Literature review of impacts of food price volatility on consumers in developed and developing countries

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ULYSSES project assess the literature on prices volatility of food, feed and non-food commodities. It attempt to determine the causes of markets' volatility, identifying the drivers and factors causing markets volatility. Projections for supply shocks, demand changes and climate change impacts on agricultural production are performed to assess the likelihood of more volatile markets. ULYSSES is concerned also about the impact of markets' volatility in the food supply chain in the EU and in developing countries, analysing traditional and new instruments to manage price risks. It also evaluates impacts on households in the EU and developing countries. Results will help the consortium draw policy-relevant conclusions that help the EU define market management strategies within the CAP after 2013 and inform EU's standing in the international context. The project is coordinated by Universidad Politécnica de Madrid.

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Highlights

For developed countries

- Considerable heterogeneity is found in the price transmission of agricultural commodity price variations to consumer prices both at the Member State and the product level in the EU.

- The impact of higher expenditure devoted to food on the standard of living of consumers in developed countries is limited, given the relatively low share of food in households´ total budget (10-15% on average), but hits particularly the most vulnerable EU households.

- Developed countries have diverse food baskets so consumers can respond to changes in food prices by shifting among foods, potentially affecting the nutritional attributes of diets.

- In 2011, 24.2% of people were at-risk-of-poverty and social exclusion in the EU, and 9.7% of the population could not afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day, reaching the latter 85.5% of the at-risk-of-poverty population in Bulgaria, suggesting that they live in severe food deprivation.

For developing countries

- The poor bear the brunt of volatile food prices because they spend a larger share of their income on food. Volatile food prices can lead to poverty traps, whereby short-term changes have permanent effects on nutritional status and well-being.

- Government policies that are more predictable and that promote private sector participation in trade will decrease price volatility.

- While transmission of world price shocks to domestic markets can be destabilizing, international trade should remain a key element of a food security strategy.

- Investment in agriculture will improve the competitiveness of domestic production and make domestic prices less susceptible to international price shocks.

List of abbreviations

CAP – Common Agricultural Policy

CPI – Consumer price index

DEFRA – Department of Environment, Food and Rural Affairs (United Kingdom)

EC – European Commission

ECB – European Central Bank

EU – European Union

EU-SILC – EU´s Statistics on Income and Living Conditions

FAO – Food and Agriculture Organization of United Nations

GARCH – Generalized Autoregressive Conditional Heteroskedasticity

HICP – Harmonized index of consumer prices

HLPE – High Level Panel of Experts

IFAD – International Fund for Agricultural Development

IFPRI – International Food Policy Research Institute

IMF – International Monetary Fund

LIFDC – Low income food deficit country

MS – Member State (EU)

ODI – Overseas Development Institute

OECD – Organization for Economic Co-operation and Development

PPS – Purchasing Power Standards

UN – United Nations

UNCTAD – United Nations Conference on Trade and Development

UNDP – United Nations Development Programme

USDA-ERS – United States Department of Agriculture-Economic Research Service

VAR – Vector Autoregressive

WFP – World Food Programme

WTO – World Trade Organization

1   Introduction

After many years of relatively stable cereal prices on world agricultural markets, there have been several large price spikes in the past few years. This price volatility has drawn the attention of ordinary citizens, the media, government, and international organizations around the world. France made it an important issue during its leadership of the G-20 in 2011, and several international organizations (FAO, OECD, IFAD, IMF, UNCTAD, WFP, The World Bank, WTO, IFPRI, and the UN High level task force on Global Food Security) collaborated to prepare an inter-agency report for the G-20 on this topic.

Further recent high-profile reports (FAO et al., 2011; HLPE, 2011; Tangerman, 2011) have analyzed various measures to prevent, manage or cope with price volatility. There seems to be a general consensus that, due change and increased linkages between food markets and volatile energy markets, food price volatility is here to stay (Dawe and Timmer, 2012).

Following the rise in the volatility of world agricultural commodity prices in recent years, the variability of food price inflation around the world has also augmented to different degrees. The rise of agricultural commodity prices translates into a rise of food prices at the domestic level, which has an inevitable impact on consumers and households, not only in developing countries but also in the poorest and most vulnerable in developed countries.

The literature suggests that the relationship between world and domestic prices may be weak (McCorriston, 2012). Still, the link among the two is obvious and the impact on consumers depends on the extent to which agricultural commodity prices are passed through to consumer food prices. This transmission is usually incomplete, and limits food price volatility impacts (Gilbert and Morgan, 2010). These authors claim that higher or more volatile prices may cause greater welfare loss to consumers who devote a larger proportion of their income to food. As food price levels rise, the expenditure devoted to other necessities, such as health or education, falls, hitting poor households and increasing the vulnerability of the poorer households.

To date, practically no effort has been made to test whether the proportion of vulnerable households, those at risk of being so or those materially deprived in developed countries has increased by the food crises of 2006/2008 and the rebound of 2011. To what extent increased food prices have reduced households´ living conditions is a still unexplored empirical question.

Given the recent volatility in international markets for the major cereals (rice, wheat and maize), it might make sense for the poor and food insecure in developing countries to rely more on traditional starchy staples (such as cassava, millet, sorghum) for which international markets are much smaller and less integrated with domestic markets.

Finally, food price inflation has been increasing in many countries pushing up consumers´ price indexes, leading to possible second round effects and therefore having possible consequences on the macroeconomy. Evaluating the potential impacts of the rise and volatility of world commodities becomes a fundamental issue to forecast food and general inflation rates.

The objective of this Working Paper is to review the literature on impacts of food price volatility on developed countries and low income food deficit countries' (LIFDCs) consumers and households, price pass-through mechanisms and disposable income.

The paper is organized as follows. In the first part (chapter 2), considerations about the properties and the behavior both of global agricultural commodity prices and consumer food prices are contemplated and their ability to determine the pass-through from commodities to consumer prices. In the second part (chapter 3), the possible impacts both on consumers and households considered in the literature are reviewed.

2   Price transmission

2.1   Price transmission in developed countries

2.1.1   The link between agricultural commodity prices and consumer food prices

The rise in the volatility of world agricultural commodity prices in recent years has been followed by the increase of the variability of food price inflation in developed countries. The rise of agricultural commodity prices translates into a rise of food prices at the domestic level. The literature suggests that the relationship between world commodity prices and domestic prices can be weak (McCorriston, 2012) and that the relationship between world agricultural commodity prices and domestic producer prices appears to be stronger than that between international commodity prices and retail prices in the United Kingdom (UK) (Davidson et al 2011). A similar finding holds for wheat in the UK, France and Poland (Lloyd et al 2012). In addition, and according to these authors, the prices of raw agricultural commodities tend to be more volatile than food retail prices. According to Apergis and Rezitis (2011) higher food prices translate into higher inflation. So the link among the two is obvious and will depend on the process of price transmission in which many factors are involved.

It is well known that price shocks pass through to consumer prices to a given extent (Ferrucci et al 2010). Consumers do not purchase agricultural commodities at world prices (Dewbre et al 2008), but purchase processed consumer products at retail prices. The degree to which both prices are related depends on horizontal and vertical price transmission (Ferrucci et al, 2010; Lloyd et al 2012). The impact on consumers depends on the extent of price pass-through from agricultural commodity prices to retail prices and this transmission is usually not complete limiting the impact of food price volatility (Gilbert and Morgan, 2010).

Horizontal price transmission refers to the co-movement of prices between spatially differentiated markets at the same stage of the supply chain (spatial price transmission) or across different agricultural or non agricultural commodities markets. Non agricultural markets may concern as well other commodities or financial markets (Listorti and Esposti, 2012). The transmission of prices across borders does not require physical flow of goods and services, the flow of price information is sufficient (von Braun and Tadesse, 2012). This relates to the extent to which markets are integrated, and in the case of price transmission from world agricultural commodity prices to food consumer prices to the extent to which world and domestic markets are integrated (Lloyd et al 2011). According to Dewbre et al.

(2008), world to agricultural domestic prices will be completely transmitted only if countries maintain open borders and do not intervene actively in commodity or exchange rate markets.

Second, vertical price transmission refers to the price linkages along the supply chain. These depend on the magnitude, speed and nature of the adjustments which take place along the supply chain to respond to market shocks (Vavra et al 2005).

Commodity raw material is processed to different degrees until it reaches consumers, adding different services (Lloyd et al 2011). Commodities typically make up only a small share of processed food in developed countries, so the volatile or high agricultural commodity prices are expected to be translated into consumer food prices to a lower degree, due to the fact that the share of agricultural raw materials in food production costs is small (European Commission (EC), 2008). The share of the commodity in final consumer food prices is lower, as the extent of processing increases (Dewbre et al 2008). According to these authors agricultural products´ prices represent on average 25-35% of the final price paid by consumers in developed countries. Table 1 shows the share of farm value in consumer prices of food in the UK and the United States (US). There are significant differences between products. While the share of wheat of the price of a white loaf slice accounts for only 11% in the UK, the share of the agricultural value of milk can exceed 50% in the US.

Table 1. Share of farm value in retail prices for food in the UK and the US (%).

	UK[1]	US[2]
Flour, white, all purpose		25
White loaf slice	11	
Cereal and bakery products		7*
MILK		
Whole milk	34	58
Milk and dairy basket		34
Butter		50
Cheddar cheese		34
MEAT		
Beef	53	49.9
Pork	39	33.2
EGGS		
Free range eggs	26	
OILS AND FATS		20*
SUGAR, white		28

Sources: (1) DEFRA: Agriculture in the United Kingdom, Farmers´ share of the value of a basket of food items, 2011. (2) USDA-ERS: Price spreads from farm to consumer (Data for 2011, except * which is for 2009).

According to the International Monetary Fund (IMF) (2008b), domestic production costs play a very important role in the magnitude and speed of the pass-through to retail prices, especially in developed countries. Labour, transportation and retailing costs account for a

large part of production costs, while the share of commodities in production costs may be modest in relation (IMF, 2008b).

Apergis and Rezitis (2011) note that the fact that persistent food price increases will translate into higher inflation can lead to higher wages and inflationary expectations, as well as reduced real consumption, savings and investments, which in turn can contribute to slow down aggregate demand.

2.1.2 Recent developments in food price inflation

Although most of the literature that assesses the impacts of food commodity prices on consumers focuses on international food prices of commodities, these impacts are best measured by changes in the food component of the consumer price index (CPI), which accounts for changes in the prices paid for food products by consumers (Dewbre at al 2008). Heady and Fan (2010) agree on the fact that the food CPI approximates better welfare costs, especially if it is deflated to measure real food price movements.

Yet, Dorward (2011) states that there is a "downward bias in estimated real food-price changes for low-income groups when these are calculated using a CPI calculated for higher-income groups" (p. 650).

Changes in CPIs affect the real purchasing power of consumers and their welfare. The change in the cost of living is defined to know the additional income that consumers will need to compensate changes in prices (Boskin et al 1997). The European harmonized index of consumer prices (HICP) is calculated according to a harmonized approach and a single set of definitions in European Union´s (EU) Member States (MS), making it easier to compare price developments between them. The basket of goods and its weighting are updated regularly based on budget household surveys and other sources, in order to reflect changes in consumer patterns (European Central Bank (ECB), 2012).

Following the 2006/2008 commodities price shocks, core inflation, which excludes food and energy prices, continued to be generally stable in advanced countries, although it increased in the rest of the world (IMF, 2008b).

Busicchia (2013) examines food price fluctuations and developments related to international shocks and how food price inflation is managed in Australia, France and the UK. While food consumer prices did not undergo a sharp rise in these countries, they remained high even though world agricultural commodity prices decreased in 2009. Busicchia (2013) notes that in the EU the rise of international agricultural commodity prices was rapidly followed by rises in

food producer and consumer prices but the easing of international commodity prices did not spill over domestic food producer and consumer prices. Both producer and consumer prices took more time to stabilize (around 6 months for producer prices and one year for consumer prices) and at a higher level (10% higher for consumer prices) (Busicchia, 2013).

In the face of the global rise of food commodity prices, Lloyd et al (2012) review the developments of food price inflation across the EU. These authors note that in OECD countries general inflation volatility begins to rise from the mid-2000´s onwards. When looking at food price inflation - a part of general inflation - in the EU they see that it is higher and more volatile than non-food price inflation. Figure 1 reports overall and food inflation developments in the EU for the period 2000-2011, showing that food inflation volatility is considerably higher than that of overall inflation.

Figure 1. Overall and food inflation developments in the EU
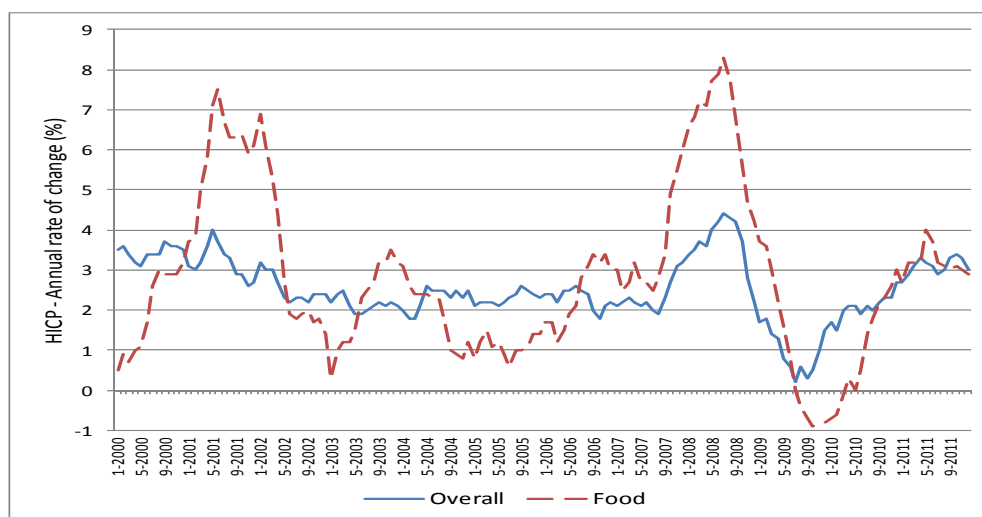
Source: EUROSTAT

According to Lloyd et al (2012), food price inflation has been higher and more variable in the EU than in Japan and tends to be more similar to that of the US. These authors note that changes of food price inflation differ significantly across MS, in level and variability. Most countries experienced high levels and variability of food price inflation from mid-2007 onwards. Many of the recently acceded MS presented also high and volatile food price inflation over the 1990s and 2000s during the transition period, which distinguishes them from the EU-15 MS.

In addition, Bukeviciute et al. (2009) find that there are significant differences between MS both in the magnitude of pass-through of agricultural commodity prices to consumer food

prices and in the transmission of price asymmetries. This may be potentially due to the fact that markets in the EU MS are fragmented.

These differences give rise to important issues, such as the factors which determine the dynamics of food price inflation across different countries (Lloyd et al 2012). In this background, the case of the EU MS needs special attention because even in the context of common trade and agricultural policies and the existence of the single market and common monetary and exchange rate adjustments in some countries (Lloyd et al 2012), as happens in the EU, the EU still presents significant differences between MS. These authors mention as potential reasons for these disparities between MS the following: (a) the relative exposure of the different MS to world shocks, which depends on their reliance on imports; (b) the exchange rate, referring to the currencies used in each MS (whether the MS uses or not the euro); (c) the imperfect pass-through of exchange rate changes; (d) and the nature of price transmission, related to differences across MS in the shares of raw commodities in food costs, market power or market structure.

Larger increases of food price levels occurred in the recently acceded MS after the 2006/2008 commodity price rise (Bukeviciute et al 2009). These may be due not only to the higher levels of wage and price inflation in these countries but also to market conditions and to the greater weight of agricultural commodities in food production costs (Bukeviciute et al 2009). In this sense, and according to these authors, consumers in the more recently acceded MS will be more vulnerable to increases in agricultural commodity prices. Besides, the share of food in household consumption is typically higher in these countries, and so will be the contribution of food price inflation to general inflation.

Food price inflation followed a decreasing trend in practically all MS after peaking in 2008. Following the decline in agricultural prices, in some countries food price inflation adjusted rather quickly while in others it took more time to react (Bukeviciute et al 2009).

2.1.3 Price transmission in the European Union

Historically, world prices of certain commodities largely produced in the EU have been lower and substantially more volatile than those of the EU (Ferrucci et al 2010). According to these authors this can be due to a large extent to the Common Agricultural Policy (CAP), which has traditionally mitigated price transmission of world agricultural commodity shocks into the EU. But no longer does it, due to the sharp rise in world agricultural prices and in certain

occasions to the decrease in guaranteed prices that have occurred in the EU (National Bank of Belgium, 2008).

Different studies have evaluated the pass-through from agricultural commodity prices to food consumer prices in advanced economies, showing a rather weak relationship between both series of prices (see for example IMF, 2008a[1] and IMF, 2008b[2]).

The National Bank of Belgium (2008) studied inflation and price level developments in processed food in Belgium and in the Euro Area, indicating that the food price rises in the second half of 2007 were related to the 2006/2008 increase in agricultural commodity prices but consumer food prices presented a less marked increase than commodities due to the fact that they comprise a small part of consumer prices. Bank's researchers used vector autoregressive models (VAR) (see Sims (1980) for origins of this) to describe the dynamic relationship between firstly, international food commodity prices and EU producer and consumer prices for the product categories which increased their prices at the end of 2007 - milk, cheese and eggs, oils and fats and bread and cereals. And secondly, EU internal market prices and EU producer and consumer prices for the same product categories. They find that the internal market price is the appropriate variable for evaluating developments in processed food prices in Europe instead of the world market price. Using internal market prices rather than commodity prices, they see that the growth in inflation in the milk, cheese and eggs category in Belgium and in the Euro Area is due to the increase in prices of skimmed milk powder on the internal market, which in turn are more responsive to developments in world prices than in the past. In the oils and fats category, the developments of consumer prices in Belgium are due to the higher prices of butter on the internal market. In the Euro Area, inflation of the oils and fats category is lower, as the higher prices of butter are offset by negative contributions from the fall in olive oil prices in the internal market. In the bread and cereals category, the developments of consumer prices in Belgium are due to shocks to the internal market price of wheat, but also to upward shocks concerning producer and consumer prices.

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[1] IMF (2008a) notes that the pass-through from world to domestic food inflation has strengthened in Europe´s advanced economies since the mid-1990s, nevertheless the pass-through to core inflation is small for most countries. According to the author, a possible explanation for the larger pass-through could lie on the reforms that the CAP has undergone. The impact on food price inflation in some of Europe´s emerging countries is larger, estimating that around 10% of the volatility in domestic food prices are due to fluctuations in world food prices.

[2] IMF (2008b) shows that the pass-through from international to domestic food prices and from domestic food prices into core inflation was much higher in emerging economies than in advanced economies and that about one half of the shocks to domestic food prices passes through to core inflation in emerging economies, while less than one quarter passes through in developed countries. This is consistent with the differences in the share of food in consumption baskets and the relative importance in production costs between developed and developing countries.

Ferrucci et al (2010) extends the National Bank of Belgium's analysis and argue that the study of the price pass-through from international to domestic prices in the Euro Area has to take into account the distortions introduced by the CAP, as a way to obtain a statistically significant pass-through. They use VAR models which investigate the relationship between commodity prices, producer prices and consumer prices for different food categories. Ferrucci et al (2010) find that a product specific approach shows important differences in the pass-through for the various food categories. Lastly, when testing the extent to which the sharp increases in retail prices were due to the 2006/2008 rise in agricultural commodity prices, they point out the strong influence of EU agricultural commodity prices on consumer food prices.

Porqueddu and Venditti (2012) analyze the relationship between agricultural commodity prices and consumer food prices in the Euro Area and test whether consumer food prices respond asymmetrically to agricultural commodity prices. They extend the study of Ferrucci et al. by including the analysis of the price pass-through in Germany, Italy and France to test whether there are significant differences in the price pass-through between MS. It differs from the approaches of the studies by National Bank of Belgium and by Ferrucci et al. in that it does not include producer prices. They find that food prices in the Euro Area are affected by commodity prices and emphasize considerable heterogeneity across countries and products. At the country level, consumer food prices are generally more responsive in Germany than in Italy and France. These authors note that a recent study suggests that different features of the distribution sector might play a role in these different patterns between countries (see ECB, 2011). At the product level, oils and fats and milk, cheese and eggs consumer prices respond more strongly to commodity shocks than bread and cereals and coffee, tea and cocoa.

Gabrijelcic et al (2012) assess the extent of pass-through of food commodity prices to consumer food prices in Slovenia using world, EU and Slovenian commodity prices. They show that the shock in food commodity prices in 2010/2011 affected the rise of Slovenian food prices to a larger extent than that of 2007/2008.

Davidson et al (2011) address the issue of modeling other factors that may drive food prices, apart from world and domestic producer prices, using a cointegrated VAR model. They find that the main drivers of UK food inflation are world commodity prices and the dollar/pound exchange rate, while manufacturing costs, unemployment and earnings are less important. Oil prices also affect retail food inflation, but indirectly due to its impact in world agricultural commodity prices. In this case, authors find a link between world commodity prices and retail

prices and show that the effect on domestic food inflation depends on the duration of the shocks on world commodity prices.

Finally, Apergis and Rezitis (2011) assess the behavior of food price volatility and whether the short-run deviations between relative food prices and specific macroeconomic factors have effects on food price volatility in Greece using GARCH and GARCH-X models. The results show that there is a significant effect of the deviations on the volatility of relative food prices, implying greater uncertainty about future prices and market risks. According to these authors, increased food price volatility can reduce the precision of producers´ and consumers´ forecasts of prices and reduce their welfare.

<u>The non-linearities in the transmission of prices</u>

In asymmetric price transmission, the transmission of prices varies according to whether prices are increasing or decreasing (Meyer and von Cramon-Taubadel, 2004). According to Stigler (2011), volatility presents asymmetric behavior because positive or negative shocks can have different impacts on the market. Price increases generate higher volatility than price decreases.

Bukeviciute at al (2009), when studying the pass-through from farm prices to consumer prices in the EU, find that the magnitude of the transmission is similar in the case of a price increase and a price decrease in the Euro Area. But in the recently acceded MS the magnitude of the pass-through of producer to consumer prices is greater when prices rise.

According to the EC (2009), food processors and distributors reacted in a slower and weaker way to the decrease in agricultural commodity prices than to the rise of 2006/2008. This may have had negative effects on the food supply chain, according to the author, because consumers cannot benefit from lower prices and it curtails the recovery of commodity prices due to decreased demand for food products.

Ferrucci et al (2010) hold that another reason for not finding a stronger relationship between world food commodities and consumer prices in the Euro Area, apart from the need to take into account the CAP, is the fact that the pass-through between prices may be non-linear and depend on the sign, size and volatility of the shock. They find that non-linearities are statistically significant, and therefore ought to be considered for in order to measure more accurately the effect of commodity price shocks on consumer prices. The non-linear specifications perform better than the linear specification and result in a higher economic pass-through of variations in commodity prices to consumer prices. The specification that takes into account volatility is preferred for most of the disaggregated products - cereal,

coffee, fats and meat. According to Ferrucci (2012), this may be due to the fact that price uncertainty depends on the specific food product and may not be captured properly by an aggregate approach.

However, Porqueddu and Vendetti (2012) find very little evidence of asymmetries, except for some evidence of asymmetries in the case of milk, cheese and eggs and oils and fats in Germany.

Table 2 displays a selection of the contribution of agricultural commodity prices to food price inflation collected from the literature.

Table 2: Estimated contribution of agricultural commodity prices to food price inflation.

CONTEXT	FINDING(S)	SOURCE
Developing / developed countries	Transmission of world food prices to domestic food prices and from domestic to core inflation much higher in emerging economies (one-half of the shock to domestic prices passes-through to core inflation, in developed economies less than one quarter)	IMF (2008b)
Belgium and Euro Area	"The effects of the food commodity price increase recorded since mid 2007 have been substantial, by historical standards. The main reason is that the CAP no longer smoothes out world market price fluctuations" (p. 10).	National Bank of Belgium (2008)
Euro Area	Cumulated impact of 0.33% on food consumer prices in the fourth quarter after a unit shock to commodity prices in linear specification. Large differences across food items (from 0.01% for sugar to 0.74% for dairy products) Non-linear specifications yield on average higher elasticities, for example: Cumulated impact of 0.35% on food consumer prices in the fourth quarter after a unit shock to commodity prices in the non-linear specification which takes into account the volatility of commodity prices. Large differences across food items (0.24% for cereals, 0.14% for coffee, 0.74% for dairy, 0.22% for fats, 0.31% for meat and 0.00% for sugar).	Ferrucci et al. (2012)
UK	Long-run effect of 10% increase in world agricultural prices associated with 6.34% increase in retail food prices "A 10% increase in world agricultural prices lasting for one month will increase retail food inflation by 0.28% while the same shock lasting for 18 months will increase food price inflation by 2.42%" (p.3)	Davidson et al. (2011)
UK	Long-run effect of 10% change in domestic farmgate prices associated with 3.31% increase for bread prices, 3.77% for meat prices, 2.51% for fruit prices and 4.65% for vegetables prices	Lloyd et al. (2011)
Euro Area, Germany, France and Italy	Cumulated impulse response of 1.5% of food consumer prices to a 10% shock in commodity prices in linear model in Euro Area, 2% in Germany, 1% in Italy and 0.5% in France Cumulated impulse response of 1% of bread and cereals´ consumer prices to a 10% shock in commodity prices in linear model in Euro Area, slightly less than 1% in Germany, 1% in Italy and 0.4% in France Cumulated impulse response of 4% of milk, cheese and eggs´ consumer prices to 10% shock in commodity prices in linear model in Euro Area, 0% in France and Italy and 10% in Germany Cumulated impulse response of 3% of oils and fats´ consumer prices to 10% shock in commodity prices in linear model in Euro Area, 5% in Germany, around 1% in France and not significant in Italy Very little evidence of asymmetries	Porqueddu and Venditti (2012)
Slovenia	A 10% shift in Euro Area commodity prices contributes 1.9% to annual processed food inflation (excluding tobacco) after a year. The same shift in Slovenian commodity prices and world commodity prices contribute 2.1% and 0.7% to processed food price inflation after a year respectively. The contribution of the same shift to unprocessed food inflation is of 2.0%, -0.3% and 0.4% respectively.	Gabrijelcic et al. (2012)

2.2 Price transmission in/to developing countries

2.2.1 Domestic and world food prices over the last crisis

The current food price market situation is historically unprecedented, with several factors converging to make it particularly damaging to people at risk of food insecurity. Several studies focusing on Sub-Saharan Africa have also demonstrated strong negative welfare effects (Arndt et al, 2008; Wodon and Zaman, 2009). First, it overlaps with a food crisis of 2006–08, which pushed the prices of basic staples beyond the reach of millions of poor people. And, although they have retreated from their mid-2008 highs, international food commodity prices remain high and volatile by recent historical standards (Headey, 2008).

FAO et al (2009) notes that the world food crisis of 2006-08 witnessed large increases in the prices of rice, wheat and maize on international markets. In most cases, the surges in international markets led to substantial increases in domestic prices, although there were some countries where domestic prices did not increase. Dawe and Morales-Opazo (2009) calculated that between January 2007 and June 2009, across 139 case studies of staple foods in developing countries, the typical maximum price increase was 38% in real terms (from a specific quarter in one year to the same quarter in the next year). This is a substantial increase for the poor and food insecure, who, in countries such as Bangladesh, Malawi and Tajikistan, often spend 30% of their income on staple foods (ODI, 2008). Thus, at the peak of the crisis, poor consumers who did not produce those staples experienced a decline in real income of approximately 11% (Aksoy et al 2008).

Other studies (see below) have also reached the conclusion that there was substantial transmission of prices volatility from world markets to domestic markets. Minot (2010) found that, while transmission is often weak in normal times, the transmission was stronger during the world food crisis. Robles and Torero (2010) also found strong transmission in four Latin American countries (Guatemala, Honduras, Nicaragua and Peru).

Dawe and Morales-Opazo (2009) concluded that using annual averages, domestic prices (adjusted for inflation) in 2008 were on average 27%, 41% and 26% higher for rice, wheat and maize, respectively than in 2006. Unfortunately, these domestic price changes cannot be compared with those experienced during the world food crisis in the early 1970s or even the spike in 1995-96 due to lack of data. Nevertheless, these increases seem substantial in terms of their impact on the purchasing power of the poor. Not surprisingly, the average

volatility of domestic prices also increased during the crisis, reaching a peak for all three cereals in 2008 (Demeke et al 2013).

Climatic factors have indisputably contributed to the price rises in 2006/2008 and again in 2010-2011. In 2008, the already weak market situation for wheat was aggravated by drought in Australia, which is an important supplier of wheat to world markets. Canada, another important supplier, also experienced weather related low yields for several crops (Dawe and Timmer et al 2012). After the collapse of international cereal prices in late 2008, domestic prices eventually began to decline in most countries (Mittal, 2009). By the second quarter of 2010, domestic prices (after adjusting for inflation) had largely returned to pre-crisis levels for wheat and maize,[3] with domestic rice prices at somewhat higher levels than before the crisis. The pattern of changes in domestic prices across cereals was similar to that on world markets. The experience across different countries was far from uniform, however – in one-fourth of all countries, rice, wheat and maize prices were 23%, 21%, and 24% higher than before the crisis. On the other hand, in one-fourth of all countries maize and wheat prices were lower in the second quarter of 2010 (in real terms) than before the crisis (Dawe and Morales-Opazo, 2009).

In the second half of 2010, however, world prices for wheat and maize rose due to wheat crop damage in the Russian Federation and a subsequent export ban (Gotz et al 2013), as well as poor growing conditions for the maize crop in the USA (International Grain Council, 2010). Notably, world rice prices were much more stable during this period (see FAO –Rice Market Monitor 2010, 2011). The speed and degree of transmission from world prices to domestic prices varied: see review by Keats et al (2010).

2.2.2 Factors affecting price transmission to domestic markets

Dawe (2008) explains that price transmission from world markets to domestic markets is affected by several factors: trade policy, transport costs, geographic condition, the level of self-sufficiency and exchange rates.

FAO et al (2011a) notes that trade policy is perhaps the most fundamental determinant of the extent to which world price shocks pass-through to domestic markets. It was also a relatively common intervention in developing countries – Demeke et al (2009) reported that 55 different countries had used trade policy instruments to mitigate the impacts of the world food crisis of

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[3] Pre-crisis is defined as the second quarter of 2007 for wheat and rice, and the second quarter of 2006 for maize. The different definitions are intended to capture the fact that world maize prices began their surge before wheat and rice.

2006-08. Timmer (2010) observe that the food crisis in 2006/08 revealed a serious asymmetry in how the WTO approaches border controls for food grains. Virtually all of the trade disciplines, and all of the current negotiations under the Doha Round, refer to import barriers rather than export controls. There is now wide agreement that export controls on food grains have been a significant source of price instability (Martin and Anderson, 2011; Sharma, 2011).

Export restrictions on foodstuffs came to prominence during 2007-11 as one of the key drivers of the food crisis and price spikes (Kim, 2011). With projections of tight world food markets and increased price volatility for many years to come, export restrictions have been singled out as one of the key issues to be addressed by the global community (Sharma and Konandreas, 2008).

Timmer (2010) notes that in particular, the key factor that affects transmission is the degree to which the government determines the volume of trade (either exports or imports), as opposed to allowing the private sector to make the decision. Because grain production is closely associated with national food security and welfare of the farming population, managing price instability has been a major challenge and government authorities and experts have been debating grain price policies for years (Demeke et al, 2012). This government control might be done formally through a fixed quota, or informally through ad-hoc determination of a quota. In the event of high world prices, export quotas can reduce pass-through of prices to the domestic economy, while import quotas can prevent the pass-through of very low world prices (Sharma, 2011).

For example, during the world food crisis of 2006-08, domestic prices of rice and wheat were very stable in China because the government controls the quantity of these foods that enters international trade (Fang, 2010). The controls exist even in normal times, and were not implemented specifically in response to the crisis. India also experienced much smaller increases in domestic rice prices than those seen in neighboring countries, again due to controls on trade volumes (Gulati and Dutta, 2010). On the other hand, domestic soybean prices went up sharply in China during 2008, because the government does not control the traded quantity of this commodity. In addition, China imports a large share of its domestic consumption, so export restrictions would be irrelevant (Yang et al, 2008).

Of course, not all government trade controls lead to more stable and predictable prices. In Africa, two of the countries that have taken the most aggressive steps to stabilize food prices in the region, Zambia and Malawi, have experienced the most volatile food prices of all the countries examined in a comparative analysis by Chapoto and Jayne (2009). For example

Zambia, during the drought of 2001, announced that the government would import maize to stabilize domestic prices. The government announcement discouraged the private sector from importing over concerns that the government would release subsidised grain, making any private imports unprofitable. But the government imports were arranged too late to prevent a price surge, leading to domestic price instability (Chapoto and Jayne, 2009; Doroch et al, 2009). Clearly, the weight of the research evidence in Africa shows that price stabilization has only rarely contributed to price stability, and in many cases it has exacerbated it, at massive cost and foregone investment in other areas where positive impacts might otherwise have been achieved. While the stabilization objective may be noble, most measures to implement it have been counterproductive in Sub-Saharan Africa.

Even when controls on trade volumes do serve to stabilize domestic prices, there are costs to such policies (Morrison et al 2008). In terms of losses to the domestic economy, there are short-run economic efficiency losses from not allowing domestic prices to follow world price movements (Ruta and Venables, 2012). In addition Sharma (2011) explain that when world prices are high, any country imposing export quotas loses potential revenue that would come from allowing exports. In addition to the losses imposed on the domestic economy, the export restrictions also mean that world prices are higher than they would be otherwise, imposing costs on other countries and also consumers in those countries. Most importantly, as noted above, quantitative controls on international trade are no guarantee that domestic prices will be stabilised. Some governments such as Ukraine, and Thailand made use of export restrictions, including export taxes and simple export bans. Without resorting to outright bans on exports, some countries employed export quotas. Such export restrictions worsened the international price situation; insulating domestic markets from world price spikes with export bans and quotas exacerbate price increases in global markets (Valdes and Foster, 2012)

In many cases, export taxes and restrictions seem to stabilize domestic prices. This is especially likely when the restrictions have been in place for a long period of time, so that enforcement mechanisms are developed (Timmer, 2008). Argentina, for example, has used export taxes on wheat for many years, and data shows that domestic prices did not experience the same spikes as were observed on world markets in 2007 and 2010 (FAO, 2012). A constant export tax would not serve to stabilize prices, however, unless the export tax increased as world prices increased, or if the export tax was so high that it eliminated all exports. Thus, in addition to export taxes, Argentina also used quantitative controls on wheat trade during 2007 (Nogues, 2011), and these controls reduced the magnitude of the spike on domestic markets. Russia's export controls in the second half of 2010 also served to control

the increases in the price of wheat flour to less than would have been expected given the increase in world prices for wheat (McMichael, 2009).

The other main tool of trade policy, an import tariff or export tax, in many cases will not impede transmission of world price shocks to domestic markets unless the tariff/tax is varied in response to changes in world prices (Timmer and Dawe, 2007). Valdes and Foster (2012) explain that with respect to the efficacy of using tariffs, if tariffs are low, the margin for reduction is limited on the down side. But if tariffs are high, large decreases might have fiscal consequences.

In any event, the pass-through from border to domestic farm and retail prices (often called the price transmission elasticity) varies among countries and across products even within the same country. Some countries have been able to shelter their domestic markets far more than others, and some authors suggest that the pass-through of prices tends to be higher in lower income countries (de Janvry and Sadoulet, 2008).

A constant import tariff will raise the domestic price of food (and an export tax will lower it), but if the private sector is allowed to choose the quantity of imports at that tariff, transmission of changes in world prices will often be complete (Timmer, 2010a). In some cases, however, a tariff can impede price transmission from world markets.

However, there are many disadvantages to high tariffs, just as there are disadvantages to high transport costs. One of these disadvantages is increased vulnerability to domestic supply shocks, and another is that higher domestic prices, in many cases, tend to increase the level of poverty.

Schwarz et al (2009) explains that the cost burden of moving food into and around Latin America and Caribe has been largely unaffected by the rise and decline of commodity prices. While commodity prices rose sharply over the last two years, freight rates (both ocean and road) as a share of the value of food products hardly changed: see reports by International Grain Council. That is, the cost of logistics rises along with international price changes for major food indexes. While there is some endogeneity associated with transport and food prices, countries that can shift to more efficient forms of transport and logistics will lock in benefits regardless of commodity price trends and spot market fluctuations (Guasch et al, 2008).

While high transport costs will theoretically reduce the impact of international price shocks in some circumstances (see World Bank 2010). In general terms there are many disadvantages of high transport costs that are likely to impede the broader development process, and the

building of better infrastructure will still generate many benefits even if it comes with some increased transmission of prices from world markets (see Teravaninthorn and Raballand, 2008). In addition, better infrastructure can serve to reduce price fluctuations due to domestic shocks by allowing the movement of supplies within the country. Thus, better infrastructure may reduce domestic price volatility even if it increases price transmission from world markets (World Bank, 2012).

2.2.3 Macroeconomic costs and benefits of volatile food prices

According to Valdes and Foster (2012) the reduction in this price transmission will be greater for countries that are closer to self-sufficiency, because a given increase in the world price is more likely to raise the import parity price to a level above the domestic autarky price, at which point the world price has no influence on domestic price formation. For a country that is heavily import dependent, however, there is more potential for domestic prices to increase before the import parity price surpasses the autarky price (Berdegue et al, 2012). This reduced vulnerability to large world price shocks is one advantage of a healthy and competitive agricultural sector that reduces undue reliance on imports.

Indeed, under a policy of free trade, even exporting countries will experience domestic price increases when world prices increase (Bouet et al 2005). For example, domestic rice prices in Thailand increased sharply in 2008, because Thailand does not restrict private sector rice exports (Dawe and Slayton, 2010). Domestic and world prices did not move in tandem in Thailand in the early 1970s during an earlier world food crisis, because it implemented export restrictions at that time (FAO, 2009). As another example provided by Dawe and Slayton (2010), Peru is close to becoming self-sufficient in rice, importing just 4% of domestic consumption in a typical year (average of 2002 to 2008). But domestic prices surged in 2008 because of its open trade policy.

More generally, self-sufficiency can reduce vulnerability to world price shocks, but only because it gives countries the option to temporarily adjust international trade without suffering large domestic price increases (Valdes and Foster, 2012). On the other hand Valdes and McCalla (2004) noted that a pure policy of self-sufficiency could exacerbate price volatility due to domestic supply shocks, because domestic prices are then free to vary within the parity price band. Since agricultural output fluctuates considerably due to the vagaries of the weather, there is a large potential for domestic prices to vary when international trade is not profitable and therefore not available to smooth domestic supply disturbances (FAO, 2008). In summary, self-sufficiency potentially reduces the exposure to world price shocks,

but increases vulnerability to domestic shocks, and it is not clear which will dominate in any particular case. Indeed, in the case of Peru in 2004-05, FAO-RLC (2009) shows that there was a substantial surge in domestic prices at the same time that the world market was stable. Rapsomanikis and Sarris (2010) found that farm producers in Peru would experience less price volatility if exposed more to international markets, although the opposite conclusion holds for Ghana.

The Dominican Republic uses quotas, minimum support prices and other measures to influence domestic rice prices and increase the rate of self-sufficiency (see UNCTAD, 2009; Demeke et al 2012 and FAO-RLC, 2011). During the rice crisis of 2008, domestic prices increased just 11% from 2007 to 2008 (in nominal US dollars), compared to larger increases in its neighbors, ranging from 26% in Costa Rica to 59% in El Salvador (Dawe and Morales-Opazo, 2009). But the smaller percentage increase in prices came at a cost – higher prices in more normal times before and after the crisis (the quotas restrict imports, driving up domestic prices). Even during the crisis, the level of prices in the Dominican Republic was similar to that of its neighbors. Thus, the policy of restricting imports has brought more stability, but at the cost of higher prices at essentially all times.

In fact and according to Ivanic and Martin (2008), a policy of permanently higher staple food prices will increase poverty in most countries. Furthermore, Minot and Roy (2007) argue that higher staple food prices relative to neighboring countries will reduce the competitiveness of labor-intensive industries that can provide a pathway out of poverty. Thus, self-sufficiency that is due to trade restrictions instead of increased productivity has many negative side-effects. In sum, a food security strategy that relies on a combination of increased productivity and general openness to trade will be more effective than a strategy that relies primarily on the closure of borders (FAO et al 2009 and FAO et al 2011).

There is clearly a tension between a staple food price policy designed to achieve self-sufficiency and one designed to enhance food security. It is well understood that high staple food prices increase the level of poverty. Timmer and Dawe (2007) evaluate the case of Indonesia where the current parameter is that a 10% increase in rice prices causes a 1.3% point increase in poverty (although the arguments for updating this parameter with more recent data are valid). At the same time, maintaining domestic rice prices at a level that is somewhat higher than the trend of world prices also makes it much easier to maintain stability of domestic prices, via varying levels of imports that complement domestic production. Avoiding price spikes for rice is highly beneficial to the poor, perhaps even

compensating for somewhat higher prices on average (especially if rapid economic growth is raising rural wages and creating lots of employment opportunities for unskilled labor).

3 Impact of food price volatility on consumers and households

3.1 Impact of food price volatility on consumers and households in developed countries

There is evidence in the literature that rising commodity prices have a higher impact on food prices of consumers in low income countries. And yet, the literature suggests that the rise in food commodity prices not only affects developing countries and that there will be an impact on the poorest households in developed countries (Dewbre et al 2008; Gilbert and Morgan, 2010; Lloyd et al 2011; Huang and Wu Huang, 2012) even though the aggregate effects can be small (see previous section). While the literature focusing on the impacts on the welfare of consumers and households on developing countries is vast, it is less abundant on the welfare effects on developed countries.

Increases in the cost of food have two effects on consumers, the income effect and the substitution effect, which occur simultaneously. The substitution effect refers to the decrease in consumption of the good whose price has increased, with its substitution by relatively cheaper goods (Dorward, 2012). In the case of increases in food prices, the rise in the price of food in relation to the price of other goods will result in a decrease in the demand for food (Ligon, 2008). The income effect takes place because the increase in a good´s price causes an increase in the total cost of purchases (Dorward, 2012). According to the author, this leads to a fall in real income, pushing downward the consumption of all goods and services, and resulting in reduced consumer welfare.

Food demand and consumption is not only a function of income, also of income distribution (Cirera and Masset, 2010). The share of food expenditure in the budget of poorer households is higher, so the income effect will be higher on the poor. As food price levels rise, the expenditure devoted to other necessities, such as health or education, falls, hitting poor households and increasing their vulnerability. In this way, the share of food in households´ total budget can be considered an indicator of vulnerability to unexpected price changes (Schnepf, 2012).

The evaluation of the impact of rising food prices on consumption should take into account that consumers can react to changes in relative prices of food by shifting to those food products that are relatively cheaper (Dewbre et al. 2008). In this sense, Wood et al (2012) note that estimates of poverty that assume constant demand or approximate second order substitution effects - which account for the decrease in consumption of more expensive food

items but do not account for the growth of consumption in relatively less expensive food items - may overestimate or underestimate respectively the effect of food price increases in countries where most households can substitute among food products (Wood et al 2012). These authors show that full substitution behavior has to be taken into account to produce accurate economic welfare estimates and Dewbre et al (2008) note that changing consumer patterns soften the impacts of food price rises.

Price changes may vary greatly depending on the commodity (Dewbre et al 2008). As the composition of consumption varies across countries, the rising food prices impact can also vary across countries. Besides, as changes in food prices or in income can translate into changes in the food products purchased, this in turn can affect the nutritional quality of consumers´ diets (Huang, 1999).

The EC (2008) estimates that the effect of higher expenditure devoted to food on the purchasing power and standard of living of consumers in the EU is small because of the relatively low share of food in total household expenditure. However, authors point out that low-income households are especially affected.

Dewbre et al (2008) assess the implications of changes in international prices for consumers in selected countries and regions - United States, European Union, China and Sub-Saharan Africa - in several scenarios, using the AGLINK-COSIMO model[4]. The selected scenarios introduce plausible alternatives to the baseline assumptions. These alternative scenarios involve a decrease in projected prices relative to the level reached in the baseline, by lowering the values of the drivers assumed in the baseline.

Results show the following. In the first place, the price impacts among the selected regions are smaller than would be implied by world price impacts. Secondly, the impact of changes in international prices on consumers varies considerably across the selected countries. And thirdly, as the selected scenarios involve a decrease in prices relative to the baseline projections, the expenditure devoted to food decreases in each scenario. The results show that the expenditure decreases which take place in the US and the EU account for only a slight decrease relative to the price decline in each of the considered scenarios. According to these authors, this entails that consumers do not change much their food consumption habits to take advantage of relative food price changes. The global impact of the higher agricultural

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[4] see http://www.oecd.org/site/oecd-faoagriculturaloutlook/45172745.pdf for further details about the AGLINK-COSIMO model

commodity prices on consumers is low in the US and the EU, but probably hides other effects on the poorest households.

Huang and Wu Huang (2012) find that an increase in food and energy prices in the US would incur substantial consumer welfare loss, especially for low income households. A 10% increase in food or energy prices would cause annual consumer welfare losses of $242 and $158 per person, respectively. The consumer welfare loss would be equivalent to 4.27% (9.94%) of their income in the lowest 20% income quintile of households, in the case of a 10% (25%) rise in food prices. A 10% (25%) increase in both energy and food prices would increase annual per capita compensated expenditures of $405 ($985). The consumer welfare loss would represent 7.15% (17.40%) of their income in the lowest 20% income quintile of households, in the case of a 10% (25%) rise in both food and energy prices.

Therefore, when looking at the impacts of food price volatility, it is useful to consider the role of food expenditure in the average budget and the overall purchasing power of an average household.

Figure 2 shows the average food consumption expenditure of households and food consumption expenditure in the lowest income quintile in the MS in the EU. The average household income devoted to food in most developed countries is around 10-15% (Gilbert and Morgan, 2010). Looking at the figure, two important observations should be made. First, there are significant differences within MS in the EU, ranging from less than 10% of average expenditure devoted to food in Luxembourg, to nearly 30% in Romania, reflecting different income and welfare levels. Consumers in a considerable number of MS spend a higher proportion of their expenditure on food than the average developed country. And second, when considering the food consumption expenditure of households belonging to the lowest income quintile, we notice that the share is much higher than the average share.

Figure 2. Food consumption expenditure of households in EU.
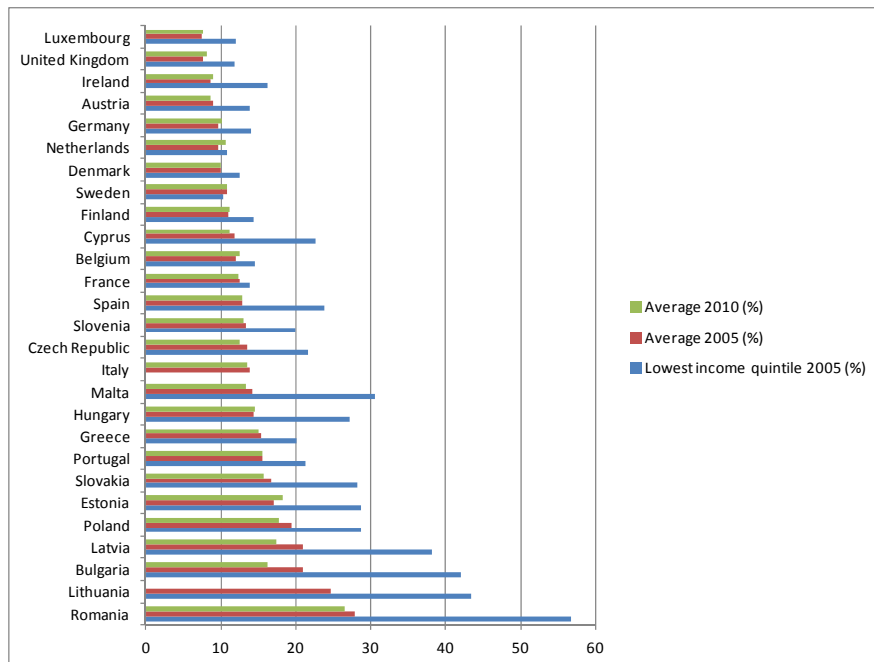
Source: Data on average food consumption expenditure 2005/2010 from EUROSTAT - National Accounts - Final consumption expenditure of households by consumption purpose - COICOP 3 digit - aggregates at current prices. Data on food consumption expenditure in the lowest income quintile 2005 from EUROSTAT - Household Budget Surveys - Structure of consumption expenditure by income quintile - (COICOP level 2).

As mentioned earlier, higher food expenditure on food leads to a fall in purchasing power. Disposable income is usually used as an indicator of the degree of inequality in purchasing power (Ward, 2009). Figure 3 shows the evolution of the HICP for food and a disposable income index across three selected countries, Netherlands, Spain and Latvia, varying from deflation in Netherlands to the rapid growth of price indices in Latvia. Consumer price levels have increased over the period 2000-2011, in particular in Latvia, while the disposable income index has decreased.

Figure 3. Harmonized index of consumer prices (HICP) for food and disposable income index of Netherlands, Latvia and Spain over the period 2000-2011.
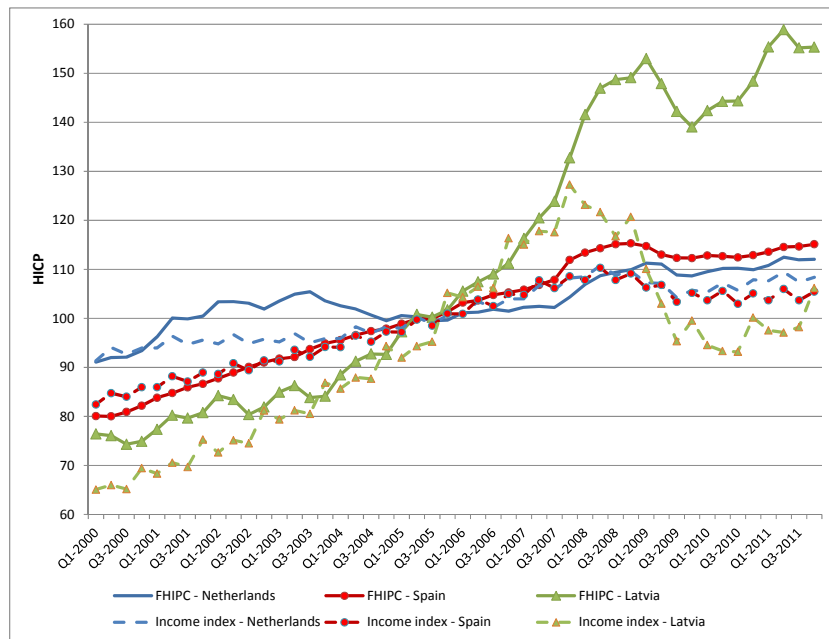
Source: EUROSTAT

Poverty and income inequalities may increase the vulnerability of households to volatile food prices. Poverty is assessed in the EU based on the EU Statistics on Income and Living Conditions (EU-SILC) by the risk of poverty or social exclusion rate, which is based on the contribution of three indicators - the number of people considered at-risk-of-poverty, the number of people in a situation of severe material deprivation and the number of people living on a household with a very low work intensity.

The at-risk-of-poverty indicator accounts for the number of people with an equivalised disposable income (after social transfers) below the risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income[5] after social transfers. Thus, it is a relative measure of poverty and the poverty threshold varies greatly across MS (see Atkinson et al 2010). Severely materially deprived people are greatly constrained by a lack of resources and cannot afford at least four of the following items - to pay rent or utility bills, to keep their home adequately warm, to pay unexpected expenses, to eat meat, fish or a protein equivalent every second day, a week holiday away from home, a car, a washing machine, a color TV or a telephone (EUROSTAT, 2012).

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[5] The equivalised disposable income is the total income of a household, after tax and other deductions, available for spending divided by the number of household´s members, which are made equivalent by weighting each according to their age, using the OECD equivalence scale (EUROSTAT, 2013a).

According to Ward (2009), disposable income may underestimate or overestimate purchasing power for several reasons. Ward (2009) mentions as possible reasons for income to underestimate purchasing power, for example, the fact that income takes no account of accumulated savings and wealth or income in the form of free or subsidised goods and services or food or other goods produced for own consumption. And, according to the author, income may overestimate purchasing power due to the fact that the income received one year might be higher than that received in previous years or the need to pay debts or additional expenses because of personal or family circumstances. As Ward (2009) notes, to gain additional information about the purchasing power of households, data on material deprivation can be examined.

Focusing on the EU indicators of income poverty (at-risk-of-poverty) and material deprivation, we find big inequalities within the EU. According to EUROSTAT (2012), the average at-risk-of-poverty population in the EU in 2011 is 16.9%, corresponding to around 83 million people and compared to 16.4% in 2010 and 16.3% in 2009. As shown in Figure 4, there are differences between MS. The highest at-risk-of-income-poverty rates are observed in Bulgaria and Romania (both slightly over 22%), Spain (21.8%) and Greece (21.4%), the lowest are observed in the Czech Republic (9.8%), the Netherlands (11%), Austria (12.6%) and Denmark and Slovakia (both 13%).

Furthermore, the EU presents significant differences in the at-risk-of-(income)-poverty threshold in 2011, ranging from 2,134 Purchasing Power Standards (PPS)[6] of Romania to 16,001 PPS of Luxembourg (EUROSTAT, 2012). These thresholds are expressed in PPS in order to make them comparable, because the cost of living can vary greatly across MS (Atkinson et al 2010).

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[6] PPS is the technical term used by EUROSTAT for the common currency in which national accounts aggregates are expressed when adjusted for price level differences using purchasing power parities (PPPs). PPPs are indicators of price level differences across countries (EUROSTAT, 2013b).

Figure 4. At-risk-of-poverty rate and threshold in PPS in 2011.
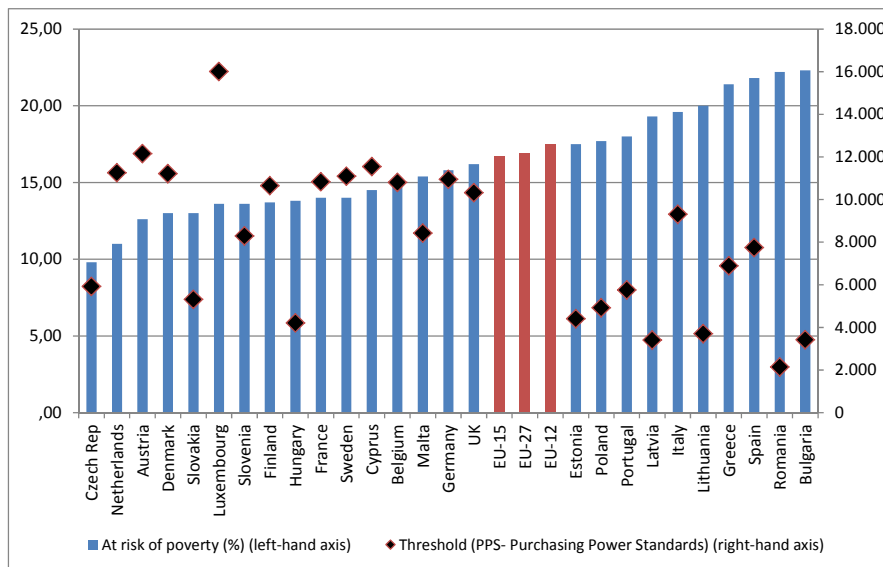
Source: EUROSTAT

According to EUROSTAT (2012), 8.8% of the population was severely materially deprived in the EU-27 in 2011, corresponding to 43.47 million people and compared to 8.3% in 2010 and 8.1% in 2009. The range between MS in terms of the percentage of severely materially deprived people is wider than that in poverty risk rates, ranging from 1.2% both in Luxembourg and Sweden to 43.6% in Bulgaria.

One of nine items used to determine the number of people severely materially deprived concerns the affordability of food - the ability to afford a meal with meat, chicken or fish every second day. This item is considered a basic human need by the World Health Organization (Ward, 2009). This indicator suggests that the household suffers from severe food deprivation (Carney and Maître, 2012) and is directly linked to current income (Fusco et al 2010). Table 3 shows the percentage of population not able to afford a meal with meat, chicken or fish (or vegetarian equivalent) every second day, both for total population and for population with income below 60% of the median equivalised income.

Table 3. Percentage of total population and population with income below 60% of the median equivalised income not able to afford a meal with meat, chicken or fish (or vegetarian equivalent) every second day in 2011 (* in 2010).

	Total	<60% of median equivalised income		Total	<60% of median equivalised income
Belgium	4.8	16.6	Hungary	29.0	59.0
Bulgaria	50.8	85.5	Malta	9.9	22.3
Czech Republic	10.7	30.6	Netherlands	2.8	10.8
Denmark	2.4	9.2	Austria	7.2	20.5
Germany	8.8	27.0	Poland	14.1	31.3
Estonia	10.4	26.9	Portugal	3.1	8.4
Ireland	3.0*	6.5*	Romania	21.8	42.5
Greece	9.2	42.2	Slovenia	10.4	22.5
Spain	3.0	5.8	Slovakia	23.2	52.0
France	6.8	19.7	Finland	3.2	9.9
Italy	12.4	24.5	Sweden	2.1	7.7
Cyprus	5.2	11.3	UK	4.9	11.4
Latvia	31.2	56.7	EU-27	9.7	23.5
Lithuania	23.0	38.8	EU-15	6.9	18.3
Luxembourg	1.8	5.5	EU-12	20.5	42.8

Source: EUROSTAT

3.2 Impact of food price volatility on consumers and households in developing countries

3.2.1 Micro-level impacts

In one of the reference papers on impact of food prices on consumer and household, Ivanic and Martin (2008) explain that existing analyses tell us that the impacts of higher and volatile food prices on poverty are likely to be very diverse, depending upon the reasons for the price change and on the structure of the economy such as the macroeconomic conditions, the country's net international trade position, and the food production and consumption patterns of different households groups at the subnational level (see Anriquez et al 2013; Hertel and Winters 2006; Ravallion and Lokhsin 2005). A great deal depends on the distribution of net buyers and net sellers of food among low-income households (Aksoy and Isik-Dikmelik 2007).

Aksoy and Isik-Dikmelik (2008) claimed that in order to understand the importance of higher food prices for welfare, poverty, and food security, it is first important to distinguish between net food sellers and net food purchasers. A net food seller, as defined by FAO et al (2011), is someone for whom total sales of food to the market exceed total purchases of food from the market, whereas for a net food purchaser the reverse is true. Net food consumers will generally be hurt by higher food prices, while net food producers will benefit. It is also true that whether a given household is a net food producer or consumer depends on market prices (see Zezza et al 2008 and Anriquez et al 2013). Higher prices will discourage consumption, encourage more production, and possibly convert some households from net purchasers to net sellers. Lower prices could do the opposite.

Although nearly all urban dwellers are net food consumers, not all rural dwellers are net food producers (see Timmer 1991). In fact, concluded FAO (2008), very small farmers and agricultural labourers are often net consumers of food, as they do not own enough land to produce enough food for their family. These landless rural households are often the poorest of the poor. Although some of these labourers work on farms and are occasionally paid in food, they typically do not earn enough food to sell a surplus on the market (see Timmer, 1993 and Gulatti and Dutta, 2010). Instead, they need to purchase food on markets and are likely to benefit from lower prices.

It has been argued, that higher food prices will substantially hurt poor net food consumers because food is typically a large share of expenditures for the poor (ODI, 2008). Since many farmers are poor, higher prices could help to alleviate poverty and improve food security

(Polanski, 2008). However, it must also be kept in mind that farmers with more surplus production to sell will benefit more from high prices than farmers who have only a small surplus to sell. Further, in many (but not all) contexts, farmers with more land tend to be better off than farmers with only a little land, so it may be that poorer farmers will not receive the bulk of the benefits from higher food prices (see FAO, 2010).

In addition, concluded Hertel et al (2004), a particular reason for concern about the impacts of high and volatile food prices on poor countries arises from the fact that incomes of farm households, frequently one of the poorest groups in low-income countries, may be increased by higher commodity prices. However, according to de Janvry and Sadoulet (2009) the benefits of higher food prices to poor farm households may be less than they might at first appear, since these benefits depend not on what they produce, but on their net sales of these goods. For example many farm households may not be able to shift into commercial crop production and sales as a response to trade reform even if it is a much more profitable activity because (small scale) farmers face high transaction costs in marketing their products or receiving modern inputs (Key et al 2000). Cadot et al (2005) showed that in the case of Madagascar's subsistence farmers these transaction costs could be equivalent to 1 to 2 years of the value of their marketable production.

A related reason for the lack of supply response to trade reforms and price changes is the need for food security and risk aversion caused by the lack of well developed local food, labour and credit markets. This leads farmers to allocate a significant portion of their land and labour to subsistence food production and not fully respond to higher cash crop profitability (de Janvry et al 1991).

Aksoy and Isik-Dikmelik (2008) point out that the average income of net food buyers is higher than that of net food sellers, and thus that high food prices would transfer income from higher income people to those with lower income. But this conclusion results from dividing the population into just two groups –studies that use a more detailed disaggregation nearly always show that the poorest 20% of the population are net food buyers, with surplus producing farmers somewhere in the middle of the income distribution.

For example, Ivanic and Martin (2008) found that higher food prices increase poverty in seven of nine countries in their sample, with Viet Nam and Peru being the only exceptions. Viet Nam is a substantial rice exporter with a relatively equitable land distribution, so it has lots of surplus rice producing households, and the beneficial impact in Peru is very small. For all other countries in the sample (Bolivia, Cambodia, Madagascar, Malawi, Nicaragua, Pakistan and Zambia), higher prices lead to greater poverty, even after taking account of

labour market effects. Zezza et al (2008) reached similar conclusions; the poor were hurt by higher prices in all countries except for Vietnamese rural dwellers. Other than Viet Nam, their sample of countries included Albania, Bangladesh, Ghana, Guatemala, Malawi, Nepal, Nicaragua, Pakistan, Panama and Tajikistan. Zezza et al (2008) did not examine labour market effects, but they did incorporate supply and demand responses.

Robles and Torero (2010) found that higher prices increased poverty in Guatemala, Honduras, Nicaragua and Peru. Dawe et al (2010) summarized a large number of studies that pertain to rice, and again found that the poorest quintile of the population is nearly always a net purchaser of rice. Ver Poorten et al (2013) suggest that heterogeneous effects in self-reported food security are consistent with economic predictions, as they are correlated with economic growth and net food consumption (both at the household and country level). Specifically, in the face of rising food prices, self-reported food security improved on average in rural households, while it worsened in urban households, a finding that holds when using global prices or domestic food prices.

Using a panel dataset to study the impact of food inflation in Ethiopia, Alem and Söderbom (2012) find that the poor are among the hardest hit by the recent inflation. However, their study only examines urban areas, and their analysis is primarily based on parametric regressions. Cudjoe et al (2010) estimate the welfare impact of food inflation while incorporating the regional differences in actual food inflation across households. However, they ignore the production side, a key component for understanding the impact of food inflation on agricultural households.

In a recent paper, Fujii (2013) deduced that the impact of food inflation in Philippines may vary substantially by location, income level, and other household characteristics have at least one policy implications. The desirable mode of transfer may vary across locations. As Sabates-Wheeler and Devereux (2010) find in their study of Ethiopia's Productivity Safety Net Program, cash transfer (not indexed to food prices) is less beneficial to the beneficiaries than food transfer under rapid food inflation because the purchasing power is quickly eroded.

According to Anriquez et al (2013), the monetary value of food consumption or total expenditure is generally used as a measure of living standards. Ul-Haq et al (2008), Brambila et al (2009) and Tefera et al (2012), for example, estimate an Almost Ideal Demand System (AIDS), which serves as a basis for their simulation exercise respectively for Pakistan, Zambia and Ethiopia.

3.2.2 Impact on nutritional status

Different studies provide further support to the idea that high food prices hurt the poor, and in more ways than just pushing them below the poverty line. Generally speaking, energy intake is less affected than consumption of other nutrients. As one example, Block et al (2004) found that, when rice prices increased in Indonesia in the late 1990s, mothers in poor families responded by reducing their caloric intake in order to better feed their children, leading to an increase in maternal wasting. Furthermore, purchases of more nutritious foods such as eggs and green leafy vegetables were reduced in order to afford the more expensive rice. This led to a measurable decline in blood haemoglobin levels in young children (and in their mothers), thus increasing the probability of developmental damage. A negative correlation between rice prices and nutritional status has also been observed in Bangladesh (Torlesse et al 2003). De Brauw (2011) found that height for age scores among children under three years old in El Salvador declined during the food crisis, although the effects were mitigated to some extent for families with access to remittances from relatives. Weight for age did not decrease, suggesting that there was a decrease in consumption of key nutrients but not in energy intake. In some situations, though, even energy intake declines, as documented by D'Souza and Jolliffe (2010) in rural areas of Afghanistan during the food crisis. In urban areas of the country, however, residents sacrificed dietary diversity instead of energy.

The relationship between price rises and dietary/nutritional changes was not always constant, as the elasticity of demand for staples was different in different areas, as predicted. For example, in parts of China, a rise in the price of rice and wheat led to lower consumption of these cereals and increased consumption of (nutritious) pulses (Jensen and Miller 2008). In contrast, in areas such as rural Indonesia, Cambodia and Bangladesh, demand for rice, the main staple, is very high and less sensitive to its price. An example is given by Raihan (2009), over two thirds of households in rural Bangladesh reported maintaining their consumption levels of rice despite price increases of 60%, while 8% actually ate more rice when its price was higher, cutting back on more expensive and utritious dietary items in order to do so. This has previously been documented for rice in Bangladesh by Torlesse et al (2003), who discuss the damaging nutritional implications.

3.2.3 Gender impact

Furthermore, we need to consider that the welfare impact of higher and volatile global food prices may differ across members of the same household. Many studies have demonstrated

that resources are generally not distributed equally to all household members, with women and girls often being disadvantaged, although the degree varies across countries and by household characteristics (see Quisumbing, 2003). Kumar and Quisumbing (2013) suggest that in Ethiopia female-headed households are more vulnerable to food price changes and are more likely to have experienced a food price shock in 2007–2008. High food prices seem to have a disproportionate negative impact on female headed households for two reasons. First, these households tend to have less access to land and other resources, which means they are less likely to be net sellers of food. Second, these households also tend to be poorer, which means they spend a larger share of their income on food and are more affected by high prices. Only with careful examination of outcomes at the household level is it possible to tell whether changes in the prices of specific staple foods will help or hurt poor people.

3.2.4 Impact on labour Market

World Bank (2010) concluded that another potentially important effect of food prices on poverty and food security works through labour markets. Higher food prices, by stimulating the demand for unskilled labour in rural areas, can result in a long-run increase in rural wages, thereby benefiting wage labour households in addition to self-employed farmers. The evidence in this regard is inconclusive. Ravallion (1990), using a dynamic econometric model of wage determination and data from the 1950s to the 1970s, concludes that the average landless poor household in Bangladesh loses from an increase in the rice price in the short run (due to higher consumption expenditures), but gains slightly in the long run (after 5 years or more). This is because, in the long run, as wages adjust, the increase in household income (dominated by unskilled wage labour) is large enough to exceed the increase in household expenditures on rice.

However, this study used relatively old data, when rice farming was a larger sector of the economy and thus had a more profound impact on labour markets. Rashid (2002), using co-integration techniques and updating the data used by Ravallion (1990), found that, since the mid-1970s, rice prices in Bangladesh no longer have a significant effect on agricultural wages. Lasco et al (2008) found an effect of rice prices on agricultural wages in the Philippines. Polaski (2008) uses a general equilibrium model of the Indian economy and finds that higher rice prices lead to reduce poverty, due to large effects of rice prices on agricultural wages, which are important to the poor. This latter paper is unclear, however, on the magnitude of its estimate of the elasticity of wages with respect to rice prices, or how that estimate was obtained.

3.2.5 Responses by poor households

Based on experience with seasonal hunger and other crises, many authors (see below) predicted broadly similar responses by poor households to an increase in world food prices. Food related effect can vary from cutting out expensive and 'luxury' foods to, in the worst cases, skipping meals or even whole days of eating, and eating types of food that would normally be rejected (Compton et al 2010). Internationally-adopted measures for this area include a Dietary Diversity Score DDS (Swindale and Bilinsky, 2006) and some of the questions on the Coping Strategies Index CSI (Maxwell et al, 2008) and Household Food Insecurity Access Scale HFIAS (Coates et al 2007).

Another responses according to World Bank HDN/PREM (2008) are livelihoods related, for example in poor households where 50%-80% of the household income goes to food, a rise in food prices can represent a significant rise in the overall cost of living. Responses to inflation can vary from what economists call 'consumption smoothing' i.e. tiding things over, mainly by drawing down savings and taking loans in cash or kind – to responses with long-term and possibly irreversible effects such as withdrawing children from school or selling off household assets. The main international measure for these is the Coping Strategies Index (Maxwell et al, 2008).

3.2.6 Interactions between food prices and welfare

In much of the policy debates on the food crisis, the discussions have ignored the ceteris paribus assumption and the complex interactions between food prices and welfare, and have used the numbers from the simulation models as if they were actual changes in food security or poverty (see Van Poorten et al (2013) and Swinnen (2011) for a review of statements and public arguments). In a recent review of the issue, Headey (2011) not only points out important deficiencies but also proposes considering alternative measures, which are based on ex-post observations instead of simulating from ex ante data.

Headey (2011) analyses self-reported food insecurity from the Gallup World Poll (GWP), a survey that has covered almost 90% of the developing world population over the period 2005–2010. His findings are strikingly different from those so far claimed. The GWP data indicate that although there was large variation across countries, global self-reported food insecurity fell sharply from 2005 to 2008, with estimates ranging from 60 to 340 million people (Headey, 2011). According to Headey (2011), the discrepancy between this finding and the results of the more commonly used simulation-based approach is likely to be due to

the combination of the ceteris paribus assumption and the under-sampling of fast-growing large economies, China, India and Brazil, in the latter approach.

3.2.7   Unpredictable food prices and poverty traps

FAO et al 2011 concluded that unpredictable price movements have negative impacts, and poverty traps are one of the most important. The poverty traps, explains UNDP (2012) involve welfare impacts on individuals and households, for example health and nutrition outcomes. For consumers (net food purchasers), increased price unpredictability will mean a greater incidence of high prices, although if the average price remains the same, there will also be a greater incidence of low prices. Nevertheless, according to IMF (2011) there are situations where temporarily high prices can cause effects that are not reversed by periods of low prices. For example, if staple food prices increase sharply during the first thousand days of a child's life, intake of more nutritious foods may be curtailed during critical developmental stages and cause permanent reductions in health and nutrition outcomes. A subsequent period of low prices will not undo the damage (see World Bank, 2012). Similar effects will result for net food sellers due to periods of low prices that cause temporarily low income and are not compensated for by a subsequent period of high prices (see Von Braun and Tadesse, 2012).

3.2.8   Impact on agricultural investment at household level

In developing country settings where credit markets do not function well and output is highly variable due to fluctuating weather conditions (see Murphy et al 2012). If farmers cannot access credit markets when needed, they will be reluctant to make productive investments, especially those that tie up capital for extended periods of time. FAO (2011, et al) explains that even investments in fertilizer use, which offers returns over a relatively short period of time, could be negatively affected. Because farmers are afraid that an adverse price shock might lead into the type of poverty trap discussed above, they may be reluctant to adopt technologies that provide greater long-run returns (Acemoglu and Robinson, 2010). Thus, they will adopt a low-risk, low-return strategy that may be optimal given their aversion to risk, but slows down the long-term development process (Rodrick, 2008). Similarly, because much investment is irreversible or involves sunk costs, investors will tend to reduce the quantity of investment in an environment of highly unpredictable prices.

When food prices are unstable, this may lead to political instability that discourages long-run private investment, both domestic and foreign. Furthermore, in such an environment, political

leaders may dissipate their political capital (and the government budget) in pursuit of policies that maximize short-term gains at the expense of investments in public goods that have longer payback periods but that are essential for long-term sustained poverty alleviation (Timmer, 1989).

On the other hand, under certain circumstances, volatile prices might actually be beneficial to certain people, even if they are not predictable (see Headey, 2013). For example, Larson et al (2011) argues that consumers who have no liquidity constraints and can store food at zero or low cost can wait to buy more food when prices are low and less when prices are high, thus paying on average a lower price for food (this would come at the expense of producers income, however). In general, however, the costs of unstable and unpredictable prices would seem to far outweigh any benefits such as these, especially for the poor and food insecure.

References

Acemoglu, D., Robinson, J. (2006). Economic origins of dictatorship and democracy. Cambridge, UK, Cambridge University Press.

Aksoy, A.M., Isik-Dikmelik, A. (2008). Are Low Food Prices Pro-Poor? Net Food Buyers and Sellers in Low-Income Countries. Policy Research Working Paper Series 4642. World Bank, Washington, DC.

Alem, Y., Soderbom, M. (2012). Household-Level Consumption in Urban Ethiopia: The Effects of a Large Food Price Shock. World Development, 40, 146-162.

Anríquez, G., Daidone, S., Mane, E. (2013). Rising food prices and undernourishment: A cross-country inquiry, Food Policy, Volume 38, February 2013, Pages 190-202, ISSN 0306-9192.

Apergis, N., Rezitis, A. (2011). Food Price Volatility and Macroeconomic Factors: Evidence from GARCH and GARCH-X Estimates. Journal of Agricultural and Applied Economics, 43(1), pp. 95-110.

Arezki, R., Brukner, M. (2011). Food Prices and Political Inestability. IMF working paper wp 11/62.

Arndt, C., Benfica, R., Maximiano, N., Nucifora, A., Thurlow, J. (2008). Higher fuel and food prices: impacts and responses for Mozambique. Agricultural Economics 39 (2008 supplement): pp. 497–511.

Atkinson, A.B., Marlier, E., Montaigne, F., Reinstadler, A. (2010). Income poverty and income inequality. In: Atkinson A.B., Marlier, E. (Eds.), Income and living conditions in Europe. EUROSTAT, European Commission, pp. 102-131.

Berdegué, J., Carriazo, F., Jara, B., Modrego, F., Soloaga, I. (2012). "," Working papers 118, Rimisp Latin American Center for Rural Development.

Block, S., Keis, L., Webb, P. (2004). "Macro Shocks and Micro Outcomes: Child Nutrition during Indonesia's Crisis," Economics and Human Biology, Vol. 2, 2004, pp. 21-44.

Boskin, M.J., Dulberger, E.R., Gordon, R.J., Griliches, Z., Jorgenson, D.W. (1997). The CPI Commission: Findings and Recommendations. American Economic Review, 87(2), pp. 78-83.

Bouët, A., Bureau, J., Decreux, Y., Jean, S. (2005). Multilateral Agricultural Trade Liberalisation: The Contrasting Fortunes of Developing Countries in the Doha Round, World Economy, Vol. 28(9).

Brambila, J., Caracciolo, F., Depalo, D. (2009), "Poverty Impact of Commodity Price Boom Using Household Survey. The Case of Maize in Zambia," SSRN Working Paper Series.

Bukeviciute, L., Dierx, A., Ilzkovitz, F., Roty, G. (2009). Price transmission along the food supply chain in the European Union. Paper prepared for presentation at the 113th EAAE Seminar "A resilient European food industry and food chain in a challenging world", Chania, Crete, Greece, date as in: September 3 - 6, 2009.

Busicchia, B. (2013). The Question of a Reasonable price for Food: Policy Alternatives to Control Food Price Inflation in Developed Countries. In: Farmar-Bowers, Q., Higgins, V., Miller, J. (Eds), Food Security in Australia: Challenges and prospects for the future, Springer Science+Business Media New York, pp. 79-96.

Cadot, O., Dutoit, L., Olarreaga, M., (2005). "How Costly is it for Poor Farmers to Lift Themselves out of Subsistence?," CEPR Discussion Papers 5392, C.E.P.R. Discussion Papers.

Carney, C., Maître, B. (2012). Constructing a Food Poverty Indicator for Ireland using the Survey on Income and Living Conditions. Social Inclusion Technical Paper No.3, Dublin: Department of Social Protection.

Chapoto, A., Jayne, T. (2009). The Impacts of Trade Barriers and Market Interventions on Maize Price Predictability: Evidence from Eastern and Southern Africa. International Development Working Paper 102. Michigan State University. December 2009.

Cirera, X., Masset, E. (2010). Income distribution trends and future food demand. Philosophical Transactions of the Royal Society B, 365, 2821–2834.

Coates, J., Swindale, A. & Bilinsky.P. (2007). Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v3). Washington, DC: Food and Nutrition Technical Assistance II Project (FANTA-II Project). Academy for Educational Development (AED). Washington DC.

Compton, J., Wiggins, S., Keats, S. (2010). "Impact of the Global Food Crisis on the Poor: What is the Evidence?". London, ODI.

Cudjoe, G., Breisinger, C., Diao, X. (2010). "Local impacts of a global crisis: Food price transmission, consumer welfare and poverty in Ghana" Food Policy. 35(4) 294-302.

Davidson, J., Halunga, A., Lloyd, T.A., McCorriston, S., Morgan, C.W. (2011). Explaining UK Food Price Inflation in TRANSFOP, Working Paper No.1, TRANSFOP project, EU 7th Framework Programme, Grant Agreement No. KBBE-265601-4-TRANSFOP, http://www.transfop.eu/

Dawe, D. (2008). "Can Indonesia trust the world rice market?" Bulletin of Indonesian Economic Studies 44(1): 115-32.

Dawe, D., Morales-Opazo, C. (2009). "How Much Did Developing Country Domestic Staple Food Prices Increase During the World Food Crisis? How Much Have They Declined?", ESA Working, FAO paper.

Dawe, D., Slayton, T. (2010). The world rice market crisis of 2007-08, in The Rice Crisis, ed. by Dawe, D. London, Earthscan.

Dawe, D. (2012). Confronting Price Volatility. Editorial, Global Food Policy, vol 1, 126.

Dawe, D., Timmer, P. (2012). Why stable food prices are a good thing: Lessons from stabilizing rice prices in Asia Editorial, Global Food Policy, vol 1.

de Brauw, A. (2011). Migration and child development during the food price crisis in El Salvador. Food Policy, 36(1): 28-40.

de Janvry, A., Fafchamps, M., Sadoulet, E. (1991). "Peasant Household Behavior with Missing Markets: Some Paradoxes Explained." Economic Journal, 101(409): 1400-17.

DEFRA, Agriculture in the UK (2010), <https://www.gov.uk/government/statistical-data-sets/agriculture-in-the-united-kingdom>, Chapter 7: Food Chain, last accessed April 2013.

de Janvry, A., Sadoulet, E. (2008). "Methodological Note: Estimating the Effects of the Food Price Surge on the Welfare of the Poor." ARE, University of California at Berkeley.

de Janvry, A., Sadoulet, E. (2009). "Agriculture for Development: Lessons from the World Development Report 2008" QA - Rivista dell'Associazone Rossi Doria, 2009(1):9-24.

Demeke, M., Pangrazio, G., Maetz, M. (2008). Country Responses to the Food Security Crisis: Nature and Preliminary Implications of the Policies Pursued. Rome, Agricultural Policy Support Service, FAO.

Demeke, M., Pangrazio, G., Maetz, M. (2009). Country responses to the food security crisis: Nature and preliminary implications of the policies pursued. FAO's Initiative on Soaring Food Prices, FAO, Rome.

Demeke, M., Dawe, D., Bell, W. (2012). Analysis of incentives and disincentives for maize in Ethiopia. Technical notes series, MAFAP, FAO, Rome.

Demeke, M., Doroudian, A., Morales-Opazo, C. (2013). Understanding the Domestic Staple Food Grains Volatility in Developing Countries. Forthcoming.

Dewbre, J., Giner, C., Thompson, W., Von Lampe, M. (2008). High food commodity prices: will they stay? Who will pay? Agricultural Economics, 39, supplement, pp. 393-403.

Dorward, A. (2011). Getting real about food prices. Development policy review, 29 (6), pp. 647-664.

Dorward, A. (2012). The short and medium term impacts of rises in staple food prices. Food security, 44(4), pp. 633-645.

D'Souza, A., Jolliffe, D. (2010). Rising food prices and coping strategies: Household- level evidence from Afghanistan. Documento de trabajo n.o 5466 sobre investigaciones de políticas. Washington, DC, Banco Mundial.

European Central Bank (2011). Structural features of distributive trades and their impact on prices in the Euro Area, Occasional Paper Series No 128.

European Central Bank (2012). Measuring Inflation - the Harmonized Index of Consumer Prices (HICP). [online]. Available from: http://www.ecb.int/stats/prices/hicp/html/index.en.html [Last accessed on March 2013].

European Commission (2007). The impacts of the developments in agricultural producer prices on consumers. Note to the file, Brussels, CM/WM/PB d 34703.

European Commission (2008). Subject: Update on recent price developments in EU-27 agriculture and retail prices. Note for the file, Brussels, CM D.

European Commission (2009). Analysis of price transmission along the food supply chain in the EU. Accompanying document to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A better functioning food supply chain in Europe. COM (2009) 591.

EUROSTAT (2012). At risk of poverty or social inclusion in the EU-27. EUROSTAT newsrelease, STAT/10/171.

EUROSTAT (2013a). Glossary: Equivalised disposable income - Statistics Explained (2013/4/4)
<http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Equivalised_dispo sable_income>

EUROSTAT (2013b). "Glossary: Purchasing power standard (PPS)" - Statistics Explained (2013/4/5)
<http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Purchasing_power _standard_(PPS)#>

Fang, C. (2010). How China stabilized grain prices during the global price crisis. In D. Dawe, ed. The rice crisis: markets, policies and food security. London, Earthscan and Rome, FAO.

FAO (2008). The 2007-08 Rice Price Crisis: How policies drove up prices... and how they can help stabilize the market, Economic and Social Perspectives, Policy Brief No. 13.

FAO (2008b). Soaring Food Prices: Facts, Perspectives, Impacts and Actions Required. High-level Conference on World Food Security: the Challenges of Climate Change and Bioenergy. Rome.

FAO, WFP and IFAD. (2009). State of Food Insecurity in the World- Economic Crisis. FAO, Rome.

FAO (2010). Global hunger declining, but still unacceptably high. Economic and Social Development Department Policy Brief No. 11, FAO, Rome.

FAO (2010). Rice Market Monitor, Vol XIII, issue 3.

FAO, WFP, IFAD. (2010). State of Food Insecurity in the World- Protracted crisis. FAO, Rome.

FAO (2011). Rice Market Monitor, Vol XIV, issue 3.

FAO, IFAD, IMF, OECD, UNCTAD, WFP, the World Bank, the WTO, IFPRI, UN HLTF, (2011). Interagency Report to the G20 on Food Price Volatility.

FAO, WFP, IFAD (2011). State of Food Insecurity in the World FAO, Rome.

FAO-RLC (2009). Panorama de la Seguridad Alimentaria en America Latina y el Caribe. Santiago de Chile.

FAO-RLC (2011). Panorama de la Seguridad Alimentaria en America Latina y el Caribe. Santiago de Chile.

Ferrucci, G., Jimenez-Rodríguez, R., Onorante, L. (2010). Food price pass-through in the Euro Area. The Role of Asymmetries and non-linearities. European Central Bank Working Paper Series, No 1168.

Ferrucci, G., Jimenez-Rodríguez, R., Onorante, L. (2012). Food Price Pass-through in the Euro Area: Non-linearities and the Role of the Common Agricultural Policy. International Journal of Central Banking, 8(1), pp. 179-217.

Fujii, T. (2013). Impact of food inflation on poverty in the Philippines, Food Policy, Volume 39, April 2013, Pages 13-2.

Fusco, A., Guio, A.C., Marlier, E. (2010). Characterising the income poor and the materially deprived in European countries. In: Atkinson A.B., Marlier, E. (Eds.), Income and living conditions in Europe. EUROSTAT, European Commission, pp. 134-153.

Gabrijelcic, M., Lenarcic, A., Pisanski, M. (2012). Food prices pass-through in Slovenia. Banka Slovenije, Prikazi in analize 5/2012.

Gilbert, C.L., Morgan, C.W. (2010). Food price volatility. Philosophical Transactions of the Royal Society B, 365, pp. 3023-3034.

Gilbert, C.L. (2011). Grains price pass through, 2005-2009. In: Prakash A. (Ed), Safeguarding food security in volatile global markets. FAO, Rome, pp. 122-143.

Gotz, L., Glauben, L., Brummer, B. (2013). Wheat export restrictions and domestic market effects in Russia and Ukraine during the food crisis, Food Policy, Vol 38, IS 0, sp 214-226.

Guasch, J., Laffont, J., Straub, S. (2008). Renegotiation of concession contracts in Latin America. Evidence from the water and transport sector. International Journal of Industrial Organitzation 26, 421-442.

Gulati, A., Dutta, M. (2010). Rice policies in India in the context of the global rice spike, in The Rice Crisis: Markets, policies and food security, ed. by Dawe, D. London, FAO and Earthscan.

Headey, D., Fan, S. (2008). Anatomy of a crisis: the causes and consequences of surging food prices. Agricultural Economics 39 (Supplement)): 375–391.

Headey, D., Fan, S. (2010). Reflections on the global food crisis. How did it happen? How has it hurt? And how can we prevent the next one? International Food Policy Research Institute, Research Monograph, No. 165.

Headey, D., (2011). "Was the global food crisis really a crisis?: Simulations versus self-reporting," IFPRI discussion papers 1087, International Food Policy Research Institute (IFPRI).

Headey, D. (2013). "The impact of the global food crisis on self-assessed food security," Policy Research Working Paper Series 6329, The World Bank.

Hertel, T., Ivanic, M., Preckel, P., Cranfield, J. (2004). The earnings effects of multilateral trade liberalization: implications for poverty. The World Bank Economic Review 18 (2), 205–236.

Hertel, T., Winters, L. (2006). Poverty and the WTO: Impacts of the Doha Development Agenda. Basingstoke and Washington DC: Palgrave-Macmillan and the World Bank.

HLPE (2011). Price Volatility and Food Security. A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.

Huang, K.S. (1999). Effects of food prices and consumer income on nutrient availability. Applied Economics, 31(3), pp. 367-380.

Huang, J.K., Yang, J., Rozelle, S. (2010). China's Agriculture: Drivers of Change and Implications for China and the Rest of World, Agricultural Economics, Vol. 41: 47-55.

Huang, K.S., Wu Huang, S. (2012). Consumer welfare effects of increased food and energy prices. Applied Economics, 44, pp. 2527-2536.

IGC (2010). Grain Market Report. GRM.424. International Grain Council, London.

International Monetary Fund (2008a). Europe: Coping with high commodity prices. Regional Economic Outlook, Dealing with shocks, World Economic and Financial Surveys, Chapter 2, pp. 19-36.

International Monetary Fund (2008b). Is inflation back? Commodity Prices and Inflation. World Economic Outlook, Chapter 3, pp. 83-128.

IMF (2011). Rising Food Prices May Be Here to Stay. Report base on -IMF Survey online.

Ivanic, M., Martin, W. (2008). Implications of higher global food prices for poverty in low-income countries. Agricultural Economics 39(s1): 405-16.

Jensen, R., Miller, H. (2008). Giffen Behavior and Subsistence Consumption American Economic Review, 98:4, 1553–1577.

Jin, H.J., Kim, T. (2012). Structural Changes in the Time Series of Food Prices and Volatility Measurement. American Journal of Agricultural Economics, 94(4): 929-944.

Keats, S., Vignieri, M., Wiggins, S., Compton, J. (2010). Price transmission? A review of domestic price experiences over the 2007/08 global food.

Key, N., Sadoulet, E., de Janvry, A. (2000). Transactions costs and agricultural household supply response. American Journal of Agricultural Economics 82(2), 245–259.

Kim, J. (2011). Recent Trends in Export Restrictions, by Jeonghoi Kim, OECD Trade Policy Working Paper No. 101, Organisation for Economic Co-operation and Development.

Kumar, N., Quisumbing, A.R. (2013). "Gendered impacts of the 2007–2008 food price crisis: Evidence using panel data from rural Ethiopia," Food Policy, Elsevier, vol. 38(C), pages 11-22.

Larson, E. A. (2011). Corporate social responsibility and transboundary flows of virtual water: bringing multinational food companies into a political economic discussion of water security, unpublished MSc dissertation, Department of Geography, King's College London.

Lasco, C., Myers, D., Bernsten, H. (2008). Dynamics of rice prices and agricultural wages in the Philippines. Agricultural Economics 38: 339–348.

Ligon, E. (2008). Food prices and the welfare of poor consumers. In: Special Issue: Causes and consequences of the food price crisis. Giannini Foundation of Agricultural Economics, University of California.

Listorti, G. Esposti, R. (2012). Horizontal Price Transmission in Agricultural Markets: Fundamental Concepts and Open Empirical Issues. Bio-based and Applied Economics, 1(1), pp. 81-96.

Lloyd, T.A., Morgan, C.W., Davidson, J., Halunga, A., McCorriston, S. (2011). Retail Food Price Inflation Modelling Project. Final Report. [online]. Available from: http://archive.defra.gov.uk/foodfarm/food/pdf/retail-food-price110809.pdf [Last accessed on March 2013].

Lloyd, T.A., McCorriston, S., Morgan, C.W., Zgovu, E. (2012). The experience of food price inflation across the EU in TRANSFOP, Working Paper No.5, TRANSFOP project, EU 7th

Framework Programme, Grant Agreement No. KBBE-265601-4-TRANSFOP, http://www.transfop.eu/

Maxwell, D., Caldwell R., Langworthy, M. (2008). "Measuring Food Insecurity: Can an Indicator Based on Localized Coping Behaviors be Used to Compare Across Contexts?" Food Policy Vol. 33(6), pp. 533–540.

Martin, W., Andersen, K. (2011). Export restrictions and price insulation during commodity price booms. Washington, DC: World Bank Economic Research Discussion Paper (April 25).

Martin, L., Anderson, K. (2012). "Export Restrictions and Price Insulation During Commodity Price Booms," American Journal of Agricultural Economics, Agricultural and Applied Economics Association, vol. 94(2), pages 422-427.

McCorriston, S. (2012). Commodity prices, Government Policies and Competition. In: Evenett, S.J., Jenny, F. (Eds), Trade, Competition and the Pricing of Commodities. Centre of Economic Policy Research.

McMichael, P. (2009). Banking on agriculture: A review of the world development report 2008. Journal of Agrarian Change 9(2), 235–246.

Meyer, J., Von Cramon-Taubadel, S. (2004). Asymmetric Price Transmission: A Survey. Journal of Agricultural Economics, 5(3), pp. 581-611.

Minot, N., Roy, D. (2007). Impact of high-value agriculture and modern marketing channels on poverty: An analytical framework. Mimeo, International Food Policy Research Institute, Washington, DC.

Minot, N. (2010). Transmission of World Food Price Changes to Markets in Sub-Saharan Africa. Unpublished research report, International Food Policy Research Institute (IFPRI), Washington DC.

Mittal, A. (2009). The 2008 Food Price Crisis: Rethinking Food Security Policies. G-24 Discussion Paper Series No. 56. UNCTAD.

Morrison, A., Raju, D., Sinha, N. (2008). "Gender Equality, Poverty and Economic Growth", Policy Research Working Paper 4349, World Bank, Washington, DC.

Murphy, A.G., Hartell, J., Cárdenas, V., Skees, J.R. (2012). Risk Management Instruments for Food Price Volatility and Weather Risk in Latin America and the Caribbean The Use of Risk Management Instruments Institutions for Development. IFD DISCUSSION PAPER No. IDB-DP-220.

National Bank of Belgium (2008). Processed food: inflation and price levels. In: The trend in inflation in Belgium. An analysis by the NBB at the request of the Federal Government, special edition, Economic Review, Annex D, pp. 53-72.

Nogués, J.J. 2011. Agricultural Export Barriers and Domestic Prices: Argentina during the last Decade. Working paper to be presented at the August 2012 meetings of the International Agricultural Economics Association in Foz do Iguazu, Brazil.

ODI. (2008). Rising food prices: A global crisis. Briefing paper 37- ODI.

OECD. (2008). Rising Agricultural Prices: Causes, Consequences and Responses. (Ed.) Policy Brief. Paris, Organisation for Economic Co-operation and Development (OECD).

Polaski, S. (2008). Food prices, poverty, and small-scale farmers: getting the global trade regime right., Paper presented at FAO Experts. Meeting on Policies for the Effective Management of Sustained Food Price Increases.

Porqueddu, M., Venditti, F. (2012). Do food commodity prices have asymmetric effects on Euro Area inflation? Banca de Italia, Working Papers nº878. [online]. Available from: http://www.bancaditalia.it/pubblicazioni/econo/temidi/td12/td878_12/en_td878/en_tema_878.pdf [Last accessed on March 2013]

Prakash, A. (2011). Why volatility matters. In Prakash, A. (ed), Safeguarding Food Security in Volatile Global Markets. Rome: FAO, 1-24.

Quisumbing, A., Stein, A. (2009). Stabilization programme: managing The impact of improving nutrition during   domestic prices during the 2008 crisis. early childhood on education among guatemalan adults. Economic Journal, Review of the role 119 (537): 734-763.

Raihan, S. (2009). Impact of Food Price Rise on School Enrollment and Dropout in the Poor and Vulnerable Households in Selected Areas of Bangladesh. Published in: (March 2009)

Rapsomanikis, G. Sarris, A. (2010). Market integration and uncertainty: The impact of domestic and international commodity price variability on rural household income and welfare in Ghana and Peru, The Journal of Development Studies, 44(9): 1354–1381.

Rashid, S. (2002). Dynamics of Agricultural Wage and Rice Price in Bangladesh: A Re - examination. MSSD Discussion Paper No. 44. Washington, DC: International Food Policy Research Institute.

Ravallion, M. (1990). "Rural Welfare Effects of Food Price Changes under Induced Wage Responses: Theory and Evidence for Bangladesh," Oxford Economic Papers 42: 574 - 585.

Ravallion, M. Lokshin, M. (2005). "Winners and Losers from Trade Reform in Morocco" Mimeo, World Bank.

Robles, M., Torero, M. (2010). Understanding the Impact of High Food Prices in Latin America. Economía 10 (2): 117-164.

Rodrick, D. (2008). The Real Exchange Rate and Economic Growth http://ideas.repec.org/s/bin/bpeajo.html

Ruta, M., Venables, A.J. (2012). "International trade in natural resources: practice and policy", CEPR Discussion Paper 8903; Annual Review of Resource Economics.

Sabates-Wheeler, R., Devereux, S. (2010). Cash transfers and high food prices: Explaining outcomes on Ethiopia's Productive Safety Net Programme, Food Policy, Volume 35, Issue 4, Pages 274-285,

Sarris, A., Morrison, J. (eds). (2010). Food Security in Africa: Market and Trade Policy for Staple Foods in Eastern and Southern Africa. Food and Agriculture Organization of the United Nations and Edward Elgar Publishing, Northampton, MA, USA.

Schnepf, R. (2012). Consumers and food price inflation. Congressional Research Service Report for Congress. [online]. Available from: http://www.fas.org/sgp/crs/misc/R40545.pdf [Last accessed on March 2013].

Schwarz, G., von Witzke, H., Noleppa, S. (2009). Determinants of International Agricultural Market Prices: The roles of energy prices and biofuel production. Paper presented at the International Agricultural Trade Research Consortium (IATRC) Symposium "Confronting Food Price Inflation: Implications for Agricultural Trade and Policies, Seattle, June 22 – 23, 2009.

Sharma, R., Konandreas, P. (2008). WTO provisions in the context of responding to soaring food prices, FAO Commodity and Trade Policy Research Working Paper No. 25, FAO, Rome.

Sharma, R. (2011). Food export restrictions: Review of the 2007-2010 experience and considerations for disciplining restrictive measures. Rome: FAO Commodity and Trade Policy Research Working Paper No. 32, UNFAO (May).

Sims, C. A. (1980). Macroeconomics and Reality. Econometrica, 48(1), pp.1–48.

Stigler, M. (2011). Commodity prices: theoretical and empirical properties. In: Prakash A. (Ed). Safeguarding food security in volatile global markets. FAO, Rome, pp. 25-41.

Swindale, A., Bilinski, P. (2006). "Development of a Universally Applicable Household Food Insecurity Measurement Tool: Process, Current Status, and Outstanding Issues." Journal of Nutrition 136(5):1449S-1452S.

Swinnen, J. (2011).' The right price of food'. Development Policy Review, 29(6), 667- 68.

Tangerman, S. (2011). Policy Solutions to Agricultural Market Volatility: A Synthesis. International Center for Trade and Sustainable Development (ICTSD). Issue Paper no. 33, Geneva.

Tefera, N., Demeke, M., Rashid, S. (2012). Welfare Impacts of Rising Food Prices in Rural Ethiopia: a Quadratic Almost Ideal Demand System Approach

Teravaninthorn, S., Raballand, G. (2008). Transport Prices and Costs in Africa: A Review of the Main International Corridors, Washington, D.C.: World Bank.

Timmer, P. (1989). Food price policy: The rationale for government intervention. Food Policy 14(1): 17-27.

Timmer, P. (1991). "Food Price Stabilization: Rationale, Design, and Implementation," in Dwight H. Perkins and Michael Roemer, eds., Reforming Economic Systems. Cambridge: Harvard Institute for International Development, Harvard University. Distributed by Harvard University Press, pp. 219-48 and pp. 456-59.

Timmer, P. (1993). Food price stabilization: The relevance of the Asian experience to Africa. Pp. 107-27 in Nathan C. Russell and Christopher R. Dowswell, eds., Policy options for agricultural development in Sub-Saharan Africa. Mexico City, D.F.: CASIN/SAA/Global 2000.

Timmer, P. Dawe, D. (2007). Managing food price instability in Asia: A macro food security perspective. Asian Economic Journal 21(1): 1-18.

Timmer, P. (2008). Causes of High Food Price, plus Technical Annexes. ADB Economics Working Paper Series No. 128 (October), Asian Development Bank, Manila.

Timmer, P. (2010). Reflections on food crises past. Food Policy 35: 1-11.

Torlesse, H., Kiess, L., Bloem, M.W. (2003). Association of Household Rice Expenditure with Child Nutritional Status Indicates a Role for Macroeconomic Food Policy in Combatting Malnutrition, Journal of Nutrition, 133(1320-25).

Ul-Haq, Z., Nazli H., Meilke, K. (2008). "Implications of high food prices for poverty in Pakistan," Agricultural Economics, 39(s1): 477-84.

UNCTAD (2009). The financialization of Commodity Market. Trade and Development Report 2009. Genève.

UNDP (2012). Food Production and Consumption Trends in Sub-Saharan Africa: Prospects for the Transformation of the Agricultural Sector. WP 2012-011: February 2012

USDA - ERS, Price Spreads form farm to consumer (2012), <http://www.ers.usda.gov/data-products/price-spreads-from-farm-to-consumer.aspx>, Dairy, Field Crops, Meat, last accessed April 2013

Valdés, A., McCalla, A. (2004). Where the interests of developing countries converge and diverge. Chapter 7 in M. Ingco and A. Winters (eds.) Agriculture and the New Trade Agenda: Creating a Global Trading Environment for Development. Cambridge University Press.

Valdés, A., Foster, W. (2012). Net Food-Importing Developing Countries Who They Are, and Policy Options for Global Price Volatility, ICTSD Programme on Agricultural Trade and Sustainable Development- Working Paper.

Vavra, P., Goodwin, B. K. (2005). Analysis of Price Transmission Along the Food Chain, OECD Food, Agriculture and Fisheries Working Papers, No. 3, OECD Publishing. doi:10.1787/752335872456.

Verpoorten, A., Abhimanyu, A., Stoop, N., Swinnen, J. (2013). Self-reported food insecurity in Africa during the food price crisis, Food Policy, Volume 39, April 2013, Pages 51-63.

Von Braun, J., Tadesse, G. (2012). Global Food Price Volatility and Spikes: An Overview of Costs, Causes, and Solutions. EF - Discussion Papers on Development Policy 161.

Ward, T. (2009). Material deprivation. In: T. Ward, O. Lelkes, H. Sutherland, I. György Töth (Eds.), European Inequalities: Social Inclusion and Income Distribution in the European Union; Budapest: TÁRKI Social Research Institute Inc.

Wodon, Q., Zaman, H. (2009), " Higher Food Prices in Sub-Saharan Africa: Poverty Impact and Policy Responses", Research Observer

Wood, B., Nelson, C.H., Nogueira, L. (2012). Poverty effects of food price escalation: the importance of substitution effects in Mexican households. Food Policy, 37, pp. 77-85.

World Bank (2008). "Rising Food and Fuel Prices: Addressing the Risks to Future Generations." World Bank Human Development and Poverty Reduction and Economic Management Networks.

World Bank (2009). "Welfare Impact of Rising Food Prices in South Asia." Policy Note. South Asia Economic Policy and Analysis Unit. Washington, DC: World Bank.

World Bank. (2010). Food Prices and Rural Poverty. The International Bank for Reconstruction and Development/The World, Washington, DC ,USA

World Bank (2012). Road freight in central America. Washington, DC ,USA

Yang, J., Huanguang, Q., Huang, J., Rozelle, S. (2008). Fighting Global Food Price Rises in the Developing World: the Response of China and its Effect on Domestic and World Markets. Agricultural Economics. Forthcoming.

Zezza, A., Davis, B., Azzarri, C., Covarrubias, K. (2008). The Impact of Rising Food Prices on the Poor. Food and Agriculture Organization, Rome.