The short- and medium- term impacts of rises in staple food prices

Andrew Dorward,

Centre for Environment Development and Policy,
School of Oriental and African Studies,
University of London

and

Leverhulme Centre for Integrative Research in Agriculture and Health,

Email: Andrew.Dorward@soas.ac.uk

Tel: +44 (0) 20 3073 8330

Abstract

There is widespread concern about the impact of recent price rises on the welfare and food security of poor people and about future impacts of high prices. Responses to these concerns are, however, sometimes clouded by lack of clarity about the nature of short and medium term impacts of food price changes for different people. This paper reviews both theory and empirical evidence on these impacts. It finds that theory and empirical evidence are broadly complementary and consistent, with a high degree of variability in impacts. In broad terms staple food price increases have had very serious effects on the poor in national or local economies which have experienced high food price shocks without broad based growth processes. Poor net buyers of food, in both rural and urban communities, have been most negatively affected, with limited second order benefits from high staple food prices tightening labour markets in poor rural economies. Short term impacts can be ameliorated by economic growth and, for international food price increases, by limited price transmission. Economic growth and lower domestic price transmission of high international prices in different countries, notably India and China, have led to lower increases in global poverty, hunger and malnourishment than hunger and poverty simulations have suggested. However these findings should not detract from the very serious impacts high food prices have had for very large numbers of very poor people in poor countries, and the need for policies and action to address this.

Key words: food prices, food security, food staples, rural poverty

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1. Introduction

Recent years have seen increasing average food prices, severe food price shocks (in 2008 and 2010/11), and increasing concerns about the impacts of food prices shocks, high food prices and food price volatility or variability on poor and food insecure people. However there is also considerable variation in views of the nature of some of these impacts. In particular while there is general agreement that high prices are bad for the urban poor (with large staple food expenditures), there has been less agreement on the impacts of high food prices on the rural poor.

This paper uses basic microeconomic theory to discuss the different meanings and effects of changes in staple food [1] prices to different consumers and producers, where staple foods are considered as the major carbohydrate foods in people's diets. Although these include both grain and root crops, empirical discussion focusses more on prices of the major grains (wheat, rice, and maize) which are internationally traded, with widely available national and international price data (this is not the case for root crops). This is followed by a review of empirical evidence of the effects of the 2008 food price spike on different people. We find strong theoretical and empirical grounds that the 2008 food price spike was generally bad for the welfare of the urban and rural poor, though there may be some cases where the rural poor were able to benefit from high food prices. However, the negative effects of high food prices on many poor people may have been outweighed by the benefits of wider economic growth. National and international concern about the short and medium term negative effects of food price spikes has therefore been justified, and there is a pressing need for policies and investments to prevent and mitigate the effects of food price spikes.

2. Theoretical insights on impacts of food price changes

In this section of the paper we draw on a long standing literature to provide a brief discussion of core economic concepts that are relevant to consideration of the short and medium term impacts and measurement of changes in food prices.[2] In this we make two distinctions: between different scales of analysis (in micro- and macro-economics), and between different stakeholders. We begin with a microeconomic analysis of the impacts of higher food prices on different consumers and producers before considering macroeconomic impacts of higher food prices, and different stakeholder and government responses to them.

2.1. Microeconomic analysis of food price changes

Despite the very considerable literature about the causes and impacts of high food prices in the last few years, there is little discussion and a lack of clarity on what food 'prices' actually are. We begin therefore from a definition of price as the opportunity cost to an economic actor of a good, service or factor of production in exchange, consumption or production. Prices of different goods, services and factors of production are only meaningful relative to each other, with money providing a convenient numeraire to give monetary prices. Changes in monetary prices work well as descriptors of underlying opportunity cost changes for a particular good or service, provided that (a) monetary

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[1] The focus of this paper is on staple food prices,. Further references to 'food prices' should be taken as referring specifically to staple food prices.
[2] This paper focuses on the impacts of high food prices *per se*. It does not consider the further costs of adjustment and uncertainty that arise with food price shocks and food price volatility, although these are of course all closely related.

prices do reflect opportunity cost and (b) monetary prices of all other goods, services and factor of production are constant. The first proviso requires the estimation and use of shadow prices to take account of economic rather than financial opportunity costs in imperfect markets, while the second proviso requires the calculation and use of price indices and 'real' rather than nominal prices to take account of changes in the value of money with (most commonly) inflation.

The use of price indices is, however, problematic when different goods, services and factors of production experience different monetary price movements and at the same time different stakeholders face different opportunity costs for food.   Thus reporting changes in real prices for rich and poor consumers with different expenditure baskets and incomes requires different indices (Dorward, 2011). Similarly, analysis of the impacts of high food prices should consider how changes in nominal monetary food prices may affect changes in the opportunity cost of food relative to different goods, services and factors of production that are important to different consumers and producers.

The application of standard microeconomic theory in basic analysis of the impact of price changes on consumers involves the maximisation of utility or welfare from purchase and consumption of goods and services, subject to a budget or income constraint (for example Timmer et al., 1983). An increase in the price of a good has two effects. The 'substitution effect' involves reduction in purchase and consumption of the good whose price has increased, with its substitution by increased purchase and consumption of competitive goods and services which are now relatively cheaper.[3] The 'income effect' arises because the increase in the price of a good causes an increase in the total cost of purchases, leading to an effective fall in real income and exerting a downward pressure on the purchase and consumption of all goods and services, with a fall in consumer welfare. The relative balance between the substitution and income effects depends upon the expenditure share of the good or service affected by the price rise, and the marginal utilities of different goods and services, with these in turn affected by incomes: poorer consumers spend a greater proportion of their income on basic foods which give them higher marginal utilities. Increases in the price of food then lead to larger proportionate falls in real income and in utility or welfare for poorer consumers.

Again following standard microeconomic theory as in Timmer et al., 1983, the impact of price changes on producers' decisions can be analysed in terms of decisions about (a) resource allocations between production of competing products and (b) varying input use with varying product price. Decisions about resource allocations between competing products again involve a substitution effect, in this case production of the good whose price and profitability has increased will substitute for production of competitive products which are now relatively cheaper and less profitable. Decisions about input use also involve a 'profit effect' (Singh et al., 1986) . Profits are maximised by setting input use and associated production at the point where marginal revenue (or marginal revenue product) is equal to marginal cost (or marginal factor cost). An increase in the price of a product leads to an increase in marginal revenue (or marginal revenue product) and hence to an increase in input use.

The important point to note from this discussion of consumer and producer responses to price changes is that the price of one good, a staple food in our example, is defined for consumers relative to (a) prices of other goods and services they purchase and (b) the consumer's budget or income, while for producers it is defined relative to (c) prices of other goods and services that might be produced, and (d) the price(s) of production inputs (including wages for labour) – and we should also

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[3] This is the case with 'normal goods'. For Giffen goods the 'income effect' may lead to an increase in consumption following a price increase (Jensen and Miller, 2008).

note (e) prices of goods and services they purchase as consumers. In a situation where there are multiple changes of price in an economy, there are therefore four different sets of prices against which a change in food price may be measured. Although each of these is valid as a measure of food price change, it suggests that when reporting food prices changes either all of these different measures should be reported, or the most salient ones should be reported, depending on their importance to different stakeholders.

We may extend this analysis to consider two types of links between production and consumption: first between production and consumption decisions and activities within farm households, second between separate producers and consumers through market interactions.

Links within households can be considered by explicit modelling of their integration in sometimes complex farm household models, and this is the focus of a large literature following Singh et al., 1986. A more intuitive approach, as followed by Deaton, 1989, is to distinguish between surplus and deficit producers, or net food sellers and net food buyers, with these differing from 'pure producers' and 'pure consumers' as regards (a) only a proportion of production or consumption going to or coming from the market and directly affected by the profit and income effects and (b) the possibility of switches between net production and consumption or surplus and deficit production in response to changes in prices or other variables.

Links between separate producers and consumers through market interactions can be investigated through partial and general equilibrium analysis, and are considered in an extensive literature on linkages and multipliers (see for example Christiaensen et al., 2011; Delgado et al., 1998; Dorward et al., 2003; Haggblade et al., 1989; Haggblade et al., 2007).

For net buyers, high food prices lead to a fall in real incomes, and this depresses non-food expenditures. The extent to which reduced non-food expenditures then depress the incomes of local suppliers of these goods and services (through consumption linkages) and thus further depress the incomes of employees in the non-food sector will depend upon
  (a) the relative importance of poorer and less poor consumers,
  (b) impacts on different consumers' expenditures on different goods and services (depending on their income elasticities of demand), and
  (c) the relative importance and supply elasticities of imported and locally produced goods and services.

For net sellers, a rise in food prices should lead to
  (a) increased expenditures on non-food goods and services through consumption linkages resulting from increased income, and
  (b) an increase in demand for and prices paid for factors of production, notably land and labour, with price changes potentially damping the benefits of sales price increases (Deaton, 1989).

The extent of (a) will again depend upon the relative importance and supply elasticities of imported and locally produced goods and services, while the extent of (b) will depend upon the nature of producers' supply responses.[4] There is considerable debate about the extent to which this may lead to increases in wages for poor rural labourers (see for example Dawe et al., 2010, for discussion of different estimates of this in rice economies).

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[4] It may also be affected by exogenous increases in prices of inputs, such as seeds and fertilisers. FAO, 2011, show that such changes are likely to have relatively small effects on increased profitability of food production as compared with the effects of higher food prices. There may, however, be important dampeners on the affordability of input use if farmers face seasonal capital constraints (for example Dorward and Poulton 2008)

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This can be investigated with standard microeconomic analysis of marginal value product and marginal factor cost. An increase in the price of output (food) leads to an increase in the use of labour and other factors with diminishing marginal returns. As this occurs across an economy it will push up wages in money terms. The extent of the increase in labour demand and in wage rates will depend upon

    a) the extent of diminishing marginal returns in labour use in food production (and this depends upon the technology in use and initial labour use) and

    b) the elasticity of supply of labour to food production (which depends upon the returns to alternative uses of labour, on elasticity of substitution across and between different labour uses, and on the elasticity of total supply).

However, unless there is some form of technical change that raises labour's marginal product (MPP) then

    (a) the physical productivity of labour in food production must be lower after the price rise than it was before the price rise (due to diminishing marginal returns) and therefore

    (b) real wages relative to food prices (or wage: food price ratio) must also be lower after the food price rise (since at equilibrium the wage = MVP).

Higher real wages and falling poverty are, however, possible, if there is also simultaneous technical change that both increases the marginal physical product of labour in food production and increases labour demand ('labour demanding' technical change). It is also possible that labour incomes may rise even if wages fall somewhat, if the increase in labour demand is greater than the fall in real wages (that is if there is low rate of diminishing marginal return from labour use) and wage rates are higher than the opportunity cost of labour for rural labourers.

Since both the direct and indirect effects of higher food prices depress the real incomes and welfare of net buyers, a positive effect of food price rises on poverty reduction requires larger stimulating effects from large numbers of net sellers who

    (a) raise production by investing in technical change with an overall increase in labour demand *and/or*

    (b) raise production by increasing total payments earnings to labourers with very low opportunity cost for their labour *and/or*

    (c) gain significant extra incomes that generate positive upstream and consumption linkages that in turn raise rural labour demand and wages.

Where there are significant numbers of less poor farmers who are net sellers of food able to access capital to increase investment in response to higher food prices, then it is likely that these conditions will apply. They will not apply, however, where the number of such net sellers is low. This will be the case in largely urban economies and in poor rural areas with large numbers of deficit producers (net buyers) with limited access to capital. Dorward, 2012c, shows that for such farmers a rise in food prices can depress production and welfare and increase hiring out (not in) of labour, posing challenges to achievement of the conditions listed above for positive effects of food prices rises on poverty reduction.

This analysis is summarised in table 1 which shows the impacts of food price increases on different categories of people depending upon their food production and the scale of their surplus sales into the market or deficit purchases from the market and (for producers) their access to capital to invest in production in response to higher prices. For net sellers without access to capital a distinction is made between short term impacts during a season when price rises occur and response to higher prices may be inhibited by lack of capital, and medium term impacts   in the following season when

higher incomes in season 1 may provide some capital for investment. Note that net buyers with small deficits and access to capital and/ or land may be able to increase production and shift from deficit to surplus production (that is from being net buyers to net sellers). The impact on consumers also depends upon their wealth and the relative importance of food expenditures in their overall expenditure budgets, as discussed earlier.

Table 1 Impacts of food price increases on surplus producers, deficit producers and consumers with or without access to seasonal capital

		Sufficient access to capital				Insufficient access to capital							
		Product-ion	Real income	Labour demand	Labour supply	Product-ion		Real income		Labour demand		Labour supply	
Time period						1	2	1	2	1	2	1	2
Net sellers	Large surplus	+++	+++	+++	na	=	++	++	+++	=	++	na	na
	Small surplus	++	++	++	na	=	+	+	++	=	+	na	Na
Net buyers	Small deficit	+	...	...	...	=	-	-	-	-	-	+	+
	Large deficit	+	-	na	+	-	-	--	--	na	na	+	+
Pure consumers		na	---	na	++	Na	na	--	--	na	na	++	++

Key: time period   1: short term, within season;   2: medium term, following seasons
          + /+++ : small / large increase   - / --- : small / large decrease   large/small refer to deficit/surplus
          … :   indeterminate   na :   not applicable

The overall effect of food price increases on real incomes and particularly on the real incomes of the poor (who spend around 50% or more on food) therefore depends upon (a) the relative importance of surplus food producers (net sellers) in an economy relative to deficit producers (net buyers) and 'pure consumers', and (b) the extent to which farmers are able to access capital for investment in increased hired labour and in inputs (such as seed and fertiliser) for labour demanding technical change. It will also depend upon the extent to which higher food prices outside the economy (or in other parts of the economy) are transmitted to them, and upon net sellers' confidence in the stability of price rises (their expectation that increased investment will be justified by sustained high prices).

This is summarised in figure 1, which sets out the features of an economy that are likely to yield positive or negative income and poverty impacts in response to exogenously induced increases in food prices.

We conclude from this consideration of microeconomic theory that the impacts of high food prices on real incomes and welfare are indeterminate, depending upon the characteristics of producers and consumers and on the structure or balance of the economy. It is therefore an empirical question whether or not increased food prices are beneficial or harmful to the poor in particular situations. We can, however, draw the following broad conclusions:

(a) improved producer access to seasonal capital will, other things being equal, improve the benefits to surplus and deficit producers without harming consumers

(b) more equitable land and income distribution are likely to reduce the negative effects and promote the positive effects of high prices: more equitable land distribution means that benefits to surplus producers should be more widely distributed in the economy (with higher marginal budget shares on non-tradables promoting more positive consumption

linkages[5]) and that production responses are likely to be more labour and less capital intensive (promoting labour demand to benefit land-poor farmers and landless labourers wage incomes); more equitable income distribution among consumers means that there should be fewer very poor consumers, lowering the proportionate effects of food price increases on consumers' real incomes, and consequently their effects on the incidence and depth of poverty.

(c) high price volatility is unhelpful as it reduces the benefits of high prices to surplus producers without providing any benefits to deficit producers or consumers.
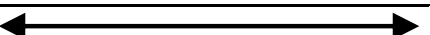
Positive impacts of high food prices: increased real incomes & reduced poverty	← →	Negative impacts of high food prices: reduced real incomes & increased poverty
more access to capital	← →	less access to capital
more surplus producers	← →	more deficit producers
more wealthy consumers	← →	poorer consumers
more wealthy economy	← →	less wealthy economy
falling input (eg fertiliser) prices	← →	rising input (eg fertiliser) prices
low price volatility	← →	high price volatility
Positive or negative impacts are multiplied by strong linkages in the economy (high marginal budget shares on non-tradables with high elasticity of supply and production that is labour and local materials intensive) and dampened by weak linkages in the economy (high marginal budget shares on tradables or on non-tradables with low elasticity of supply and/or production that is capital and import intensive). *Positive or negative impacts are also increased by strong price transmission from external markets and dampened by weak price transmission.*		

Figure 1 Factors influencing likely impacts of exogenous food price increases on incomes, poverty and welfare

Although the analysis of short and medium term microeconomic impacts of food price increases on producer and consumer behaviour and welfare is very valuable, it has to be set in the context of short and medium term macroeconomic impacts of food price increases, to which we now turn.

2.2.   Macroeconomic analysis of food price changes

The macroeconomic impacts of high food prices differ between food importing and food exporting countries (with effects analogous to microeconomic impacts on producers and consumers) and also depend upon prior taxes and subsidies and upon any changes in taxes and subsidies made in response to high prices.

For food importers, high food prices increase import bills (unless demand is highly elastic, which is unlikely), adversely affect the balance of payments and put downward pressure on the domestic currency. This restricts availability of foreign exchange for other imports or leads to a fall in the value of the local currency, raising the local price of imports (leading to a further increase in domestic food prices) with wide ranging impacts in the domestic economy. The opposite effects are experienced by food exporters, unless high food prices are accompanied by increases in the import costs of other

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[5] See for example Delgado et al., 1998

commodities, such as oil and fertilisers.[6] As with the microeconomic analysis, distinctions can be made between rich and poor importers, deficit (importing) producers, and surplus (exporting) producers. Large price food rises can have very serious balance of payments implications for poor food importing countries.

If a country normally imposes taxes or subsidies on food imports or exports, then direct fiscal effects of increases in the price of food depend upon whether a country imports or exports food, and on the nature of the tax or subsidy – is it fixed per tonne of import or export, or is it '*ad valorem*', a fixed proportion of the price. These effects are set out in table 2. In broad terms, a fixed rate tax or subsidy will lead to relatively small fiscal changes due to changes in import or (lagged) export quantities resulting from reduced domestic consumption and increases in supply in response to higher prices. The size of these changes depends upon demand elasticities and, for suppliers, expectations of sustained rather than volatile price changes relative to other crops and the elasticity of supply (affected by producers' ability to reallocate land and other inputs away from existing crops).

The situation is more complex with *ad valorem* taxes and subsidies. For food importers there may be some cancelling out of extra *ad valorem* revenues (with taxes) or costs (with subsidies) from higher prices by lower volumes of demand. The relative importance of these two opposing rate and volume influences depends upon the elasticity of demand for the imported food, with relatively inelastic demand for food staples making demand relatively insensitive to price (damping the volume effect). For food exporters the volume and rate influences reinforce each other as higher prices stimulate higher volumes of exports as well as higher ad valorem revenues or costs per unit export.

Table 2 Fiscal impacts of food price increases on existing import or export taxes or subsidies

	Fixed rate tax/ subsidy		*Ad valorem* tax/ subsidy	
	Tax	Subsidy	Tax	Subsidy
Importing country	Some reduction in tax income if increased price reduces demand	Some reduction in subsidy cost if increased price reduces demand	Increase in tax income per tonne imported but some reduction in imports	Increase in subsidy per tonne imported but some reduction in imports
Exporting country	Some increase in tax income if increased price increases supply	Some increase in subsidy cost if increased price increases supply	Increase in tax income per tonne exported and also in tonnes exported	Increase in subsidy cost per tonne exported and also in tonnes exported

The situation is complicated by domestic pressures for governments to respond to higher food prices with measures that will reduce consumer prices. For importing countries this will involve cuts in import taxes or increases in import subsidies. These will be doubly expensive as there will be a higher cost per unit import as well as some stimulus to demand (that is part of their purpose), cancelling out some of the 'savings' noted in table 2. General import subsidies on food can be extremely expensive, with very high opportunity costs in terms of other government investments foregone (for example in roads or agricultural research) and can be very difficult to withdraw, even if food prices fall again. Targeting of subsidies or cash transfers to the poor and vulnerable may therefore be preferred to general subsidies (FAO, 2011). Exporting countries may increase export tariffs or impose export restrictions, reducing the benefits of high prices to producers (and incentives

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[6] This raises again questions about how food prices are defined, what they are measured against – incomes of (different) consumers, prices of other goods and services purchased by (different) consumers, production inputs, or alternative products.

to increase production) and pushing up world prices if this is practiced by countries responsible for substantial shares of global exports.

If high international food prices are transmitted to consumers then inflationary pressures will be experienced by both exporting and importing countries. This is likely to affect income distribution between and costs for different sectors and social groups, and affect foreign exchange rates, interest rates and other macroeconomic variables. Direct inflationary pressures may be avoided if governments use subsidies or taxes to offset domestic price increases, but increased subsidies in importing countries may put pressure on government finances and macro-economic management.

An important longer term benefit from high prices, however, is the stimulus they provide for policy attention and both private and public investment to increasing agricultural productivity. Low food prices are commonly cited as a cause of reduced investment in agricultural research, contributing to the slow-down in agricultural productivity growth from the mid 1990s (for example Piesse and Thirtle, 2009, Timmer, 2010). However the returns to this in lowering long term food prices offer cold comfort to those suffering from the more immediate adverse effects of high food prices and, as Dorward, 2012a , argues there are other long term development costs where food prices are high relative to incomes.

3.   Empirical evidence on impacts of recent food price changes

Having considered theoretical insights into the impacts of food price changes on different producers and consumers, we now consider empirical evidence of the impacts of recent prices changes, with a particular focus on impact on poorer producers and consumers.

3.1.   Recent food price changes

We begin by examining how food prices have changed in the last few years. Microeconomic theory discussed earlier suggests that we should examine food price changes for consumers and producers in four different ways, relative to:

   (a) the prices of other products that consumers buy,
   (b) consumer incomes,
   (c) the prices of other products farmers can produce, and
   (d) the prices of farm inputs.

Figure 2 shows the World Bank international grain price index [7] from 2005 to 2010 or 2011 using price measures attempting to represent each of these perspectives.

Figure 2(a) presents changes in nominal international grain prices and prices deflated by the US CPI. This provides a measure of changes in real prices relative to the prices of goods and services in the expenditure baskets of US consumers – a wealthy population by global standards. Both the nominal and CPI deflated prices show increases from 2005, with two spikes, in 2008 and 2010/11, with nominal prices rising more than deflated prices, as expected. Grain price deflated by GDP per capita (figure 2(b)) provides a measure of changes in real prices relative to mean incomes, but does not allow for differential income effects on rich and poor consumers (Dorward, 2011. This shows only

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[7] International grain prices are summarised using the World Bank Development Prospects Group 'cereals' price index. This hides considerable diversity in shorter term price fluctuations between maize, wheat and rice, but shows well the broad patterns which are common to all the main grains.

the 2008 spike (GDP per capita data were not available for 2011 at the time of writing, and the annual average for 2010 masks the increases in grain prices in late 2010).
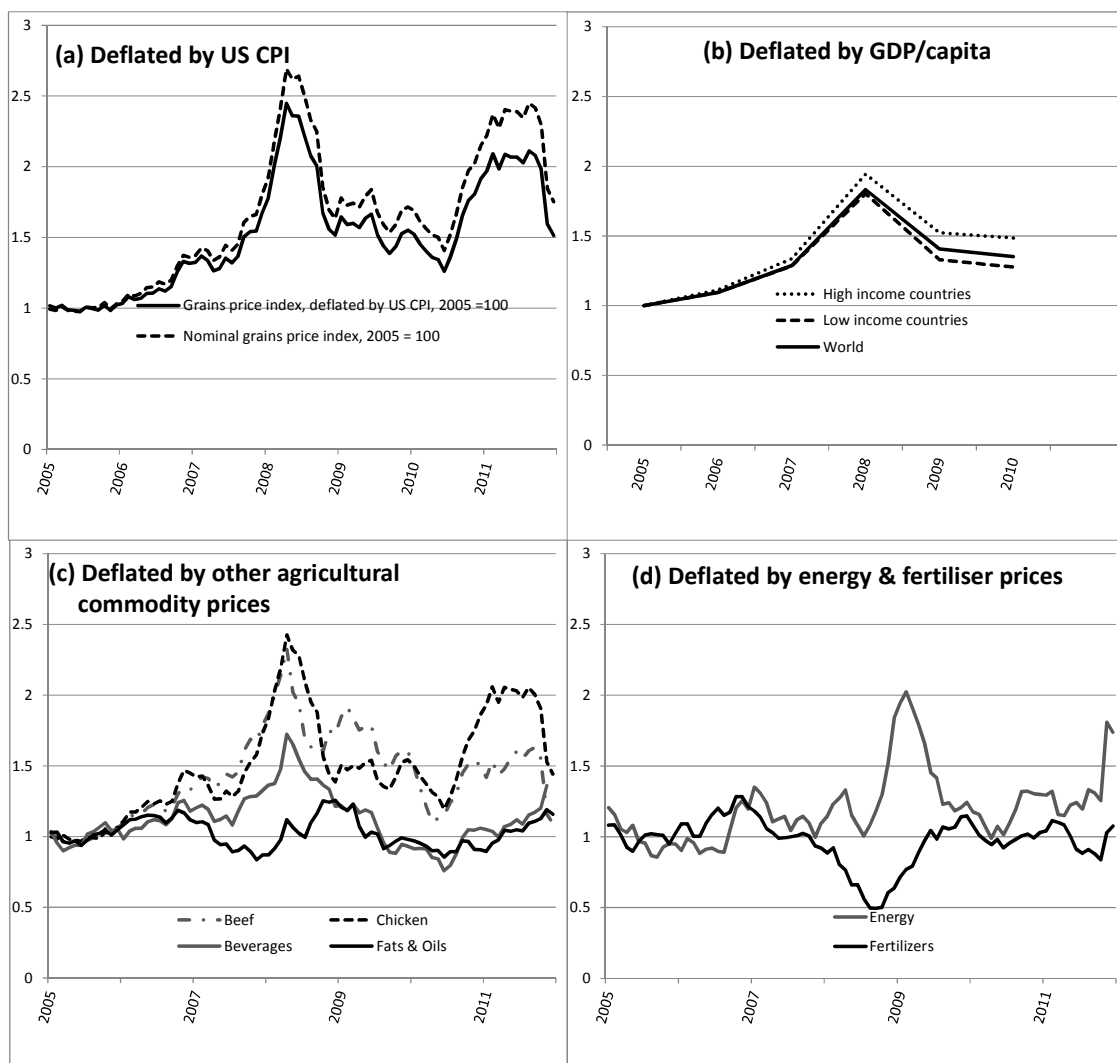

Figure 2 Indexed grain prices 2005-2011 (2005 = 100)

Sources: Sources: World Bank, 2012, Bureau of Labor Statistics, 2012

For measures of price changes more relevant to grain producers' decisions (though not necessarily to their relative incomes), Figure 2(c) shows international grain prices deflated by the prices of other agricultural commodities that farmers might produce, although this provides only limited information about different commodities' relative profitability (as the extent to which different commodities offer alternatives to farmers depends upon agroecology and market access, while beef and chicken production also use grain as an input). Grain prices deflated by chicken prices show a similar pattern to nominal and CPI deflated prices, while against beef they remained higher after the first spike and do not show a second spike. Against beverages they have a smaller first spike and fell back more before rising later in 2011 for the second spike, while grain prices against fats and oils show later and smaller rises and no upward trend. When deflated by oil prices in figure 2(d), grain prices again show two spikes, but again these are later than the spikes in nominal or CPI deflated

prices, and they are closer to 2005 levels between spikes.[8] Grain prices deflated by fertiliser prices show a completely different pattern, however, falling dramatically in 2008, due to a very high spike in fertiliser prices, before returning to 2005 levels. Since labour is a major input in grain production (although with varying cost shares in production in rich and poor countries), figure 2(b) provides another perspective on recent changes in real grain prices for producers.

Taken together, the different international grain price patterns in figure 2 show that nominal price changes over the last six years or so lead to a broadly common pattern of changes in real prices for consumers when measured relative to other prices faced by wealthy consumers and relative to average consumer incomes. Changes in real prices faced by producers do not show such a consistent pattern, however, with different patterns of change where nominal prices are deflated against other agricultural commodities and against different inputs. Furthermore, figures 2(a) and (b) give no information about differences in severity of the price increases faced by richer and poorer consumers: this would require calculation of food price changes deflated first by the different consumer prices indices of rich and poor people, and second by income available for non-food expenditures (Dorward, 2011, 2012a).[9] Similarly changes in real prices relative to different inputs shown in figures 2(b) and (d) take no account of the cost shares and hence importance of relative price changes to producers, nor of the effects of variation in input cost shares between, for example, large and small scale producers.

Two further points need to be made about this discussion. First, the changes in international prices shown in figure 2 may not represent changes in prices for consumers and producers in different countries, as these may be affected by taxes and subsidies and/or be relatively isolated from world prices due to import or export tariffs or (for grain prices) by transport costs. Changes in global GDP per capita clearly do not represent changes in income for different groups, due to differences in economic performance between countries and differences in incomes between groups within countries. Second, producers may be affected by subsidies and by changes in subsidies that affect the relative profitability of producing different commodities. A particular issue here are changes in grain production subsides in the US and EU, and subsidies for ethanol production from maize in the US and for biodiesel production from oilseeds in the EU.

Overall, therefore, the overwhelming conclusion from this examination of recent grain price changes is that changes in real prices for different producers and consumers have been much more varied and complex than is suggested by simple, standard analysis and discussion using real prices relative to the US CPI or other internationally cited price index. While many measures show increases from 2005, with two spikes, in 2008 and 2010/11, this is not universal, and there is substantial variation in the scale of these increases and spikes between measure that should be applied to different consumers and producers.

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[8] This relationship needs to be examined in the context of evidence of long run relationship between oil prices and grain prices, with increasing influence of oil prices on grain prices in recent years (Arshad and Hameed, 2009, Baffes, 2011). Furthermore, there are multiple relationships between oil and food and hence oil and food prices, with oil both an input in grain production, and an output from grain and other agricultural production (in the sense that increasing amounts of maize, sugar and oilseeds are used for ethanol production). Oil prices also have important effects on consumer prices for non-food expenditure on transport and power.

[9] This is complicated by the increasing correlation between food and fuel prices noted above, as this means that consumers will often face correlated price changes in both their food and non-food expenditures.

3.2.   Empirical evidence and debates on the welfare impacts of recent food price changes

Having considered basic theory on the short and medium impacts of changing food prices on consumers and producers and on different perspectives on changes in food prices from 2005 to 2011, we now briefly review some of the empirical evidence of these impacts. We draw on two types of 'empirical evidence' found in the literature: studies of changes that people have experienced in their livelihoods and welfare in the context of food price increases, and simulations that model the effects of food prices changes on people's livelihoods and welfare.

There are relatively few studies that attempt to directly measure the effects of food prices changes on people's livelihoods and welfare. Compton et al., 2010, provide a valuable review of studies up to 2010. They find that "high food prices increased malnutrition (especially in young children) and poverty", particularly in rural areas, with the greatest poverty impact from increasing depth of poverty among those who were already poor, rather than from increases in the poverty headcount. Poverty increased in some exporting countries (for example Thailand) as well as importing countries, with local influences on prices often critical. The poorest households (including many female-headed households and those with a large proportion of dependents) were the worst affected, particularly rural and urban casual wage labourers, land-poor farmers, petty traders, and producers of commodities which experienced worsening terms of trade against food grains. The paper's focus was on negative rather than positive impacts of food price rises. Nevertheless they note variability in impacts with some who gained from higher food prices: better off farmers able to benefit from rapidly-rising prices (a minority) and those with loans to repay (if inflation led to falling real values of loan repayments). Although for the studies reviewed there may not have been enough time for wages to rise in response to higher food prices, the studies did not suggest an economic environment putting upward pressure on wages.

The findings of more recent studies generally support these earlier conclusions (for example D'Souza and Joliffe, 2010; de Brauw, 2011; Hella et al., 2011; Hossain and Green, 2011; Kumar and Quisumbing, 2011; Lu and Yu, 2011; Perez et al., 2011; Santoalla, 2011; Smale et al., 2011; Sophal, 2011; Ticci, 2011; Helen Keller International, 2011; Heltberg et al., 2012). An important additional point is that the impacts of food price rises are critically affected by their timing relative to seasonality (as it affects prices, wages, livelihood opportunities, food stocks, etc) and relative to other changes in the economy (for example changes in other commodity prices, in livelihood opportunities other sectors) and by spatial variables (for example Hella et al., 2011; Perez et al., 2011). These findings are also supported by earlier studies of effects of high rice prices, such as Block et al., 2004, which found increased malnutrition rates as a result of the impacts of the Asian crisis in Indonesia[10], and Torlesse et al., 2003, which found a negative correlation between rice prices and nutritional status in Bangladesh.

There are substantial difficulties in obtaining robust assessments of food price impacts on people's welfare from these field studies as they vary as regards the quality of data used and of analysis, the representativeness of samples within each study, the representativeness of the studies as a whole (for example internationally across countries and across livelihood categories), and the attribution of observed changes in welfare to the effects of food prices (it is for example very difficult to disentangle the effects of food price impacts from the effects of price increases in fuels and other commodities). Compton et al., 2010, are aware of this and in a useful summary table set out their

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[10] See also Headey et al., 2012, who report spatial variability in results from different studies and note that an increase in rice prices may reduce consumption of important micro-nutrients but not of calories as households reallocated spending from a more diverse diet in order to maintain calorie consumption

judgements on both the quality and pervasiveness of the evidence behind their conclusions. Nevertheless this is still an issue.

Headey, 2011, takes a different approach to examine welfare changes, using results from the Gallup World Poll (GWP) conducted before, during, and after the 2007/08 crisis. He finds statistical evidence that food inflation led to an increase in global self-reported food insecurity while economic growth led to a reduction in this. Overall, global self-reported food insecurity fell over the period 2005 to 2008 as the benefits of economic growth outweighed the problems posed by high food prices. There was, however, significant variation across countries in the balance between economic growth and food price changes, and hence in net changes in self-reported food insecurity. The global fall in self-reported food insecurity is driven by limited domestic food price increases (due to export controls) and rapid growth in China and India and their very large populations. Sensitivity analysis suggests that these findings appear to be robust to questioning of data quality and assumptions in the GWP data and its analysis.

Verpoorten et al., 2012 report a similar study using 2005 and 2008 Afrobarometer data from 18 countries. Using cross sectional data from over 50,000 individuals they examine relationships between international grain prices and self-reported food security measures similar to those analysed by Headey from the Gallup World Poll. From 2005 to 2008 there was a small increase in the incidence of self-reported food insecurity but a small decrease in its depth, although more than 50% of respondents still reported some food shortage in the previous 12 months. The incidence of self-reported food insecurity increased in net food exporting countries and decreased in net food importing countries and, like Headey, they found increases in food insecurity in countries with low economic growth, and decreases in countries with higher growth. They also found increases in food insecurity to be greater among urban, educated and female headed households than among rural, less educated and male headed households. No information is available about the nature and extent of differential effects of food price increases on net food buyers and sellers in rural areas.

The finding of relatively small changes in food insecurity in SSA countries from 2005 to 2008, and the correlation of poor economic growth with larger increases in food insecurity, are of considerable interest and are consistent with Headey, 2011. However, as the authors note, in other ways their findings raise more questions than they answer. In particular, significant questions are raised by the absence of any analysis of food security variables against domestic (as opposed to international) food price changes, possible definitions of 'food' in the calculation of net food imports and exports, possible inconsistencies in reported food security by more and less educated households, higher food insecurity in countries with higher GDP growth, and possible country sample bias (with sampled countries having lower food imports and conflict and higher GDP growth than other SSA countries). It is therefore very difficult to draw any conclusions about the relationships between food insecurity and local food prices.

The set of findings reported above are generally supportive of core findings of both international and national models or simulations regarding the nature of food price impacts on welfare, though, with possible allowance for the counteractive effects of economic growth, there is less agreement on the scale of these impacts. However the relatively narrow focus of Headey, 2011 and Verpoorten et al., 2012 on food insecurity may also under-estimate the negative impacts of high food prices on poorer households which make substantial sacrifice in other expenditures, working patterns or food quality in order to maintain the frequency and size of meals.

Within simulation studies, Headey, 2011, distinguishes between 'hunger estimates' (largely based on national-level food availability data), and 'poverty estimates' (largely based on Living Standards Measurement Study surveys)' (p4). Robles and Torero, 2010, in a discussion of models of food price

impacts, divide studies along two dimensions – the extent of disaggregation (between sectors, household types and households) and the extent of responsiveness in models (from static to partial equilibrium to static general equilibrium to dynamic general equilibrium). There are few models that fall in the lower and lower right half of their table and therefore few models that explore both micro- and macro- economic impacts and, importantly their interactions.[11]

Both these classifications are useful. Models based on 'hunger estimates' and 'poverty estimates' generally yield similar results, with most of them predicting large increases in global food insecurity, hunger and poverty as a result of high food prices in 2007/8 (for example de Hoyos and Medvedev, 2009, Ivanic and Martin, 2008, Tiwari and Zaman, 2010). Major findings are that both the urban and rural poor suffer (the latter due to the large numbers of net food buyers, for example representing 50% or more of farmers in many African countries (Barrett, 2008)), that partial equilibrium wage effects reduce these impacts slightly, and that there are large differences between countries. Most of these estimates are derived from aggregation of individual country simulations. More country studies tend to support these conclusions on the impact of high prices on welfare (for example Robles and Torero, 2010; Robles and Keefe, 2011; T. W. Hertel et al., 2007; Klytchnikova and Diop, 2010; Zezza et al., 2009). However there are also differences and contradictions –for example in contrast to Ivanic and Martin, 2008, McCulloch and Grover, 2010 report relatively few food deficit households in rural Zambia and a net reduction in poverty among rural households. Mason et al., 2011, report that the staple food purchasing power of urban consumers in Kenya and Zambia was reduced by high food prices but in Zambia this was still higher than at any time from 1994 to 2003, and in Kenya was comparable to that between 2000 and 2005 or lower than at any time since 1994, depending on measures used.

Ivanic and Martin, 2008, introduce a partial equilibrium analysis to investigate the second round effects of higher food prices on wages (postulating a positive relationship), and find limited effects, leading to small reduction in estimated increases in poverty incidence as a result of food price increases. Similar findings are reported by Isik-Dikmelik, 2010, in Vietnam. However Aksoy and Hoekman, 2010b, reviewing a set of studies, paradoxically including Isik-Dikmelik, 2010, argue that 'the studies in this book suggest that higher prices for food and cash crops can also be beneficial for many poor rural households' as a result of second order effects and 'the evidence—admittedly partial and incomplete—suggests …. that sustained higher prices need not be detrimental for poverty alleviation in developing countries'. Matthews, 2011, goes further in a review of Aksoy and Hoekman, 2010a, concluding that 'the case studies make a powerful case for the likely importance of these indirect (multiplier or linkage) effects'. It is unfortunate that the basis for generalising these conclusions to the effects of staple food price increases is very weak. Of the country studies examining the impacts of food price rises, two report on the effects of cash crops (sugar and coffee) not staples, one from Bangladesh reports on the effects of low prices, and the conclusions from Vietnam ignore the possible confounding effects of productivity gains from liberalisation alongside rice price increases.[12] This leaves valid and relevant evidence from only one study, on Mexico. None of the studies examine the effects of staple food price rises in poorer rural economies in Sub Saharan Africa.

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[11] We focus below on more microeconomic studies but note that a variety of macroeconomic impacts have been observed, very much as discussed earlier in section 2.2 (for example Dia Kamgnia, 2011)

[12] However Minot and Goletti, 1998, modelling the effect of liberalisation on rice prices, estimates slight reductions in the incidence and severity of poverty for two reasons: net sellers of rice are more common among the poor, and poor households which make small net purchases may either be able to increase production and switch from deficit to surplus producers or benefit from higher increases in producer prices as compared with consumer prices.

Beneficial second round impacts are, however, dependent on producers showing a positive supply response to price changes. Robles and Keefe, 2011, note that second round effects of food price rises are likely to be small in Guatemala due to credit and input constraints, while Cadot et al., 2010 comment that 'the feeble response of poor farmers to price signals is an old observation in development economics' and note that De Janvry et al., 1991, have demonstrated that this is consistent with quantity constraints or "missing markets". Dorward, 2004, with a detailed partial equilibrium model of interactions between different farm-households in the informal rural economy in Malawi, finds non-linear impacts of rising maize prices on wages, poverty incidence and real incomes of some of the poor. This is due to changing relative importance of high prices' pressure on poor households' seasonal capital constraints (increasing labour supply and depressing wages) as against opportunities for less poor households to increase agricultural and non-agricultural labour demand (exerting upward pressure on wages).

This discussion of differing conclusions from the studies reported in Aksoy and Hoekman, 2010a, highlights a number of reasons for difficulties with different studies' findings about the reported impacts of high food prices.[13] These may be classified into five main categories:

(a) Country selection from which implicit or explicit generalisations are made
(b) Commodity selection (for example impacts of changes in staple or non-staple food crop prices will differ, but this is not always made clear)
(c) The extent of price increases considered, and the extent of price transmission from international to domestic markets (which is highly variable, see for example Minot, 2010)
(d) The allowance for and separation of food price increases from other changes (such as non-food price increases, tariff removals or wider economic growth), with model results often presenting the *ceteris paribus* effects of food price changes (that is in the absence of other changes, such as economic growth) whereas changes in people's actual circumstances are of course affected by these other changes
(e) The validity of model specifications in simulations as regards, for example, elasticities of supply, partial and general equilibrium linkages, and the extent and effects of seasonal capital constraints on farm household options. Model specifications and structures are often based on very pragmatic considerations of data availability and tractability in parameter estimation and model structures, and consequently may not adequately reflect real conditions.

Many of these difficulties are particularly applicable to simulations studies, but the results of all the studies reviewed in this section should be interpreted with great caution.

4.   Conclusions

This paper has examined microeconomic and to a lesser extent macroeconomic theory and empirical literature on the impacts of higher staple food prices on food security, poverty reduction, and wider economic growth and development.

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[13] A number of commentators (for example Rodrik, 2007, and Rodrik, 2008) have commented on apparent contradictions between simulations reporting benefits for the poor from liberalisation of agricultural policies (leading to increases in world food prices) and apparently similar simulations reporting welfare losses for the poor from high food prices. T.W. Hertel and Martin, 2008 explain that there is no contradiction: their liberalisation simulations show welfare losses to the poor from high food prices following reductions in rich country domestic support and export subsidies (consistent with later simulations of the effects of high food prices), but these are outweighed by benefits to the poor from reductions in rich and poor country agricultural tariffs. Rodrik, 2008, also notes the effects of sample selection.

Theory and empirical evidence on the short and medium term impacts of food price increases on different producers and consumers are broadly complementary and consistent, with a high degree of variability in impacts, as summarised in figure 1. It appears that in broad terms

(a) staple food price increases have had very serious effects on the poor in national or local economies which have experienced high food price shocks without broad based growth processes, with poor net buyers of food, in both rural and urban communities, most negatively affected.

(b) impacts are affected by changes in food prices relative to the prices of different commodities and incomes important to poor and less poor producers and consumers

(c) there are weak theoretical grounds and empirical evidence for second order benefits from high staple food prices in poor rural economies

(d) short term impacts are serious but can be ameliorated by economic growth and, for international food price increases, by limited price transmission, so that food price rises have had a lower impact on global poverty and hunger and malnourishment than hunger simulations and early poverty simulations might suggest, due to lower price transmission and the counteraction of economic growth, most notably in India and China, but also in sub Saharan Africa

(e) findings that the effect of food price rises have not been accompanied by such bad global increases in poverty incidence and food insecurity as initially estimated should not detract from the very serious impacts they have had for very large numbers of very poor people in poor countries (on the depth of poverty as well as its incidence), or from the need for policies and action to address this

These conclusions support national and international concern about the short term negative effects of food price spikes and pursuit of policies and investments to prevent and mitigate the effects of food price spikes. These arguments are strengthened by consideration of (a) the detrimental effects of food price volatility (see for example FAO, 2011) and (b) the long term effects of high food prices – on the welfare and productive potential of neo-natals and young children affected by malnutrition (World Bank, 2006) and on processes of wider economic growth and development (Dorward, 2012b). They also support calls for better measures of the effects of food prices on the welfare of poor people (Headey et al., 2012; Dorward, 2012b).

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