responsible for the large component of the 2006-08 grains price rise that could not be explained by other factors. Other commentators, more successful in quantifying the impact of these other factors, left a smaller residual for biofuels – see Abbott *et al* (2008) and Gilbert (2010a). A more recent World Bank working paper has concluded that “the effect of biofuels on food prices [in 2007-08] has not been as large as originally thought” (Baffes and Haniotois, 2010). In a detailed study for the U.K. government, Pfuderer *et al.* (2010) concluded “available evidence suggests that biofuels had a relatively small contribution to the 2008 spike in agricultural commodity prices where its impact was largely limited to the maize market with some knock-on effects on soybean prices”. There has been no systematic study of the effect of biofuels demand on food price volatility, as distinct from on the level of food prices.

Babcock (2011) produces more complicated results, Simulations from a calibrated model show that ethanol production has had a substantial effect in raising U.S. corn (maize) prices. However, this effect resulted through the impact of high crude oil prices, which made it attractive to convert corn into ethanol, and not from mandates and subsidies. The implication is that, at least to the present, it has been market forces and not government policies which are responsible for the biofuels pressure on food prices. However, Babcock also notes that in the event of a poor corn harvest, biofuel mandates could put strong upward pressure on prices, effectively by making a large part of demand completely price inelastic. See also Babcock and Fabiosa (2011). According to this view, biofuels mandates and subsidies have not been quantitatively important up to the present, in line with the views of Gilbert (2010a) and Pfuderer *et al* (2010), but may become important in the future, in line with fears of the biofuels critics.

The biofuels debate interacts with trade issues (see Al-Riffai *et al.*, 2010) since Brazilian sugar-based ethanol has the potential to be substantially cheaper, on a full cost basis, than

U.S. the maize-based product, but currently faces a large U.S. tariff barrier. Many have argued for liberalization of ethanol commerce. Currently, however, the U.S. is an ethanol exporter so elimination of the import tariff would have no effect on food prices (Babcock, 2011).

3.2. Multilateral contracting

The four post-war I.W.A.s, starting with that of 1949, were based on multilateral contracting. I.W.A. exporting members guaranteed assured supplies of wheat subject to a maximum price while importing countries guaranteed purchases subject to a minimum price. These provisions were maintained in the 1953, 1956, 1959 and 1962 I.W.A.s. Contractual floor and ceiling prices were absent from I.W.A.s after 1971 (International Wheat Council, 1993; Gilbert, 2011b).

The I.W.A. multilateral contracts were contracts between governments. This was natural at a time in which international trade in wheat was dominated by intergovernmental transactions and in which the prices paid to farmers in wheat exporting countries were set or heavily influenced by national farm support policies. Except in rice, grains commerce is now largely in the hands of private companies which contract on the basis of market prices. Governments would therefore currently need to enforce commitments of this sort through a regime of taxes and subsidies. However, W.T.O. regulations require countries to reduce export subsidies thereby making it difficult for governments to guarantee agreed maximum prices. Even if it were judged desirable, the original I.W.A. concept of multilateral contracting would therefore no longer be feasible.

Multilateral contracts are a form of forward contracting. The I.W.A.s extended for three years, so the I.W.A. multilateral contracts may be regarded as a set of one, two and three year forward contracts, for quantities which were not specified but implicitly related to past transactions, capped at predetermined floor and ceiling prices. These prices are negotiated to be fair to both exporting and importing countries at the start of the agreement so, at that time, they have zero value to either side, i.e. neither exporters nor importers are financially better off as the result of the contracts (Hull, 2006). However, as market conditions change during the course of the agreement, the contracts have positive equity for one side and negative for the other – if prices rise, importers gain from the price ceiling at the expense of

exporters while if they fall, exporters gain from the floor at the expense of importers. Once the losses from adherence to the negotiated ceiling prices become substantial, there is pressure from farmers to renegotiate or renege, as in the Commonwealth Sugar Agreement (also based on multilateral contracting) in 1973. If the losses from sticking to the negotiated floor prices become substantial, consumers and importing governments seek renegotiation, as in the 1967 I.W.A. a year after its negotiation.

Multilateral contracting can work well so long as price volatility remains low but lacks enforcement mechanisms and hence credibility when volatility becomes high. It is ill-adapted to a world in which commerce takes place between private companies. It is in no way prejudicial to the historical I.W.A. experience to state that this approach is not well-suited to current circumstances.

3.3. International stockpiling

Policies which result in higher levels of storage than would otherwise have been the case may be expected to lower prices and reduce volatility. This raises the question of the adequacy of storage in the absence of public intervention. This question may be posed either at a global or a national level. In this section, I discuss the adequacy of global stocks from an economic theory perspective and then move to the practical difficulties in an international stockholding scheme.

Economists discuss the adequacy of global grain stocks in terms of whether private stockholding decisions will result in “optimal” outcomes. Gardner (1979) argued that private stockholding will be sub-optimal because price volatility results in negative externalities. It is difficult to make this view rigorous – the dangers arising from food riots might be one possible route.

Price risk is generally not insurable, since it is common across the entire range of producers, consumers and intermediaries, but it may be possible to offset these risks, either directly or indirectly, through hedging on organized exchanges where these exist. Supply chain intermediaries in developed economies, including those involved in physical storage, will routinely access these markets. Producers may benefit indirectly if these benefits are intermediated to them by, for example, purchase contracts which provide price-fixing options. Governments might in principle operate in the same manner for consumers. A

second reason for supposing that private stockholding will be inadequate is therefore that those impacted by volatility are unable to offset the resulting uncertainty either by hedging on futures or options markets.

The extent to which global stocks are adequate can therefore not be separated from the question of the adequacy of risk-sharing arrangements. These arrangements will be least effective for those products where the markets themselves work least well. In the grains complex, this is most evidently the case with rice. For other grains, there is a choice between taking the state of risk sharing arrangements as given and focussing policy on augmenting storage, or, alternatively, of taking storage levels as adequate and focussing policy on improving the access to and the effectiveness of risk management.

If global grains storage is regarded as inadequate, governments might either attempt to augment private stocks by public food security storage programmes or provide incentives to the private sector to carry additional stocks. The public storage approach has the major disadvantage that it will discourage, and possibly eliminate, private storage. Miranda and Helmberger (1988) have shown how public stockholding, for instance by a buffer stock agency, changes the incentives for the private sector to hold stocks. At the same time, if the stabilization band (the gap between the ceiling and floor prices) is narrow, intervention will limit potential capital gains to private stockholding. If market conditions are sufficiently weak, the public sector may end up holding the entire market deficit. This was the situation under the sixth International Tin Agreement which collapsed in 1985 – see Anderson and Gilbert (1988). Clearly, a floor price, at which the public sector is obliged to purchase, can make buffer stock stabilisation extremely expensive.

A stabilisation ceiling price can also be vulnerable to speculative attack (Salant, 1983). If speculators perceive the stocks held by the stabilization agency as possibly insufficient to maintain the ceiling price in the future, they will compete to buy the entirety of the agency's remaining stock in order to take advantage of likely capital gains. Recognizing this, Wright and Williams (1991) suggested that, while a stabilization agency might choose to defend a defined floor price, price band schemes, with both ceiling and floor prices, offered few, if any additional advantages. In particular, the apparent symmetry of the price band is only superficial since once the stock is exhausted, there is no means of defending the ceiling. If a

public storage scheme is initiated it should act opportunistically, like central banks (Bagehot, 1873), and avoid firm commitments to support levels.

These considerations make it more attractive to work towards improving the incentives to private storage rather than investing in public storage schemes which are likely to exacerbate the inadequacy of private storage. Wright and Williams (1991) found that subsidization of private storage was superior to public storage schemes.

It is widely held that low grain stocks are a significant contributory factor in explaining recent high grains prices and elevated volatility – see Wright (2009). Poor harvests in 2010 certainly have reduced stocks to low levels and resulted in rises in prices in the second half of that year. However, the importance of stocks was less clear in 2007-08.

Gilbert (2011b) discusses the evolution of world grain stocks over the most recent decades. The general picture is one of trend declines in wheat and maize stock-consumption ratios taking place simultaneously with declines in real grains prices, although rice has seen rising stock-consumption ratios. Some part of the trend decline in these ratios is attributable to change in developed country agricultural policies (Mitchell and Le Vallee, 2005). Overlaying this, there was a very substantial accumulation of grain reserves on the part of China, starting with rice in the late nineteen eighties and following through into wheat and maize in the nineteen nineties followed by disaccumulation in the first five years of the new century.

Taking a long period view, declining stock-consumption ratios in wheat and maize probably result from greater production and organisational efficiency in the food processing industry. The more general decline in stocks in all three grains over the most recent decade, by contrast, is the result of Chinese destocking – see Dawe (2009) and Wiggins and Keats (2010). Part of the argument as to whether world wheat and maize stocks are now too low therefore revolves round the issue as to whether Chinese stocks were, in the past, available to the world economy to provide a cushion in the event of a negative shock. A negative answer to this question would suggest that the decline in Chinese stocks may not be important in understanding recent and current high grains prices.

My conjecture is that even though Chinese stocks may not have been available to the rest of the world, they shielded world markets from rapid growth in Chinese demand in the first five years of the new century and may explain why agricultural prices were followers in the most recent commodity price boom in contrast with their leading role in the 1973-74 boom (Cooper and Lawrence, 1975).

3.4.Enhanced regulation of futures markets

A number of informed commentators (Desai, 2008; Masters, 2008; Soros, 2008), along with much popular discussion, blame speculation on organized futures markets for high food prices and increased volatility levels. Such critics tend to point to the enormous increase in futures market transactions relating to agricultural products over the past two decades, an increase which is much larger than that in the quantities of physical products bought and sold. They suggest that either limitations on futures market trading of food commodities or taxation of such transactions would reduce price levels and volatilities.

By analogy with insurance markets, speculators will expect to profit in aggregate and hedgers to pay for this risk transfer. A traditional view is that speculation will tend to be stabilizing (i.e. volatility reducing) because destabilizing speculation will be unprofitable and will therefore not persist (Friedman 1953). This probably remains the standard opinion of most economists. However, both financial economists and behaviouralists (see, for example, Laibson, 2009) offer a more nuanced view.

Modern finance theory distinguishes between informed and uninformed speculation (Bagehot, 1971; O'Hara, 1995). According to this view, informed speculation is the channel through which private information becomes impounded in publically-quoted prices. Uninformed speculation should either not have such effects, or in less liquid markets, should not have persistent effects. If uninformed trades do move a market price away from its fundamental value, informed traders, who know the fundamental value of the asset, will take advantage of the profitable trading opportunity with the result that the price will return to its fundamental value.

Bubbles are a particular concern, and it is hard to argue that commodity futures market will be immune from this phenomenon, in particular since the first documented bubble relates to an agricultural (but not food) commodity – tulips in the Netherlands in 1636-37 (Krelage,

1942; Dash, 1999). De Long *et al.* (1990) provide an account of how such bubbles may emerge. Seeing a rise in the price of a financial asset, uninformed traders may guess that informed traders have received information which increases their valuations. They therefore buy and push the price further upward increasing the positive momentum. The result may be that the price now exceeds the revised valuation of the informed traders. Alternatively, if the initial rise in price was just have a random effect arising out of “noise trading”, the market price again exceeds its fundamental value as the result of trend-following speculation. However, it is not clear that the informed traders, who see the over-valuation, will attempt to reverse this move. De Long *et al.* (1990) showed that, if informed traders have short time horizons (perhaps as the result of performance targets or reporting requirements) and if there are sufficiently many uninformed (trend-spotting) speculators, they may choose to bet on continuation of the trend even though they acknowledge it is contrary to fundamentals.

The view can also make concrete which the Diba and Grossman (1988) concept of a “rational bubble” in which explosive asset prices satisfy the first order (Euler) condition equating the expected rate of appreciation to the return on assets of similar riskiness through the rationally perceived possibility of the bubble bursting generating a large negative return. On commodity futures, see Irwin and Yoshimaru (1999), Irwin and Holt (2004) and Gilbert (2010b).

The 1999-2000 internet equities bubble appears to fit this description. Phillips *et al.* (2011) have developed a methodology which allows the identification of asset market bubbles, at least *ex post*. In Gilbert (2010b), I use the Phillips methodology to ask how much of the 2006-08 price boom was due to bubble behaviour, at least in the (narrow) sense or a rational bubble. The answer in that paper is “not much”. There is evidence of bubbles in the copper market but, contrary to the results reported by Phillips *et al.* (2011), the tests for crude oil were inconclusive. The only agricultural products where bubbles were detected were soybeans and soybean oil, but these bubbles were small and not long-lasting. However, the testing methodology is new and relatively untried – other investigators claim more substantial evidence for agricultural price bubbles in 2007-08.

More recently, a significant group of institutional investors have started to invest in commodity futures through index-based swap transactions as a portfolio diversification strategy and to assume exposure to the commodity 'asset class'. In agricultural futures markets, these positions are often large in relation to total activity – up to 40% of market open interest (Gilbert 2010b). Differently from traditional speculation, these positions are relatively long-term and are predominantly long, i.e. they involve purchase of futures contracts which are then held as long-term investments. The sharp rise in index-based investment in commodity futures over the past five years may therefore be seen as a positive shock to inventory demand. Gilbert (2010a) argues that this shock was a significant contributory factor to the 2007-08 food price spike. See also U.S. Senate Permanent Subcommittee on Investigations (2009) and Baffes and Hanjotis (2010).

In summary, there is substantial evidence the futures market activity contributed in some way to the 2007-08 agricultural futures market spike, although there is less evidence, at least currently, that these factors have been important in 2010-11. These perceptions have led a number of politicians to argue for greater regulation of agricultural commodity futures markets. This regulation might take the form of

- a) Prohibition of certain type of transactors, in particular index providers and/or hedge funds. (Note that we never observe the motivations for trades so we cannot easily prohibit particular types of transaction).
- b) Taxation of futures markets transactions, along the lines of the Tobin tax.
- c) Increased market transparency (discussed in section 3.5 below).

The proposal to prohibit index providers and hedge funds from accessing agricultural futures markets is based on the premise that their activities fail to serve any useful function and add to volatility. It is probably true that index providers did indirectly raise food prices in 2008. They certainly also lost money when prices fell in the second half of that year in line with Friedman's (1953) claim that destabilizing speculation will result in financial loss. However, it was less obvious *ex ante* that these investments were ill-advised. Index-based investment in commodity futures may be seen as a form of macroeconomic speculation – unable easily to invest directly in China and some other emerging markets, investors take

positions in the commodities that China will need to purchase if it is to continue to grow rapidly. These investors failed to foresee the financial crisis. With this event behind us, commodities have again seemed an attractive investment in a low return world. On this view, it is an error to see index-based investment as non-fundamental. Rather, these investors are taking a longer term view of fundamentals than that taken by participants in the physical markets.

The claim that index investors and hedge funds fail to fulfil a useful social function is also mistaken, since they provide liquidity to commercial transactors who wish to hedge their positions. Liquidity provision will be volatility-reducing. The evidence suggests that it is the hedgers who tend to increase volatility by attempting to protect themselves against possible future price movements. However, it is never suggested that hedging should be prohibited.

The Tobin tax proposal runs into the same problems. First, it would have a negligible effect on index investment since index investors typically follow a buy-and-hold strategy, the result being that the tax would add negligibly to their costs. More generally, the tax would be a tax on liquidity provision and would be therefore likely to increase and not reduce volatility. Neither of these proposals therefore makes much sense. By contrast, the proposal for increased market transparency is generally seen as desirable, in particular in Europe which lags U.S. practice. The impact on volatility would primarily be through better informed speculation.

It has been suggested that there should be limits on large positions. Some exchanges do impose such limits on expiring contracts. This is a proposal which is worth studying but its effects would be to restrict opportunities for market manipulation, which is already illegal, and not to reduce volatility since in general few commercial transactions are based off the prices of these expiring contracts.

3.5. Increased market transparency

There is general agreement that international responses to both the 2008 and 2010-11 price shocks have been hampered by a lack of comprehensive information on the physical supply and demand situation, in particular in relation to the level and availability of grain stocks. Both the F.A.O. and the U.S. Department of Agriculture (U.S.D.A.) provide an efficient and timely assessment of grain production at the world level but they are constrained to base

their estimates on data collected by national agencies. At the country level, both the U.S.A.I.D.-financed Famine Early Warning System (F.E.W.S.) Network and the F.A.O.-supported Global Information and Early Warning System (G.I.E.W.S.) work efficiently. However, some users complain that G.I.E.W.S., which is currently still in the process of development, remains insufficiently comprehensive in relation to country coverage and often lacks timely information. This suggests that funding levels may be inadequate.

The largest gap remains comprehensive information on inventories. To cite one example, I noted above in section 3.3 that although reported world grain stock levels have fallen sharply over the past decade, this fall is largely due to an apparent fall in Chinese stocks but that it is unclear whether this fall is real and whether the Chinese stocks reported in the 1990s would have been available to the world market if required. In Gilbert (2011b) I stated that it would be very helpful if agencies could work with the Chinese government to increase transparency on grains stock levels and to establish, with greater certainty and on a consistent basis, what stock levels were over the past decade.

This is the basis for the current G20 proposal for an Agricultural Market Information System (A.M.I.S.).¹⁰ Details of the how the A.M.I.S. may work are set out in F.A.O. *et al.* (2011). Its objectives would be both the compilation of comprehensive information and the coordination of policy responses. In general terms, any proposal which will result in more comprehensive, consistent and timely statistical information is to be welcomed. The success of the A.M.I.S. will, however, be measured less in terms of what it manages to achieve at the multilateral level than in terms of the extent to which it can persuade or pressure national governments, particularly those of the large emerging economies, to increase both the amount of information they collect and the extent to which they share this with the wider international community.

Transparency issues also arise in relation to futures markets. The U.S. Commodity Futures Trading Commission (C.F.T.C.) provides detailed information on so-called commercial and non-commercial trading positions, loosely identified as representing hedging and speculative activity respectively, through its weekly Commitments of Traders (C.O.T.)

¹⁰ *Financial Times*, 7 June 2011. The French Minister of Agriculture Bruno Le Maire is quoted as stating “Markets cannot operate blindly. We need reliable information on stocks and production”.

reports. Since 2006, these reports have been augmented for agricultural commodities by a supplementary report detailing the holdings of various categories of financial market participants. The C.O.T. reports are widely followed by market analysts but are only available for U.S. markets. There is widespread, but not universal, support for the view that comparable reports should be issued for non-U.S. markets, in particular for the London and Paris futures markets.

Many commentators appear to take the view that increased financial market transparency is always a benefit. The academic finance literature fails to support this position. The level of transparency affects the distribution of profits amongst market actors as well as its level and this prohibits simple conclusions – see Pagano and Röell (1996). In extreme cases, market transparency can make trading by particular parties completely unprofitable with the result that liquidity declines perhaps leading to disappearance of the market. It should therefore not be surprising that some futures market participants oppose increased transparency.

There is room for debate on the adequacy of the current level of transparency enforced by the C.F.T.C. on U.S. futures markets. Nevertheless, it does seem difficult to make a case that extension of the same level of transparency to European markets would in any way impede their functioning. So long as reporting requirements remain lower in European markets there is a danger that traders who wish to hide their activities will choose the less transparent European markets over the more tightly regulated U.S. markets. There is only anecdotal evidence that such evasion currently takes place, but a level playing field would enable European markets to more easily rebut that suggestion.

Increased futures market transparency will not have any direct impact on food price volatility. However, by throwing light on the existence of large positions, it should make market manipulation more difficult, and indeed this is the primary objective of the C.O.T. reports. Along with increased transparency on stocks and production, it should also result in better informed speculation perhaps thereby decreasing the probability of speculative bubbles.

4. National food security policies

Increased food prices and the associated volatility have brought food security concerns back into prominence. An elementary but important observation is that countries differ markedly in their food security situations. Although we can find some general principles, country diversity should make us cautious in offering universal food security recipes.

4.1. The food balance

The normal food balance is the most important difference across countries in relation to food security:

- a) Some countries are always, or almost always, grain exporters. These countries will rarely face problems of lack of food availability, and in the few cases that this problem arises, it can be dealt with by a small food security stock. Instead, their problem is that, through trade, countries import price variability from world markets to domestic markets. Governments of these countries often seek to insulate domestic consumers from imported price variability.
- b) At the other extreme, some countries are always, or almost always, dependent on grains imports. These countries face both the problem of variable prices on world markets and possible problems of lack of availability if world markets cease to function efficiently. In particular, they find suppliers renegeing on contracts if price rise sharply.
- c) A very much larger number of countries find themselves in an intermediate position in which they are normally food self-sufficient but in which they need to import if bad weather results in a poor harvest.

Historically, population centres have been located in terrain in which they can feed themselves. On a self-sufficiency model, most countries find themselves in the third category.

Fast population growth can reduce self-sufficiency moving countries from category (c) to (b). Comparative advantage-based specialization can also move countries out of group (c). Either the shift of the labour force into manufacturing, as in Korea, or deagriculturalization resulting from resource extraction, as in Nigeria, can turn previously self-sufficient countries

into importers. Agricultural specialization has allowed agriculturally-based development in which countries become major exporters, as in Brazil and Thailand.

Climate change may interact with these factors. There is an old concern that global warming may result in desertification so that previously self-sufficient countries become dependent on imports. This is a slow process. Perhaps of more immediate concern is the perception that weather patterns may be becoming more variable. Climatologists have focussed less on this aspect of climate change. Increased variability can translate into a greater proportion of poor harvest years and larger losses when harvests are poor. This is consistent with the evidence cited above in section 2.2, that grains price volatility appears to have increased over recent years. However, it is also consistent with grains production moving to more marginal land, such as Ukraine and Russia, where weather conditions have always been variable

A second important difference across countries relates to the staple food. Asia is largely dependent on rice, southern and eastern Africa are dependent on maize while north Africa and the Middle East largely consume wheat. Latin America shows more diversity with maize, rice and wheat contributing to different extents in different countries. These differences are important because of differences in the importance of international trade across the three major grains markets and also because of differences in the extent to which markets function. Rice is characterized by a low proportion of total world production entering trade and by poorly functioning international markets with most trade remaining on an inter-governmental basis – see section 2.4. This makes reliance on international trade more dangerous for rice-importing countries than for those countries which import maize or wheat.

4.2. Trade policy

Commercial policy – import tariffs and export taxes, quotas or outright restrictions – allow governments of exporting or near self-sufficient countries to insulate domestic prices from shocks to the world market. Asian rice producing and consuming countries have a long history of successfully using these instruments to stabilize domestic prices – see Timmer (2010). Thailand and Vietnam, the two most important rice exporters, have successfully used variable export taxes to shield domestic consumers from movements in world prices

over a number of decades. Siamwalla (1975) discusses the Thai experience in the initial postwar decades. Indonesia, which for many decades was not quite self-sufficient, employed an import monopoly (Ellis *et al.*, 1991). Both Indonesia and the Philippines intervened “at the margins of the private marketing system” (Timmer, 2010) in a manner which contrasts with the African model in which public activities tend to squeeze out the private sector.

These rise stabilization programmes have been similar in both design and effect to the (evolving) E.U. Common Agricultural Policy (C.A.P.). Timmer (2010) argues that these policies have enabled Asian governments to deliver substantial price stabilization benefits to consumers.

Stabilization policies of this sort impose costs. One cost element is the government’s fiscal contribution. This has provided the dominant theme in the E.U. C.A.P. debate. Redistributive impacts have also been important. In exporting countries, export taxes and outright bans have redistributed purchasing power from producers to consumers and from the countryside to the cities as producers have been prevented from taking advantage of high world prices. Since the rural poor are generally poorer (as well as less politically vocal) than the urban poor, the result has been to redistribute from the very poor to the poor. In importing countries, domestic prices have been held above world levels redistributing from consumers to producers and from cities to the countryside. This has also been the European C.A.P experience.

Export controls are an alternative to variable export taxes and have been widely used over the years since 2007 – see, for example, DEFRA (2010). Such controls are less market compatible than variable taxes, in particular since they will often result in non-performance on existing commercial contracts. Export bans affect the commercial reputation of the exporting country and of private firms involved in the export sector. A reputation for poor contractual performance will often result in lower prices once the controls are lifted as counterparties seek discounts relative to world prices to compensate for possible future non-performance.

The lessons from food price stabilization schemes in food exporting developing countries is therefore that they can be successful in protecting countries against price shocks but they

are also redistributive, in certain cases unfavourably so. Variable export taxes are preferable to quantity-based restrictions.

4.3. Food security stocks

Standard definitions of food security run in terms of the availability of adequate food and access to this food – see, for example, Pinstrup-Andersen (2009). We can think of food security at the national or the household level. Access problems arise at the household level since even if a country has potentially adequate food availability, not all households will have adequate access to food.

At a national level, a country may be said to be food secure if it can guarantee adequate food to its citizens with a reasonable degree of certainty over the future, even if access problems may prevent some households from obtaining adequate food. Countries may choose to hold stocks either to ensure availability of food on domestic markets and thereby stabilize domestic prices or to protect food access for specific vulnerable groups in the event of a food shortage. I refer to the first of these as food security stocks and the second as humanitarian stocks. Although this conceptual distinction is clear, it is not always made and, in practice, stocks may be held for a mixture of motives. I concern myself in this and the next section with food security stocks, as defined above, and postpone discussion of humanitarian stocks to section 4.7.

Food security at the national level, in the precautionary sense defined above, is not a serious problem in the major developed market economies. No developed economy experienced problems in obtaining the food its citizens required either in 2007-08 or 2010-11. Furthermore, there does not appear to be any likelihood of food availability problems in the future. Contrast the situation of grains with energy where it is easy to envisage political conflict which closes the Straits of Hormuz drastically limiting petroleum availability in Europe. It is true that high food prices will erode living standards, even in developed economies. However, the share of food total household expenditure in the nineteen nineties was less than 20% in all developed economies and as low as 8% in the USA (Mitchell *et al*, 1997). Because the farmgate share of many food products is also as low as 20%, a doubling of farmgate food prices will have a significant but not serious impact of around 1%-5% on the overall household budgets, greater for the poor and less for the rich.

Food importing countries, including countries which are normally exporters but import occasionally, are likely to consider national food security stocks to shield themselves against lack of availability or high prices on world markets. The standard argument from economic theory that private stockholding will be adequate to control volatility loses its validity in poor economies. That argument is based on an absence of externalities and the ability of stockholders to offset their price exposure on futures markets – see Gilbert (2011b). Futures markets will generally be absent or inaccessible from these countries. To the extent that it does store food, the private sector will do so to meet the likely purchases and not the needs of the poor and vulnerable groups.

On top of this, policy risk may imply that they do even less than this. Because staple foods form a large part of the budgets of poor households, food prices and availability become acutely political issues. Governments are therefore unable to credibly and effectively commit not to intervene in the event that a shortage arises. However, this makes it unattractive for private merchants to store grains until government has announced its intervention decisions. By the time governments have made these decisions, it is likely to be too late for the private sector to act effectively. In turn, governments justify intervention by reference to the unpreparedness of the private sector (Jayne and Tschirly, 2010). These problems are largely absent in middle income and developed economies in which governments typically follow policies based on pre-announced intervention rules.

There is a further problem which relates to the meaning of the word “stabilize”. Timmer (2010) states that, the anticipatory action of private sector stockholders tends to destabilize the market price “*when there are expectations of shortages and rising prices*” (italics in original). Standard economic arguments would indicate that anticipation of likely future price rises is likely to reduce price variability by providing timely signals to producers and consumers. However, governments may prefer to delay bad news in the hope that matters improve – see section 4.6, below.

Finally, food price volatility may impose negative externalities (Gardner, 1979). The major impact of these externalities will typically be on supply chain intermediaries, in developing countries particularly acutely on locally-based intermediaries with limited access to credit and futures markets. The consequence is that such intermediaries will often operate at

inefficiently small scale and will be at a competitive disadvantage relative to multinational competitors (Dana and Gilbert, 2008; Gilbert, 2009).

National food security stocks are particularly attractive for landlocked countries where transport costs are high and can also rise sharply in the event of an urgent requirement to transport large quantities – Dana and Gilbert (2008) note that the cost of transporting maize into Malawi from South Africa can rise sharply during a shortage as the result of limited truck capacity. In principle, road transport constraints may be circumvented by use of rail links but railways typically prioritize long term minerals transportation contracts over crisis food transportation, which, although urgent, will not constitute a long term opportunity for the rail company.

The experience over a number of decades indicates that national stock policies have been costly – they tie up scarce resources, the grain is vulnerable to deterioration, they are vulnerable to corruption and theft and, like internationally held stocks, they discourage private stockholding. In an authoritative review, Knudsen and Nash (1990) concluded that stabilization schemes should “avoid handling the commodity when possible”. If other options are available, they are likely to be preferable. Nevertheless, and contrary to the view expressed by Knudsen and Nash (1990), the Asian experience with national rice stockpiles has been generally positive. Indonesia, for example, has managed to insulate its domestic consumers from volatility in world rice prices using a combination of export taxes and a small buffer stock – see Sicular (1989) and Timmer (2010).

The resolution of this difference in views rests on two considerations. Those Asian countries which have successfully used rice stockpiles have generally been close to self-sufficient and have experienced only modest weather shocks. Consumption variability is low. Variable export taxes or import tariffs have been largely sufficient in insulating domestic markets from world price shocks with buffer stocks playing a supporting role. This experience may not translate well to countries which are major importers or which can experience severe weather shocks. Second, grains storage is technically demanding and storage agencies are vulnerable to both favouritism and corruption. Governments may therefore benefit by seeking assistance in administering national food security stockpiles.

The most recent rise in food prices, which started in the 2010 northern hemisphere summer, has left food-importing L.I.C.s in a difficult position. This would be an expensive time in which to accumulate a food security stock but the 2008 experience has led many governments and commentators to the view reliance on trade may be ill-advised. In general terms, this conclusion is misconceived. Maize and wheat markets functioned well over 2007-08 and continue to function well now. The problem with these markets is the unpredictability of the prices that importers will need to pay, not availability of the grains themselves. It is this price unpredictability that governments need to address. For many countries, stockpiling will be an expensive way to do this although this may nevertheless be the best response in landlocked countries. I outline an alternative market-based food security strategy in section 4.6 below.

4.4. The balance between trade and food security stocks

Timmer (1986) argued for a move away from national food security stocks towards food security via trade and production based on comparative advantage. This view was reflected in the policy advice offered by the multinational development agencies over the two decades prior to the 2007-08 food price surge. If supply (harvest) shocks are largely uncorrelated across countries, governments can import when they need to do so without, on average, paying high prices. A trade-based food security policy requires access to foreign exchange but does not tie up resources in those years in which supplies are adequate. It is less vulnerable to corruption. However, trade based food security works less well if imports are required at a time when a demand shock has driven up prices on world markets, and are less attractive in landlocked countries than in countries with good port access.

Gouel (2011) has explored the optimal balance between trade and a national food security stock for a small grain importing developing country. He supposes that storage is optimal in both the country in question and in the world economy in the sense defined by Gustafson (1958) that stocks earn the expected (possibly risk-adjusted) rate of interest. Gouel supposes that this results from public storage both in the small economy and the world economy, but it could equally well result from offering subsidies to private sector actors. In the event of a shortage, the small country has the choice between consuming out of inventory, supposing this to be positive, or importing. In the event of a surplus, the country can either add to inventory or export. The possibility of importing and exporting reduces, but does not eliminate, the incentive to hold stocks. Domestic stocks are valuable when the

world price is high and storage is attractive when it is low. Storage is more attractive when transport costs impose a high wedge between import and export parity prices. Storage is probably also more attractive when shocks in the small country are correlated with those in the world market, although this goes beyond Gouel's model.

Gouel's analysis leads to three important conclusions:

- a) It emphasizes that trade and storage are complements and not substitutes – the issue is one of balance.
- b) It implies that countries which are dependent on food imports should not be afraid to export in the event that they find themselves with a surplus over domestic requirements in a year in which world prices are high. There are many L.I.C.s, such as Malawi and Zambia, which are self-sufficient in good years but need to import if weather conditions are poor. Often, these countries ban exports in order to ensure that any surplus is available for inventory. This policy may be misconceived.
- c) Transport costs are a major reason that national stocks remain an important food security instrument. Improving transport links, in particular port efficiency and rail access, is an important and simple means of increasing food security.

4.5. The WTO and food exports

The response of rice exporting countries to export controls in 2007-08 and the similar response of Russia in wheat in 2010 have persuaded many developing country governments that trade fails to deliver on food security in precisely those circumstances that it is required – see Christiaensen (2009) and DEFRA (2010). This has resulted in a reversal of the move towards trade-based food security and a revival of interest in food security and humanitarian stocks. Post-2008 attempts by countries to restore grain stock levels in what was already a tight market may have been a contributory factor behind the renewed rise in food prices in 2010.

By insulating domestic producers and consumers from the world market, export restrictions and variable export taxes force the burden of adjustment on importing countries. In many cases, these countries may be poorer and less well-equipped to cope with the price volatility than the exporters. Widespread resort to controls reduces the depth of the world market

and increases the volatility of prices on what can become a residual market of last resort. Variable export taxes result in incomplete or absent communication of price incentives for increased production to producers in exporting countries. Quantitative restrictions or bans on exports are likely to reduce availability at the world level at just the time shortages are occurring.

Faced with this high price volatility and the threat of export bans, importing countries have felt themselves obliged to institute food security stocks. Seen in this light, export restrictions generate a familiar Prisoners' Dilemma: both exporters and importers are better off if in the long run if exporters forbear from restricting exports but the governments of exporting countries are unable to commit not to resort to such controls if they become expedient in the short term. The consequence is a "bad" equilibrium in which importing countries run national food security stockpiles and aim for food self-sufficiency despite the high costs involved and exporting countries are unable to fully exploit their comparative advantage and their farmers are unable to profit from periods of high world prices.

How can the world escape from this "bad" equilibrium? There is a growing consensus for discussion of possible limitation of the use of export controls within the W.T.O. Fan (2010) has argued that "governments should be encouraged to eliminate existing export bans and refrain from imposing new ones". Sharma (2011) emphasizes the current asymmetry in W.T.O. provisions in relation to imports and exports. Currently, countries are only obligation to notify the W.T.O. of any restrictions they wish to impose, and many fail even to do this. F.A.O. *et al* (2011) makes a number of specific proposals for strengthening current W.T.O. export disciplines. However, any strengthening of W.T.O. disciplines on export controls will require a balancing of the interests of both exporting and importing countries – see Konadreas (2011) and Sharma (2011) for discussion.

A number of proposals have already been tabled to increase these obligations – see Mitra and Josling (2009). Some of these proposals would go beyond notification to consultation and even arbitration. Sharma (2011) is sceptical whether these proposals will go sufficiently far in disciplining countries. He considers both a Tax Rate-Quota (TRxQ) system and a variable export tax. Given that export controls have achieved significant success in stabilizing domestic grains prices across a range of countries, it is unrealistic to expect the

governments of these countries to accept major curtailment of their current rights. As was the case with imports under the G.A.T.T., formalization of the circumstances in which and the modes by which controls can be imposed and would be a useful first step leading in time to eventual reductions.

Of the major grain markets, it is that for rice which functions least well– see section 2.4. It was also shortages of, and high prices for, rice which generated most of the 2008 food price riots. The argument, which is frequently made, that many L.I.C.s could not access food in 2008 is only valid for rice. A pragmatic approach might therefore distinguish between those countries which depend on wheat or maize imports, and those which depend on rice. In current circumstances, L.I.C.s can probably rely on being able to import additional maize or wheat if this proves necessary, but may justifiably be worried about being able to do so for rice. This points towards the need for contingency arrangements for rice – either food security stocks, or formal trade agreements with rice exporters or, where this is feasible, a move towards rice self-sufficiency.

4.6.Markets and food security

I raise two issues in this section – how well do markets cope in crisis situations and what means are available to improve their functioning.

There is a widespread view that L.I.C. food markets fail to cope well in periods in which prices are rising rapidly, whether these rises are the consequence of a poor domestic harvest or are imported from regional or world markets.

- One frequent charge is that of “hoarding” whereby private traders hold inventory off the market in the expectation that prices may rise further, an expectation which may become self-fulfilling – see the comment from Timmer (2010) quoted in section 4.3.
- A second charge is that the private sector may fail to mobilize supplies from outside the country or the affected region in the fear that the profitability of these trades will be undermined by subsequent government intervention. This inaction then provokes exactly the official interventions that the private sector feared – see Jayne and Tschirley (2010).
- It is further asserted that even if government or the private sector does contract for additional supplies in advance, either on an unconditional or a contingent basis, it is

likely that foreign counterparties will renege on contracts which have become *ex post* unattractive. The widespread resort to bans and controls by food exporters contribute to this fear – see section 4.5. This suggests that there may be little value in advance planning since it provides no more than a false sense of reassurance.

Governments of many L.I.C.s, particularly in Africa, have therefore come to the view that they cannot rely on market responses in food crisis situations. The result has been to push food security and crisis response almost entirely into the hands of governments and international agencies, in particular the World Food Programme (W.F.P.).

It would be incorrect to imply that the private sector is excluded in this process. W.F.P. in particular makes is concerned to maximize local sourcing. However, a consequence is that the private sector comes to service government, the W.F.P. and other agencies and not directly serve the consumers themselves. In that sense, government and the W.F.P. supplant the market.

Does this matter? In a crisis, the answer is no. The imperative is to get food to mouths and the government-agency-dominated structure is effective in doing this. In other periods, the answer is probably that it does have negative consequences in that it reduces the space left for the private sector and tends to induce a food dependency culture. In non-crisis situations, government and the agencies should measure their success by how little, and not how much, they are doing. Such a strategy will reduce the role they need to take on when crisis times recur.

The failures of the market¹¹ that I listed at the start of this section are different and need to be addressed in different ways. Worries about hoarding and inappropriate governmental intervention can be reduced if government talks to and consults the major private sector grains traders talk in a regular basis. Discussion can avoid the emergence of very different views of likely market developments whereby “prudent action” on one side is seen as “anti-social hoarding” by the other. Consultation can ensure that, when government does intervene, it respects existing contractual arrangements. Some sort of national grains council would provide an enabling framework.

¹¹ I deliberately use this phrase rather than the more theoretically-laden “market failures”.

Problems of contractual performance are less tractable since it will often be foreign counterparties that renege. In this instance, W.F.P. and other agencies have a comparative advantage in enforcement since their reach is wider and few suppliers are likely to risk subsequent exclusion from their procurement processes. This suggests that, in non-crisis times, these agencies should focus on contracting and not on direct provision. Futures market clearing houses provide a model – when two parties transact on a futures exchange, their transaction is immediately intermediated by the exchange clearing house such that each now has a contract with the clearing house – see Edwards (1984).

The emphasis on contracting meshes with the so-called market approach to managing grains price volatility discussed in Dana *et al.* (2006), Sarris *et al.* (2006), Dana and Gilbert (2008), Sarris (2010) and Sarris *et al.* (2011). This involves setting up structures and institutions which allow governments and supply chain intermediaries to cope with price volatility instead of attempting to reduce or eliminate this volatility and without resorting to extraordinary government intervention. It can be applied to either food security stocks or to humanitarian stocks. The approach was embraced by the G20 Agriculture Ministers in their June 2011 declaration (G20, 2011, Annex 5) and also in the joint policy report coordinated by the FAO and OECD (FAO *et al.*, 2011).

The principal instruments involved are futures and options contracts or “over the counter” (O.T.C.) instruments, by means of which providers (usually international banks) intermediate the hedging instruments to the governments or entities concerned. Prior to the most recent decade, the use of these instruments was typically discussed in relation to protection of commodity exporters against price falls. However, they turn out to be even better suited to the protection of commodity importers against price spikes.¹²

Consider a government which wishes to protect itself against a possible grains price spike. By buying futures contracts in the appropriate grain, the government locks in the grain purchase price. It will typically not take delivery on this purchase and will close out at the time it, or the national importing companies or agencies, purchase spot grain. On average, this hedge should neither lose nor make money and there will be a modest reduction in the

¹² Because commodity price distributions are skewed with flat bottoms and sharp peaks (Wright and Williams, 1991; Deaton and Laroque, 1992), protection against the price spikes is more valuable than protections against low prices.

variability of grain purchase prices. The major advantage to the hedger is that the purchase is known more or less accurately at the time the hedge is initiated.¹³

In practice, for a mixture of political, credit and anti-money-laundering concerns, L.I.C. governments and enterprises are likely to be constrained to hedging with option contracts – see Dana and Gilbert (2008). Options allow a government to secure price protection at a certain level in return for a fixed premium. For importers, a call option has the effect of putting an approximate ceiling price on the contracted quantities. A ceiling price is particularly attractive if the intention is to hedge against a price spike in which case the “strike” (i.e. contractual ceiling) price of the call option can be significantly above the market price level at the time of contracting.

A major advantage of the call strategy is that it has a market price. The cost of protection is therefore known (and will typically also be paid) in advance. Purchasers can decide on the level and duration of protection that they require or can decide that the cost is too high and they prefer to remain unprotected. In developed and middle income economies, the cost of staple grains is no longer a major component of household budgets and the resulting diversification implies that self-insurance is likely to be the preferred outcome. On the other hand, many L.I.C.s may value this type of price protection. Others may regard it as inappropriate or too costly.

Call options can be structured either on a purely financial basis (i.e. using exchange-traded contracts), or on a physical basis (i.e. by integrating the price “cap” into a purchase or supply agreement). In countries where food import prices are not closely correlated with world prices (the basis risk problem), physical option strategies (i.e. contingent purchase agreements) might be more suitable. For many L.I.C.s, interest in a purely financially settled product may not be useful since it would not result directly in food shipments moving into the country, typically an important priority for a country facing a shortage or food price shock.

¹³ The hedge is only approximate because of “basis risk”, i.e. the fact that the country’s import prices will be less than perfectly correlated with the exchange price. As basis risk increases, the usefulness of the hedge decline – see Dana and Gilbert (2008).

Finally, governments may decide that the funds required for payment of the premium could be better spent on other projects. The result of these multiple considerations will be that this sort of strategy becomes appropriate for those for whom it has the greatest value. As a result, it may be significantly less costly than the establishment of an international grain reserve which will offer a uniform (but low) degree of protection to all grains consumers.

Market-based protection against grains price spikes is feasible for many countries and is likely to be affordable for at least some. Where it is feasible and affordable, agencies, such as the W.F.P., will be better employed in facilitating such contracts rather than in organizing direct provision of food. The fact that not all governments will wish to purchase this form of protection is probably an advantage since it will ensure funds are not wasted. Unlike public storage, this approach also encourages additional private storage and trade finance. These additional benefits in terms of strengthening the roles of private actors suggest that these ideas deserve further and wider discussion. They may be seen as reinforcing trade-based food security policies and thereby obviating the need to retreat back to more expensive stock-based policies. They will encourage the development of an efficient consumer-orientated private sector in grains which should be in a position to better cope with any eventual crises.

4.7.Humanitarian and emergency stocks – P.R.E.P.A.R.E.

What happens when, notwithstanding the best developmental efforts, a food crisis does occur? The P.R.E.P.A.R.E. scheme, set out in F.A.O. *et al.* (2011), addresses this question and proposes a system of regional, humanitarian emergency stocks. The rationale for humanitarian stocks is that of protecting poor and vulnerable households from the impact of food shortages and food price spikes:

“Relatively smaller food security emergency reserves can be used effectively and at lower cost to assist the most vulnerable. Unlike buffer stocks that attempt to offset price movements and which act as universal subsidies benefiting both poor and non-poor consumers, emergency food reserves can make food available to vulnerable population groups in times of crisis. In addition, emergency reserves of relatively small quantities of staple foods will

not disrupt normal private sector market development which is needed for long term food security". F.A.O. *et al.* (2011, paragraph 111)

Maxwell and Smith (1992) discuss the relationship between poverty, vulnerability and food security. At the household level, food insecurity correlates with poverty. National poverty lines should be defined such that a non-poor household will have sufficient resources to purchase adequate food but, since poverty is a broader concept than food insecurity, not all poor households will necessarily lack adequate food (consider subsistence farmers with little cash income). Just as poverty statistics are snapshots, so are food security statistics based on availability measures. Vulnerability may be thought of as the probability that a non-poor, food-secure household finds itself poor or with inadequate access to the food in the future. In that sense, it is reasonable to state that a household is food-secure if it not only currently has access to sufficient food but if it can also reasonably expect continued access in the future. Many poor households will lack this guarantee even if they do currently possess adequate food.

This discussion raises two questions:

- a) Which are the vulnerable households?
- b) How can assistance be efficiently targeted at this group?

Humanitarian stocks will generally be distributed directly to qualifying households if the need so arises. Possible mechanisms include school and hospital meals. If the qualifying groups are carefully specified, these households would only have been able to buy small amounts of food from local markets in the absence of the assistance. Provided distribution is efficient, there will be little leakage into local markets. These issues were not directly addressed by either FAO *et al.* (2011) or G20 (2011) These considerations indicate that the price impact of well-conducted humanitarian assistance should be small and, by implication, the crowding out effect on private stocks should also be small. Provided the qualifying group is narrowly defined, the financial cost of the programme should be small and, in view of the favourable terms of trade movements experienced by many L.I.C.s (see section 2.3), manageable within the country's own resources.

Humanitarian stocks therefore do appear to be a potentially effective means of protecting poor and vulnerable households from low food availability and high food prices. At the same time, it is important to underline the qualification that the qualifying households should be carefully, and probably narrowly, identified and that distribution should be efficient to minimize leakages into the wider market. If these conditions cannot be met – for example, if assistance is to be targeted at entire urban populations – the earlier discussion of sections 4.3 and 4.4 apply.

Poorly conceived and badly executed humanitarian stock programmes will do little to increase food availability. Their main impact will be to redistribute food from the market to those households who are favoured by the programmes. Both the markets themselves and the private stockholding function will be undermined. Non-favoured households will pay more and consume less. The result will be arbitrary redistribution and, very probably, resentment amongst the non-favoured. None of this argues against humanitarian stocks, but it does emphasize the importance of careful design and efficient implementation.

It is against these criteria that we should judge the P.R.E.P.A.R.E. (Pre-Positioning for Predictable Access and Resilience) system set out in Appendix E of F.A.O. *et al.* (2011). The objective is to ensure that small regionally pre-positioned emergency humanitarian food reserves be available in order that the international community can respond rapidly to any emergency. Possible concerns over the proposal include

- a) The extent to which vulnerability can be defined and isolated. The F.A.O. *et al.* (2011) discussion is clear on this requirement.
- b) The proposed delivery channel, including whether in terms of food or cash, and the extent of any leakage. F.A.O. (2011) discusses some of these issues.
- c) The proposal envisages the possibility of regional stocks. There are two problems here. First, the extent of any cost savings from regionalization will depend on food shortages being uncorrelated across countries. Second, transportation costs between regional centres can be very high, particularly in emergency situations where speed is important. If regionalization is to be pursued, it may be preferable to hold stocks in ports rather than inland centres. Further study is required.

- d) There is an obvious danger that the existence of an emergency humanitarian stockpile may discourage governments from making their own food security provision. This is likely to result in pressure for non-emergency calls on the humanitarian reserve. It may even result in a lower level of food availability in an emergency situation that would have been the case in the absence of the scheme. At the very least, the P.R.E.P.A.R.E. scheme should be coordinated with the efforts of national agencies. Better, the proponents of the new scheme should consider arrangements which enhance the capacities of national food security agencies rather than attempt, as in the current proposal, to substitute them.

- e) Missing from the F.A.O. *et al.* (2011) discussion is any consideration of the role of the private sector, emphasized in section 4.6. It is suggested that procurement will be based on “optimized spot purchasing that takes advantage of bulk purchases, relative commodity pricing, regional and international sourcing and seasonal price movements” (*ibid*, Appendix E, paragraph 18), but such policies tend to favour multilateral over local intermediaries. W.F.P. already occupies a dominant monopsonistic role in the food supply chains of many developing countries and even if, as I believe, it exercises its monopsony power benevolently, this does little to encourage the growth of resilient and independent local supply intermediaries.

The outcomes from the P.R.E.P.A.R.E. scheme may be complicated and its authors are correct that a pilot programme will be necessary to permit a reasonable evaluation. The P.R.E.P.A.R.E. proposal starts from the premise that it is the obligation of the international community to provide humanitarian assistance to developing countries. This is correct, but it is only half the answer.

In the aftermath of the riots which took England by surprise in August 2011, politicians on the right argued that the rioters should be strongly punished, implicitly as an example to others. Politicians on the left instead stressed the need to address the causes of youth disaffection. Both views were correct, but neither is sufficient alone to ensure that riots do not recur. The same is true of the P.R.E.P.A.R.E. proposal. It is sensible and desirable in terms of crisis response but fails to address the causes of the poor functioning of L.I.C. food markets which underlies the emergence of many food crisis situations.

Like British politicians, the G20 should beware of an unbalanced knee-jerk reaction to the recent food crisis. I recommend that, in welcoming the F.A.O. *et al.* (2011) proposals, it asks the authors to complement these by proposals which will foster private sector development in the food sector of L.I.C.s in such a way as to reduce their likely future dependence on P.R.E.P.A.R.E. or similar schemes. I further recommend that active consideration be given to the possible intermediation role of agencies in contracting as set out above in section 4.6.

5. Conclusion

Food prices surged in 2007-08 and again in 2010-11. Volatility has also increased over the levels experienced at the start of this century. Whereas the rise in food prices is fairly general, the increase in volatility is confined to grains and some vegetable oils. However, these are exactly the food products which are of concern when discussing food security.

A number of international initiatives have been suggested to lower prices and limit volatility. In this paper, I have argued that these initiatives are unlikely to succeed and in some cases will make things worse.

- I argue that the role of biofuels mandates and subsidies in driving food prices upward have been exaggerated. Nevertheless, it does appear that high crude oil prices have fed through into grains prices via biofuels demand for maize.
- Multilateral agreements, along the lines of the International Wheat Agreements, rely on government-to-government commerce which is now the exception in international markets.
- On stocks, it is true that these are now low, but it is unclear whether the fall in stocks over the period top 2005, largely resulting from a decline in Chinese stocks, was a major driver of the price rises in 2008. In any case, it would be folly to build up stock levels in the current period of tight demand and high prices.
- Although there was some evidence of speculative bubbles in the 2007-08 grains markets, speculators are liquidity providers and in general terms reduce volatility. There may be other arguments for tighter regulation of grains futures markets, but

trading restrictions or a Tobin tax are both likely to result in increased volatility and more costly hedging.

On the other hand, increased transparency, both in relation to food production and stocks and in the operation of European commodity futures markets, where transparency is lower than on U.S. markets, will be beneficial, even if it will have little direct impact on food price volatility.

National food security policies offer the prospect of more favourable returns. The debate is often posed as a choice between trade and stocks, but this is misleading since the two strategies can and should be complementary. Countries need to achieve a food balance. In general terms, food importing countries will need to rely on a mixture of variable import tariffs and export taxes, together with a food security stock. The precise nature of the balance will depend on the country's normal food balance, its grain staple, transport costs and (although this remains a conjecture) the correlation between its supply and demand shocks and those in the rest of the world.

Export bans, and to a lesser extent export taxes, impose external costs on the remainder of the world. The world market becomes residual and hence more volatile and importing countries find grain supplies are unavailable at the very time that they are required. This forces them to tilt the policy balance away from trade and towards stockpiling and national self reliance, which are likely to be more costly options. The result is a bad equilibrium with lower trade and greater food security costs than in the good equilibrium in which exporters forbear from controls. The hope is that by regulating the use of controls, the W.T.O. might prevent the world from slipping into this bad equilibrium. The current asymmetry in W.T.O. export and import disciplines should be addressed.

Asian rice-producing and consuming countries, many of which have managed to achieve a good balance between trade and stocks, have typically done this using relatively light government interventions and procurements allowing an efficient private sector to prosper. This contrasts with the situation in much of Africa where there is a widespread view that food markets do not work well, particularly in crisis situations. A consequence is that grains commerce has come to be dominated by governments and the agencies. I have suggested

that it is important in these countries to identify why markets are thought not to work well and hence suggest ways which might improve their functioning.

There are two major reasons why grains markets work poorly in some L.I.C.s. The first is a lack of trust and communication between government and private sector actors. Lack of communication can result in the two groups holding divergent views on likely market developments. This may sometimes lie behind accusations that the private sector is “hoarding” grain in a shortage situation. Lack of consultation can result in government making regulations, or undertaking trades on its own account, which undermine private sector actions. Lack of communication and consultation results in a fear that government may act in this way even if, subsequently, it does not intervene. Creation of improved communication and consultation channels can help resolve these difficulties.

A second problem relates to performance risk in contracting. In the event of sharp price rises, suppliers with fixed prices supply contracts to L.I.C. governments or enterprises may believe that the costs of default are small relative to those of performance on the contract. Redress will be difficult and costly and, in any case, would not resolve the food situation. The situation will be exacerbated if exporting governments impose restrictions. A planned food policy at most gives a false sense of security. This suggests that W.F.P. and other agencies should consider taking on an intermediation role in the contracting process, thereby allowing L.I.C. governments and enterprises to make viable plans in advance of any crisis.

These considerations are relevant in the context of the discussion of emergency humanitarian stocks in the current G20 meetings. I distinguish humanitarian stocks from food security stocks on the basis that the former are targeted specifically at vulnerable groups whereas the latter are directed towards overall availability and the general level of prices in local markets. Provided the target group is narrowly defined and the assistance is efficiently managed to minimize leakages, humanitarian stocks will be relatively robust in relation to the crowding out concerns which apply to wider national food security stocks. They will also involve a much more limited financial commitment. The danger is that targeting is imprecise, that the target group is wide and that there is significant leakage into local markets. If this turns out to be the case, well-intentioned programmes, even when

genuinely motivated by humanitarian concerns, may undermine market mechanisms. The main impact of poorly designed and executed programmes is likely to be on the distribution of food across households rather than on the overall level of availability. It is therefore essential that any humanitarian stock programme is well designed and efficiently executed. Note, however, that neither of the proposals advanced above for better consultation and for more reliable contracting involve any multilateral agency holding stocks additional to those they already carry.

The W.F.P., in conjunction with other agencies, has recently launched a P.R.E.P.A.R.E. proposal for regionally based emergency humanitarian stocks. A number of detailed points are unclear, in particular with regard to how P.R.E.P.A.R.E. stocks would be coordinated with national food security provision. More generally, the proposal starts from the premise that it is the obligation of the international community to provide humanitarian assistance to developing countries rather than to facilitate their own efforts to become more resilient to food crises. The proposal is unbalanced, both in its lack of consideration of crisis avoidance in addition to crisis response and its neglect of the potential role of the private sector. I suggest that, in welcoming the P.R.E.P.A.R.E. proposal, G20 members also ask the sponsoring agencies to reflect further on how the proposal may be broadened to work towards a situation in which the L.I.C.s can become less crisis-prone.

References

- Abbott, P.C., C. Hurt and W.E. Tyner (2008), "What's Driving Food Prices?", Oak Brook (IL), Farm Foundation.
- Al-Riffia, P., B. Dimaranan and D. Laborde-Debucquet (2010), "European Union and United States biofuel mandates: Impacts on world markets", seminar, Washington D.C., IADB, 2 December 2010.
- Anderson, R.W., and C.L. Gilbert (1988), "Commodity agreements and commodity markets: lessons from tin" *Economic Journal*, **98**, 1-15.
- Babcock, B.A. (2011), "The impact of US biofuel policies on agricultural prices: Options for addressing volatility", *Securing food in volatile markets: How can trade policy help?*, ICTSD, 27 May 2011, Geneva
- Babcock, B.A., and J.F. Fabiosa (2011), "The impact of ethanol and ethanol subsidies on corn prices: revisiting history", *CARD Policy Brief*, **11-PB 5**, Ames, Iowa State University.
- Baffes, J., and T. Haniotis (2010), "Placing the 2006/08 commodity price boom into perspective", *Policy Research Working Paper*, **5371**, Washington D.C., World Bank.

- Bagehot, W. (1873), *Lombard Street*, London, Henry S. King.
- Bagehot, W. [pseud.] (1971), "The only game in town", *Financial Analysts Journal*, **27**, 12-14.
- Balcombe, K. (2009), "The nature and determinants of volatility in agricultural prices: an empirical study from 1962-2008", in A. Sarris and J. Morrison eds., *The Evolving Structure of World Agricultural Trade*, Rome, FAO.
- Christiaensen, L. (2009), "Revisiting the global food architecture. Lessons from the 2008 crisis", *Review of Business and Economics*, **54**, 345-61.
- Cooper, R. N., and R.Z. Lawrence (1975), "The 1972-75 commodity boom", *Brookings Papers on Economic Activity*, **3**, 481-90.
- Dana, J., and C.L. Gilbert (2008), "Managing agricultural price risk in developing countries", in H. Geman ed., *Risk Management in Commodity Markets: From Shipping to Agriculturals and Energy*, Chichester: Wiley Finance.
- Dana, J., C.L. Gilbert and E. Shim (2006), "Hedging grain price risk in the SADC: Case studies of Malawi and Zambia", *Food Policy*, **31**, 357-71.
- Dash, M. (1999), *Tulipomania: The story of the world's most coveted flower and the extraordinary passions it aroused*, London, Gollancz.
- Dawe, D. (2009), "The unimportance of 'low' world grain stocks for recent world price increases", *ESA Working Paper*, 09-01, Rome, FAO.
- De Long, J.B., A. Shleifer, L.H. Summers and R.J. Waldman (1990), "Positive feedback investment strategies and destabilizing rational expectations", *Journal of Finance*, **45**, 379-95.
- Deaton, A.S., and G. Laroque (1992), "On the behaviour of commodity prices", *Review of Economic Studies*, **59**, 1-23.
- DEFRA (2010), "Export restrictions on food over 2007/08: An analysis of their impact and evaluation of policy options", Annexe 5 of *Agricultural Price Spikes 2007/2008: Causes and Policy Implications*, London, DEFRA, <http://archive.defra.gov.uk/foodfarm/food/pdf/ag-price-annex%203.pdf>
- Desai, M. (2008), "Act now to price the bubble of a high oil price", *Financial Times*, 6 June 2008.
- Diba, B., and H. Grossman (1988), "Explosive rational bubbles in stock prices", *American Economic Review*, **78**, 520-30.
- Edwards, F.R. (1984)" The clearing association in futures markets: guarantor and regulator", in R.W. Anderson ed., *In The Industrial Organization of Futures Markets*, Lexington, Mass, D. C. Heath.
- Ellis, F., P. Magrath and B. Trotter (1991), *Indonesia Rice Marketing Study 1989-91*, Jakarta, Badan Urusan Logistik.
- Fan, S. (2010), "Five steps to prevent a repeat of the 2007–08 food crisis", Washington DC, IFPRI.
- F.A.O., I.F.A.D., I.M.F., O.E.C.D., U.N.C.T.A.D., W.F.P., the World Bank, the W.T.O., I.F.P.R.I. and the U.N. H.L.T.F. (2011), *Price Volatility in Food and Agricultural Markets: Policy Responses*, Paris, O.E.C.D.

- Friedman, M. (1953), *Essays in Positive Economics*, Chicago, University of Chicago Press, 157-203.
- G20 (2011), Ministerial Declaration, *Action Plan on Food Price Volatility and Agriculture*, Meeting of G20 Agriculture Ministers, Paris, 22 and 23 June 2011
- Gardner, B. L. (1979), "Robust stabilization policies for international commodity agreements", *American Economic Review, Papers and Proceedings*, **69**, 169–172.
- Gilbert, C.L. (2009), "Cocoa market liberalization in retrospect", *Review of Business and Economics*, **54**, 294-312.
- Gilbert, C.L. (2010a), "How to understand high food prices", *Journal of Agricultural Economics*, **61**, 398-425.
- Gilbert, C.L. (2010b), "Speculative influences on commodity futures prices 2006-08", Discussion Paper **472**, Geneva, UNCTAD.
- Gilbert, C.L. (2010c), "The terms trade and grains prices in six developing countries", Report for FAO, Department of Economics, University of Trento.
- Gilbert, C.L. (2011a), "Grains price pass-through, 2005-09", in A. Prakash ed., *Extreme volatility in agricultural markets: causes, consequences and policy options*, Rome, FAO (forthcoming).
- Gilbert, C.L. (2011b), "International Commodity Agreements and their current relevance for grains price stabilization", in A. Prakash ed., *Extreme volatility in agricultural markets: causes, consequences and policy options*, Rome, FAO (forthcoming).
- Gilbert, C.L. and C.W. Morgan (2010), "Food price volatility", *Philosophical Transactions of the Royal Society*, **B 365**, 3023-34.
- Gilbert, C.L., and A. Tabova (2011), "Coping with food price surges", in A. Prakash ed., *Extreme volatility in agricultural markets: causes, consequences and policy options*, Rome, FAO (forthcoming).
- Gouel, C. (2011), *Agricultural Price Instability and Optimal Stabilisation Policies*, unpublished Ph.D. thesis, Paris, École Polytechnique.
- Gustafson, R.L. (1958), "Carryover levels for grains: a method for determining the amounts which are optimal under specified conditions", *Technical Bulletin*, **1178**, Washington, D.C.: U.S. Department of Agriculture.
- Huchet-Bourdon, M. (2011), "Developments in commodity price volatility", Food Agriculture and Fisheries Working Paper, OECD, Paris (forthcoming).
- Hull, J.C. (2006), *Options, Futures and Other Derivatives* (6th edition), Upper Saddle River (NJ), Prentice Hall.
- International Wheat Council (1993), *The International Wheat Council and the International Wheat Agreement*, London: International Wheat Council.
- Irwin, S.H., and B.R. Holt (2004), "The effect of large hedge fund and CTA trading on futures market volatility", in Gregoriou, G.N., V.N. Karavas, F-S. Lhabitant and F. Rouah, *Commodity Trading Advisors: Risk, Performance Analysis and Selection*, Hoboken (NJ), Wiley.
- Irwin, S.H., and S. Yoshimaru (1999), "Managed futures, positive feedback trading, and futures price volatility", *Journal of Futures Markets*, **19**, 759-76.

- Jayne, T.S., and D. Tschirley (2010), "Food price spikes and strategic interactions between the public and private sectors: Market failures or governance failures?", *Commodity Market Review*, 2009-10, Rome, FAO, 121-38.
- Knudsen, O., and J. Nash (1990), "Domestic price stabilization schemes in developing countries", *Economic Development and Cultural Change*, **38**, 539-58.
- Konandreas, P. (2011), "International trade policy options for mitigating the effects of world price volatility", in A. Prakash ed., *Extreme volatility in agricultural markets: causes, consequences and policy options*, Rome, FAO (forthcoming).
- Krelage, E.H. (1942), *Bloemenspeculatie in Nederland*, Amsterdam, van Kampen and Zoon.
- Laibson, D. (2009), "Bubble economics", Frank Hahn Lecture, Royal Economic Society, 20 April 2009, <http://www.firstsightmedia.co.uk/clients/res/slides/davidlaibson.pdf>
- Lipsey, R.E. (1994), "Quality change and other influences on measures of export prices of manufactured goods", *Policy Research Working Paper*, **1348**, Washington DC, World Bank, International Economics Department.
- Masters, M.W. (2008), Testimony before the U.S. Senate Committee of Homeland Security and Government Affairs, Washington, DC, 20 May 2008.
- Maxwell, S., and M. Smith (1992), "Household food security: a conceptual review", in S. Maxwell and T.R. Frankenberger eds., *Household Food Security: Concepts, Indicators, Measurements*, New York, UNICEF and Rome, IFAD.
- Miranda, M.J., and P.G. Helmerger (1988) "The effects of commodity price stabilization programs", *American Economic Review*, **78**, 46-58.
- Mitchell, D. (2008), "A note on rising food prices", *Policy Research Working Paper* #4682, World Bank, Development Prospects Group, Washington D.C.
- Mitchell, D.O., M.D. Ingco and R.C. Duncan (1997), *The World Food Outlook*, Washington DC, World Bank.
- Mitchell, D., and J. Le Vallee (2005), "International food price variability: the implications of recent policy changes", paper presented to the workshop "Managing price instability in low income countries", Washington DC, World Bank, 28 February – 1 March 2005.
- Mitra, S., and T. Josling (2009), "Agricultural export restrictions: Welfare implications and trade disciplines", IPC Position Paper, Agricultural and Rural Development Policy Series, International Food and Agricultural Trade Policy Council, Washington D.C.
- O'Hara, M. (1995), *Market Microstructure Theory*, Oxford, Blackwell.
- Pagano, M., and A. Röell (1996), "Transparency and liquidity: a comparison of auction and dealer markets with informed trading", *Journal of Finance*, **51**, 579-611.
- Pfuderer, S., G. Davies and I. Mitchell (2010), "The role of demand for biofuel in the agricultural commodity price spikes of 2007/08", Annexe 5 of *Agricultural Price Spikes 2007/2008: Causes and Policy Implications*, London, DEFRA, <http://archive.defra.gov.uk/foodfarm/food/pdf/ag-price-annex%205.pdf>
- Phillips, P.C.B., Y. Wu, Y., and J. Yu (2011), "Explosive behavior and the Nasdaq Bubble in the 1990s: when does irrational exuberance have escalated asset values?", *International Economic Review*, **52**, 201-26.

- Pinstrup-Andersen, P. (2009), "Food security: definition and measurement", *Food Security*, **1**, 5-7.
- Salant, S.W. (1983), "The vulnerability of price stabilization schemes to speculative attack", *Journal of Political Economy*, **91**, 1-38.
- Schmidhuber, J. (2006), "Impact of increased biomass use on agricultural markets, prices and food security: A longer term perspective", Global Perspectives Unit, FAO, Rome.
- Saimwalla, A. (1975), "A history of rice policies in Thailand", *Food Research Institute Studies*, **14**, 233-49.
- Sarris, A.H. (2010), "hedging import price risks and institutions to assure import supplies", *Commodity Market Review*, 2009-10, Rome, FAO, 134-79.
- Sarris, A.H., P. Conforti, and A. Prakash (2006), "The use of futures and options to insure wheat import price risks by low income food deficit countries", in A.H. Sarris and D. Hallam (eds.), *Agricultural Commodity Markets and Trade: New Approaches to Analyzing Market Structure and Instability*, London, Edward Elgar.
- Sarris, A.H., P. Conforti, and A. Prakash (2011), "The use of organized commodity markets to manage food import price instability and risk", *Agricultural Economics*, forthcoming.
- Sharma, R. (2011), "Food export restrictions: Review of the 2007-2010 experience and considerations for disciplining restrictive measures", *Commodity and Trade Policy Research Working Paper*, #32, FAO, Rome.
- Sicular, T. (1989), ed., *Food Price Policy in Asia*. Ithaca, Cornell University Press.
- Soros, G. (2008), Testimony before the U.S. Senate Commerce Committee Oversight Hearing on FTC Advanced Rulemaking on Oil Market Manipulation, Washington D.C., 4 June 2008.
- Timmer, C.P. (1986), *Getting Prices Right – The Scope and Limits of Agricultural Price Policy*, Ithaca, Cornell University Press.
- Timmer, C.P., (2010), "Management of rice reserve stocks in Asia: Analytical issues and country experience", *Commodity Market Review*, 2009-10, Rome, FAO, 87-120.
- United States Senate Permanent Subcommittee on Investigations (2009), *Excessive Speculation in the Wheat Market, Majority and. Minority Report*, 24 June 2009, Washington D.C., U.S. Senate.
- Wiggins, S. And S. Keats (2010), "Grain stocks and price spikes", Annexe 2 of *Agricultural Price Spikes 2007/2008: Causes and Policy Implications*, London, DEFRA, <http://archive.defra.gov.uk/foodfarm/food/pdf/ag-price-annex%202.pdf>
- Wright, B.D. (2009), "A note on international grain reserves and other instruments to address volatility in grain markets", World Grain Forum 2009, St. Petersburg, June 6-7, 2009, Working Paper, FAO Investment Centre, Rome, FAO.
- Wright, B.D., and J.C. Williams (1991), *Storage and Commodity Markets*, Cambridge: Cambridge University