Commodity market instability and asymmetries in developing countries: Development impacts and policies

Edited by Alexandros SARRIS





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Introduction

Alexandros Sarris

Economic market instability has been at the center of development policy debate in the recent past, starting with the food commodity prices spikes on 2007-8, then continuing with the 2009-10 financial crisis, the ongoing energy market volatility, and the continuing commodity market instability of the last few years. Risk, defined as exposure to uncertain future events, is part of everyday life, and people and countries have learned to deal with it over centuries. However, there is a growing realization that uncertainty and risk maybe crucial to a country's growth and development as well as its welfare. Sudden and unanticipated shocks, whether caused by natural events, or economic developments affect developing countries, as well as poor people in unequal ways. Commodity market risks in particular are well known to affect development and welfare in a variety of ways and it is important to understand these so as to prioritize policy actions, and to design strategies to avoid the undesirable parts of the consequences. In particular commodity market shocks may have both asymmetric patterns and asymmetric impacts, namely differing in booms and busts, or create irreversibilities that may hamper subsequent development. While considerable research has taken place in the past to understand the influences of commodity market shocks, asymmetries and irreversibilities have not been studied much. It was to this general topic that the conference was addressed. The general purpose of the conference was on the one hand to examine the state of the art in the area of asymmetries and irreversibilities relating to commodity market instability and development, with the purpose to first pinpoint gaps in current research, and secondly to highlight promising areas of policy intervention to aid developing countries to manage/cope with market instability. While commodity market instability can originate in many ways, the workshop was restricted to market instability arising from natural or other unpredicted events, as well as unforeseen market developments.

The conference was organized around the following themes. Trends and asymmetries in market instability; instability asymmetries and market distortions; market instability and impacts in developing countries; policies addressing commodity market instability. The policy briefs in this compendium are presented according to their contribution to these themes.

Trends and asymmetries in market instability

The major problem with commodity markets, which impinges negatively on all market participants is unpredictability (Sarris, chapter 1). Unpredictability coupled

with food commodity import dependence is what undermines food security for many low income food deficit countries. The reactions of governments to food commodity price spikes are normally stronger than to periods of low prices as it is large numbers of poor and urban consumers that seem most vulnerable. Price spikes are transmitted more strongly to domestic markets compared to price decreases. Prevention of price spikes is difficult, if not impossible, but there exists a variety of market based ways to manage market volatility and spikes.

Gilbert (chapter 2) indicates that there has not been a trend in food commodity market volatility over the long run. While the average real prices seem to have declined, recent experience suggests a leveling off, if not a shift to an upward trend. Food market price volatility increases in the recent past seem to have been an exceptional event. Gilbert argues that index traders, namely traders not related to the actual commodity markets and investing mostly in commodity index futures, had a small price impact in the 2008 price spike, and it was more fundamental factors that influenced prices. On the other hand it appears that the 2007-8 food price spike had the characteristics of a price bubble.

Whether a commodity price shift is permanent or temporary can have significant impact on policies in commodity dependent countries. Ghoshray (chapter 3) suggests that there seem to exist asymmetries in commodity price behavior when they are subjected to sophisticated econometric tests. Such asymmetries relate to the longer duration of slumps compared to booms, and to asymmetric fluctuations around secular trends.

Instability, asymmetries and market distortions

Does instability create market distortions? Pieters and Swinnen (chapter 4) develop a political economy model to test whether governments have traded off price distortions for reduced domestic market volatility. They show that when taking into account this trade-off, many policy distortions do not seem to be compatible with minimizing volatility in domestic markets. Their empirical results, nevertheless, indicate that the inefficiency of actual government policies during price spikes is correlated with ex-ante distortions.

Do domestic prices in developing countries respond faster to increases rather than decreases of international prices? Brunelin (chapter 5) analyzes domestic prices of imported and local rice in three West African markets-Senegal, Chad, and Mali- to examine this question and to test for asymmetry in the transmission of large and small shocks. She finds that the results are mixed. Asymmetric price transmission is found in the main rice markets of Mali and Senegal, which might be attributed to domestic government interventions, reinforcing the results of Pieters and Swinnen.

One potential source of asymmetries can result from the liquidity constrained behavior of developing country farmers. Maitre d'Hotel and Le Cotty (chapter 6) suggest that the tendency of farmers in Africa to sell early in the season, namely after harvest, due to their need for cash, creates asymmetric price dynamics. Farmers are assumed to sell their produced crop in anticipation of price increases, but if actual prices are not what they expect, they tend to continue holding stocks, and this creates the possibility that when these stocks are actually sold, unanticipated price drops may occur. This hypothesis is tested with data from Burkina Faso, and it is shown that unanticipated price drops indeed lead to higher than expected carryovers, and eventually larger negative price drops.

Market instability and impacts in developing countries

An interesting question pertains to the market instability of food commodities in coastal versus landlocked countries. If food markets are well connected to international markets, larger transaction costs for landlocked countries would suggest that volatility should be larger in landlocked countries. Greb and Rapsomanikis (chapter 7) consider this issue empirically with a large panel of monthly prices of five basic food commodities in 49 countries. They find that food markets in landlocked countries are not more volatile than those in coastal countries. They rationalize this by suggesting that the largest contributor to food price volatility in landlocked countries is the variation of local production, rather than international market volatility, due to lower connectivity to global markets. Similarly they find that the more open to regional trade a country is the lower its food market volatility, and also that food stocks lessen volatility mostly in landlocked countries, both results consistent with a-priori reasoning.

How does commodity market volatility affect developing countries? Ziegelhofer (chapter 8) utilizes a large pseudo panel data set of 38 countries which have data from Demographic and Health Surveys. He decomposes international price data into trends and volatility components around trends, and finds that there is an overall negative relationship between the variation in global food prices and household welfare. The effect is transmitted through short-term price movements (volatility), medium-term changes (period-to-period change) and permanent shocks to global food prices. The effects on household welfare are strong in terms of equivalent education effects and estimated effects of the above indicators on malnutrition rates.

A crucial question for policy is whether price shocks induce poverty traps. Mukasa (chapter 9) examines, using a longitudinal data set from Uganda, whether food price shocks reinforce poverty traps. He uses sophisticated econometric techniques to show that such shocks lower the rate of consumption growth, and the more so the more vulnerable is the household in terms of exposure to food price shocks. However, he does not find evidence that food price shocks induce or reinforce poverty traps.

While commodity price risk can have detrimental impacts on households, the impact on household welfare is not a-priori determinate, as the specific impacts depend on the degrees of risk preference of households. In particular it is not clear that the existence of price instability leads producers to reduce production, as

theoretically expected, and whether this effect is different if producers are faced with price ambiguity, namely imprecise knowledge about the underlying risk profile of the prices they face. Lee, Bellmare, and Just (chapter 10) conduct a lab experiment with students from Cornell University to test these propositions. They find that more risky prices lead, counterintuitively, to increases in production, and that increases in ambiguity reduce output, which is more in line with a-priori expectations. This suggests that some price uncertainty may not be all that bad for overall food production and food security, but too much uncertainty may indeed be detrimental.

A different albeit interesting issue is taken up by Cariolle (chapter 11). This is whether rent seeking and corruption increase during export booms and decrease during negative price changes, namely are procyclical. The reverse, namely the countercyclical nature of corruption could arise from competition for temporarily scarce resources, namely survival behavior. Cariolle uses an extensive microeconomic firm level data set from 38 developing countries in combination with macroeconomic variables, and finds that opportunistic corrupt behaviors spread during export booms while survival corruption behaviors, namely competition for temporarily scarce resources, spread during export busts. Hence corruption seems to arise during both phases of the commodity cycle. The effects are stronger when the level of democracy is weaker and when credit availability is larger.

Policies addressing commodity market instability

Most governments try to insulate their domestic markets from external commodity shocks. This, according to Martin and Ivanic (chapter 12), has the effect of reducing poverty in times of external shocks. However, when many governments do the same in times of international price rises, the effect is to raise the international price, and this, with a given degree of domestic market insulation by each country results in little overall domestic market stabilization, and no reduction in poverty. Despite the insulation afforded to domestic markets, domestic prices tend to converge after a shock to their longer term levels implied by constant levels of protection.

The role of trade and storage policies in affecting domestic price stability is examined by Kornher, Kalkuhl and Muhajid (chapter 13). They indicate that trade policies and quality of institutions are the most important tools to moderate domestic supply and demand shocks, while, however, opening a country to international price risks. These operate both directly as well as indirectly through transactions costs. They highlight the fact that regional trade agreements seem to provide considerable domestic stabilization possibilities. They also indicate that stock policies are price stabilizing, but not necessarily if they are publicly managed. Stock policies seem to have more stabilizing effect in food importing countries, and are more effective in stabilizing intra-annual prices rather than inter-annual ones.

Many countries adjust their food trade and in particular their export policies countercyclically with food prices, to such an extent that the use by numerous

food exporters of export restrictions has occasionally threatened the food security of food importing countries, by increasing further any international positive price shocks. Gouel (chapter 14) observes these trade policies can worsen the terms of trade of the countries that apply them, but they are adopted for political economy reasons. He uses a framework that considers trade policy coordination when trade policies are driven by terms-of-trade effects and a desire to reduce domestic food price volatility. This framework implies that importing and exporting countries have incentives to deviate from cooperation at different periods: the exporting countries when prices are high and the importing ones when prices are low. Since staple food prices tend to have asymmetric distributions, with more prices below than above the long term mean but with occasional spikes, a self-enforcing trade agreement generates asymmetric outcomes. Without cooperation, an importing country uses more frequently its trade policy because of the concentration of prices below the mean, but an exporting country has a greater incentive to deviate from a cooperative trade policy because positive deviations from the mean price are larger than negative ones. Thus, the asymmetry of the distribution of commodity prices can make it more difficult to discipline export taxes than tariffs in trade agreements.

The new environment that many developing countries face post 2011, implies that these countries have greater needs for policies to manage and cope with higher and persisting global food market volatility. In light of their weak policy formation capacities, there is a significant role for international organizations like the World Bank, IFAD, AFD, IADB etc. to play in increasing the countries' capacities to cope with this new world scenario. The issue is whether the policies recommended are consistent with the scientific evidence on their potential costs and benefits. Short term policy recommendations to cope with food price volatility have tended to emphasize support for the poor and price stabilization through trade restrictions and food reserves. Longer term policies have emphasized productivity gains. Torero (chapter 15) suggests that there seem to have been some inconsistencies in policy recommendations given to countries by some international organizations and by high-level meeting documents prepared for action by high level policy makers.

Chapter 1

Commodity market instability and development. Issues and policies

Alexandros Sarris

The purpose of this paper is to review the various aspects of commodity market instability and development, with the purpose to identify whether research has dealt with some of the pressing issues relating to the topic during the past years, to identify appropriate policy measures to deal with food price spikes in particular, and to identify promising areas for further research. Market instability or volatility normally refers to variations of market prices from period to period. As such it is an ex-post concept, in the sense that everyone can observe the market variations. However, what matters for both market participants as well as policy makers are not the market price variations per se, but their unpredictability, and the risks they create. Uncertainty of the variable x, when looked at from some period before its realization, is basically a summary measure of the unpredictable elements in the process determining x, that are likely to occur between the time of the prediction and the time of realization of the variable x. Risk, in turn is generated by uncertainty. In other words risk is generated by actions whose outcomes are subject to unpredictability.

The principal concern of market participants and policy makers alike is not large ex-post variations in observed prices per se, but large shifts in the degree of unpredictability or uncertainty of subsequent prices. Such large shifts normally also cause large changes in observed market prices and are associated with what has been termed "excess volatility", a rather elusive concept referring to variations of prices outside what maybe inferred or predicted on the basis of expectations of rational efficient markets.

The detrimental effects of uncertainty or unpredictability on both private agents, as well as governments are not hard to understand, and have been the object of both discussion as well as research for a long time. For instance, Keynes argued that commodity price fluctuations led to unnecessary waste of resources, and, by creating fluctuations in export earnings, had a detrimental effect on investment in new productive capacity, and tended to perpetuate a cycle of dependence on commodities, what we may call in modern growth terminology a "commodity development trap".

That unpredictability is the main problem in agricultural production is one of the oldest, but apparently forgotten or not appreciated, issues in agricultural economics. In fact one of the earliest classic works in agricultural economics considered exactly the issue of agricultural price unpredictability and the benefits of establishing forward prices for producers. By establishing forward prices for agricultural producers, one basically eliminates one of the most troublesome and potentially damaging sources of income unpredictability, and makes producers able to plan better their activities.

While general commodity market instability and upredictability is crucial for commodity exporting countries, and this is where the commodity dependence literature has focused for most of the past 40 years, food commodity dependence, expecially by LDCs, LIFDCs, and NFIDCs¹ came to the fore with the first world food

LIFDCs (Low Ijncome Food Deficit Countries) are a FAO classification. The latest list of May 2012 includes 62 countries. The list of LDCs (Least Developed Countries) is one used by the United Nations (UN) and as of 2012 includes 49 countries. Almost all LDCs are also included in the LIFDC list. The list of NFIDCs (Net Food Importing Developing Countries) is a World Trade Organization (WTO) group, which as of 2012 includes all 49 LDCs and another 31 higher income developing countries, for a total of 80 countries.

crisis of 1973-74, and recently with the food crisis of 2007-8. Food market instability and especially unpredictability matters a lot for food security for countries and households that are net staple food buyers.

The reactions to the recent price boom, suggest that policy reactions to the food price surge have been prompt, with governments in many developing countries initiating a number of short-run measures, such as reductions in import tariffs and export restrictions, in order to harness the increase in food prices and to protect consumers and vulnerable population groups. Other countries have resorted to food inventory management in order to stabilize domestic prices. A range of interventions have also been implemented to mitigate the adverse impacts on vulnerable households, such as targeted subsidized food sales. Most of these measures were government led, manifesting a retreat from earlier market oriented strategies for food security.

The major issue relevant to the impact of high international food prices, and/ or unpredictable food price spikes on food security, is the impact on poor rural and urban net staple food buying households. This impact in turn depends on two factors. First, it depends on the share of staple foods in total consumption expenditures. Secondly, it depends on the degree to which international food prices are "transmitted" to the local markets.

On the first issue empirical research has shown that in most low-income countries, people living on less than \$1.25 per day are largely net buyers of staple foods, and the share of these foods in total expenditures is very high, usually larger than 50 percent. On the second issue t has been documented that policies of various countries have been insulating domestic from international markets, thus exacerbating price variations in the residual international market. Based on such assessment, studies have shown that the potential increases in poverty and hunger due to the world food price spikes is significant.

In terms of asymmetric price behavior and imperfect markets, it has been shown that spreads between domestic consumer prices and respective international commodity prices, as well as spreads between domestic wholesale prices and international prices increased dramatically in the 25 year period before 1997, because of the asymmetric response of domestic consumer prices to movements in world prices. In all major consumer markets, decreases in world commodity prices have been systematically much less transmitted than increases to domestic consumer prices. This asymmetric response, which has been attributed to trade restrictions and processing costs, appears rather to be largely caused by the behavior of international trading companies.

A well known possible consequence of large real income shocks for individual households is the fall into poverty traps. The idea is that a short term shock may induce a household to lose a substantial amount of its productive assets, thus, in the presence of credit constraints, not allowing it to produce adequate income in subsequent periods, and hence falling in a state of chronic poverty.

Increases in market prices of basic purchased commodities, such as wheat,

maize, or rice, would have to be substantial to induce a large income shock. To accommodate large consumer food price rises households employ a variety of "consumption smoothing" strategies, or reduce the amount of consumption of the staple. As reducing or selling assets is one such strategy, and a shock may induce the sale of productive, rather than unproductive assets, the possibility is very real that a commodity price shock can induce poverty traps. No evidence, however, of any such occurrence has as yet been provided in the literature in light of the recent or earlier food crises.

There are basically two ways in which individual countries can manage their domestic food markets in the face of excessive international market volatility. One involves trade actions, and the other involves public stockholding. If countries or other agents can be assured their commodity supplies through trade, then they would need to carry lower levels of security stocks. Hence trade can be an important substitute for carrying costly physical inventories. In the recent as well as previous food crises, there were three major trade facilitation related problems that caused governments to examine carrying larger security stocks. The first concerned unexpected and uncoordinated export bans by key exporters, which tend to increase international prices. The second was the unavailability of import financing for several lower income food importing countries, and the third was the uncertainty about international contract enforcement in times of rising prices.

There are several ways to manage (rather than prevent) market volatility and spikes for the benefit of low-income food importing countries, and there have been several proposals along these lines. The paper reviews all these proposals and makes some new ones. The ones that seem most cost effective and least distorting of international markets are those that are market based. Among those, utilizing existing systems of commodity risk management, such as futures and options, is the easiest, and could be enhanced by the support of new exchanges in developing countries as well as technical assistance on how to exploit the various instruments available.

A new proposal for a new system of a Global Financial Food Reserve (GFFR) is made, in the form of a fund to finance long positions or food commodities in organized exchanges. Such a fund could constitute a dormant virtual physical reserve that could generate physical and financial resources in times of a spike, so as to benefit highly negatively affected developing countries. In other words the GFFR would be a market based global safety net. Apart from the GFFR, the proposal for a Food Import Financing Facility (FIFF) is also deemed cost effective and an appropriate mechanism to ensure the continuous flow of food imports in times of a spike.

There are ways to guarantee the performance of international food import contracts, through the promotion of standardized international food contracts in existing international commodity exchanges or the linking of existing exchanges and their clearing houses, through an International Grain Clearing Arrangement (IGCA). These could be explored further with the collaboration of existing exchanges. The final set of measures that could be taken involve global safety nets. The GFFR proposed in the paper is one form of such a global safety net, and a physical emergency reserve to smooth out flows of food aid is another. However, others in the form of permanent funds or technical assistance to help needy countries maintain their local food safety nets can also be envisioned.

In summary it appears that there are quite a few cost effective and nondistorting measures and options to lower the probability of food price spikes, and help food importing low-income developing countries to manage the attendant risks. Given that food security is of paramount concern to all counties, especially those that are at low levels of food intake, it appears that the international community has a major role to play in ensuring global food security in a world of growing uncertainty.

Chapter 2

Food prices, food price volatility and the financialization of agricultural futures markets

Christopher L. Gilbert

The supply and demand background

Over the long term, food prices have tended to decline in real terms, as the result of increased yields. Averaging over the four years 2011-14, the deflated price of grains and vegetable oils are respectively 15% and 14% lower respectively than those over the four years 1969-72; the prices of softs (cocoa, coffee, tea and sugar) are 35% lower. However, prices have tended to rise over the period since 2000. In 2011, grains prices were 92% higher than in 2000, vegetable oil prices 136% higher and softs prices 65% higher. Prices have dropped back slightly from 2012.

Supply and demand factors have both contributed to higher food prices. The food demand curve has shifted right as the result of income growth, particularly in Asia. The food supply curve has shifted up as the result of higher input (particularly fertilizer) prices plus a slowdown in yield growth as the consequence of low levels of agricultural investment.

It is an open question whether the fall in prices over the past two to three years will continue. The OECD-FAO Outlook (OECD, 2015) suggests further modest falls but insufficient to bring back prices to historic levels. By contrast, analysis of long term price movements suggests that in the very long run, food supply is almost perfectly elastic – over the past, demand has had no long run effect on prices. High prices make investment attractive and we have seen the impact of this in particular in major increases in US grains production. However, yields remain obstinately low in Africa. Food price optimists take the view that these incentives will be sufficient to bring supply back in line with demand at historical price levels. Pessimists argue that a higher, and perhaps even a continuously rising, long run price will be necessary to feed the rapidly growing world.

Food price volatility

Food price volatilities show little trend over the long run. Volatility is determined by shocks to production and consumption (notably harvest shocks) and is inversely related to supply and demand elasticities. Stocks attenuate volatilities by increasing the elasticity of net supply. There is an argument that production shocks have increased, possibly in part due to global warming, although there is no clear evidence of this impact, and, in grains, because of the increased importance of the Black Sea region where weather conditions are very variable.

Stock levels, which had fallen to low levels by 2007, have now largely recovered. It seems that shock transmission from the crude oil markets to grains and vegetable oils has increased but crude oil price volatility remains low – oil prices are prone to large jumps more than month-to-month oscillation. Volatility was more of a problem over the past decade than it is currently. Comparing the 2011-13 with the nineteen nineties (1990-99), grains price volatility is unchanged at 17%, the volatility of vegetable oils has risen from 16% to 18% but softs volatility has jumped from 18% to 24%. 2014 saw an uptick in vegetable oil volatility, and there was also a smaller rise in grains volatility. These rises may be associated with the sharp downward movements in crude oil prices.

In retrospect, the 2007-08 price and volatility episode does appear to have been exceptional. Real price levels and volatilities both rose; the latter have fallen back but prices have only declined partially and remain relatively high. One possibility is that the volatility was associated with the uncertainty generated in the transition from the previous trend of low and declining prices to the current situation in which higher prices are required to stimulate the additional production required to feed the growing and self-enriching population in the developing world.

► The financialization of food commodity markets

The term financialization refers to the major increase in the presence of financial agents on food commodity futures markets – see Mayer (2010). Statistics produced by the he Bank for International Settlements show the notional value of outstanding commodity derivative positions. The BIS figures show rapid growth in the dollar values of these positions from 2004 to 2008 followed by a subsequent fall back to lower levels from the end of 2008. Even after this fall, the outstanding contract value remains three times that of 2004, prior to the major rise.

Much of the growth in non-commercial activity in commodity futures is attributable to index-based ("CIT") investors. These investments generally take the form of swaps contracted with investment banks - the investor pays \$1m to the bank and receives back \$1m times the change in the commodity index specified in the contract less a fee payable to the bank. The investors are typically pension funds and the like plus rich individuals. They tend to think of commodity futures as an additional asset class and diversify a typically small proportion of an equities plus bonds portfolio into commodities. It is claimed that, over the long term, commodity investments of this sort would have generated returns comparable to those on equities at a comparable level of risk. Historically, commodity returns and equity returns were only weakly correlated so diversification into commodities should have reduced risk. However, these claims are based on simulated returns over a period in which these investments were not available. In practice, the tradable commodity indices have a high energy weighting and so have done well when oil prices have risen and poorly when they have fallen. Because oil price movements are correlated with changes in overall activity and hence with equity price movements, the correlation between commodity and equity returns has risen.

Index traders invest to track one or other tradable commodity index or subindex. They are invariably net long in all markets. They have seen themselves investing in the "commodity asset class" rather than individual commodities. In US Senate testimony, hedge fund manager Michael Masters argued that they were driving commodity prices in 2008: *You have asked the question "Are Institutional Investors contributing to food and energy price inflation?" And my unequivocal answer is "YES"*. He added that they "eat" rather than provide liquidity (Masters, 2008). Irwin and Sanders (2012b) call this view the Masters Hypothesis.

The current academic consensus (Irwin, Sanders, Stoll, Whaley) is that index investors had a negligible impact on agricultural futures prices – Irwin and Sanders (2011, 2012a,b), Sanders and Irwin (2011a,b), Stoll and Whaley (2010). I have taken a different view. Specifically, Simone Pfuderer and I have demonstrated clear evidence of CIT impacts on prices in the soybeans complex – soybeans, soybean oil and (less strongly) soybean meal. There are also high contemporaneous correlations between changes in index positions and returns on agricultural futures. Using an instrumental variable approach (all instruments lagged) we see impact for a wider range of markets, but not in corn or soft wheat (Gilbert and Pfuderer, 2014a,b).

The overall conclusion is that there is some evidence that index investment moved food prices but that evidence is weak for corn (maize) and wheat, the two most important futures-traded grains, and cannot apply to rice, which is not actively traded on a futures exchange. However, agricultural futures account for only a small share of total CIT investment and it is to energy and metals that one should look to see the real CIT action.

Data on index investment positions in non-agricultural futures markets are only available monthly and from June 2010. They do not cover the major build-up in positions in 2006 and 2008. In a 2010 paper for UNCTAD, I constructed a quantum index (equivalent CBOT wheat contracts) for total index position in US agricultural markets. If the agricultural share in total investment is broadly constant, this will provide a good proxy for total index investment. We can compare this index constructed from the limited sample of CIT traders available from January 2006 with the Special Call data for all US commodity futures which is available monthly since mid-2010. The two series track well except over the initial Special Call observations. Granger causality testing is the standard method in the literature for investigating whether one factor is causally related to another. Because the claimed causal variable is lagged, any link cannot be from the effect variable to the causal variable. However, it may be that the structural cause is a third variable which drives the effect and is correlated with the claimed causal variable.

In Gilbert and Pfuderer (2014a), we showed that changes in this index Grangercause changes in the IMF's major non-food commodity price indices. The results are driven by the large upward movements in index investment through to the summer of 2008, the collapse in 2009 and the revival in 2010. Index investment has moved relatively little since 2011. (If we simply estimate over the 2011-14 period, the results are weaker but mainly because the coefficients are less well determined, not because they are at variance with the earlier estimates).

In summary, there is some evidence that index traders had price impacts. However, this is far from arguing that they caused the 2008 food price spike. (The results are less clear in relation to volatility but there the impact appears to have either been null or volatility-reducing). The puzzle with these results is that they are much stronger than the results obtained on weekly data looking at changes in positions in particular markets (corn, wheat etc.) on the prices in those markets. This leads to the suspicion that there may indeed be a third factor which is driving both index investment and the commodity prices. I conclude that

My personal view is that the high 2008 and 2011 prices reflected fundamental factors, but that financial actors, and in particular index investors, played an important role in transmitting fundamental information into the market. This can explain why CIT investment predicts overall movements in commodity prices without necessarily causing impacts in any single market. The explanation does not preclude the possibility that financial actors may have exacerbated fundamentally-based price movements.

Food price bubbles?

There is general agreement that the 1998-2000 Nasdaq dot.com boom was a bubble. Caballero Fahri and Gourinchas (2008), echoed by Phillips, Wu and Yu (2011), have suggested that Nasdaq was just the first of a wave of bubbles moving across asset markets over the final decade of the so-called Great Moderation which ended with the 2008 financial crisis. Subsequent bubbles in this alleged sequence are the US housing price boom, attributed to sub-prime lending, house price booms in Spain and Ireland and the 2007-08 crude oil and food price spikes. Grains and oilseed prices are candidates for inclusion in this list.

Some commentators ascribe this alleged bubble wave to overly loose monetary policies, in particular on the part of the Federal Reserve Board. On this view, investors, flush with funds, chased high nominal returns in markets in which, absent inflation, low returns had become the rule. Behavioral economists emphasize return chasing, extrapolation, herding, and over-optimism on the part of retail investors. Investment in commodity futures is dominated by institutions who do not exhibit these features but who may suffer from "short termism". Institutional investors will aim to beat common "benchmark" portfolios but will not deviate far from the implied allocations for fear of underperforming. Even if they are aware that particular price developments are without fundamental support, they lack the freedom to take a contrarian view.

The mainstream (rational) account of bubbles rests on the view that finance theory gives a good account of the relationship between asset returns (Euler equations), but only a weak account of asset values (the transversality condition). The weak form of the transversality condition appears to rule out bubbles since any bubble will eventually diverge from the fundamental by an arbitrarily large amount. Diba and Grossman (1988) considered periodically collapsing bubbles. They suppose a probability π t that the bubble collapses back to the fundamental in any period t. The higher the bubble component, the more likely it is to burst. On this view, bubbles tend to grow increasingly fast prior to bursting.

Bubble processes are non-stationary but subject to structural breaks. Evans (1991) showed that standard test procedures (such as the ADF) will not work and will fail to find bubbles. I use the Phillips, Shi and Yu (PSY, 2013) procedure which has now become standard in this literature. The procedure uses a combination of backward and forward recursive ADF tests. The forward recursions deliver the Generalized Sup ADF (GSADF) statistic which tests for a bubble at some point in the sample. The backward recursions deliver a sequence of Sup ADF (SADF) tests which time stamp bubble start and end dates. The PSY procedure has previously been used on agricultural futures data by Etienne, Irwin and Garcia (2015) and on metals price data by Figuerola-Ferretti, Gilbert and McCrorie (2015).

Using the approach on weekly data, a single bubble is identified in wheat, at the 5% level, from August 2007 through March 2008 (33 weeks with a 2 week "hole"). In corn two bubbles are identified at the 5% level – from November 2006

through March 2007 (9 weeks) and from February 2008 through July 2008 (28 weeks). In soybeans, a bubble is identified from February to May 2004 (14 weeks) plus a second bubble from November 2007 to April 2008 (22 weeks). There is also evidence of a negative bubble in 2000. There is no evidence of bubbles in 2010-12. Only a single bubble episode is identified in grains and oilseeds over 2000-05 but the years 2006-08 see bubbles in all three markets including simultaneously in February and March 2008. Was this a coincidence?

A crude oil bubble is also identified in 2008 but this came later and after the wheat bubble had terminated. It does not seem possible to blame contagion from the crude oil market. Economists who emphasize fundamentals will point to low stocks over this period. However, low stocks should lead to high but not explosive prices. Economists who emphasize financialization will note that this was exactly the period that the growth in index investment was fastest.

Etienne, Irwin and Garcia (EIG, 2015) analyzed bubbles in agricultural futures markets over the long sample of 1970-2011. They found a substantial number of bubbles but conclude that "bubbles are short-lived" with 65%-80% of episodes concluding within 20 days. EIG use daily data while I use weekly data. My conjecture is that what EIG have identified is futures market froth which is likely to be of little policy concern.

Explosive index investment can account for explosivity in grains and oilseeds prices. The PSY test throws up a bubble for CIT investment in agricultural commodities from October 2007 to June 2008. The coincidence of the explosive periods index investment and in grains futures suggests that index investment was indeed the channel through which impounded their views about market fundamentals into prices. Whether or not one chooses to regard this as a speculative bubble depends on whether one believes that index investors brought new information into the market. This is in effect an inference based on a single episode and so should be treated with caution. Nevertheless, the coincidence is remarkable and reinforces the regression results reported earlier linking index investment to food price movements.

Conclusions

The food commodity price movements in 2007-08 were exceptional. They were also associated with exceptional volatility. The fact that food prices remain high suggests that there was a fundamental driver – I have suggested a rightward shift in the demand curve. However, the volatility was transient. Financial actors, particularly index investors, played a role in impounding the perception of a changed fundamental environment into prices. The end of 2007 and the first half of 2008 were characterized by euphoria across a range of agricultural and other markets. Index investment in food commodities exhibited the same characteristics and may have been instrumental in generating excessively high prices.

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Chapter 3

Asymmetries in Commodity Price Behaviour

Atanu Ghoshray

Many developing countries are dependent on commodity prices as their main source of income. Additional income from commodity price booms can benefit the economies of low income countries that are reliant on a few commodities, while a slump in commodity prices can be harmful. Policy prescriptions can be potentially catastrophic if the income from a commodity boom is diagnosed as permanent when in actual fact turns out to be temporary. It is no surprise therefore, why the dynamic properties of commodity prices in relation to manufactures has been of great interest to economists and policy makers. Deaton and Laroque (1992) in an influential paper have described commodity prices to have long periods of doldrums punctuated by sharp upward spikes. This would imply that in relation to a threshold, commodity prices would be persistently below the threshold and when prices move above it then the movement would be sharp, in the sense that it would revert guickly back to the attractor or long run intertemporal equilibrium.

To address this behaviour we adopt the Threshold Autoregressive (TAR) model due to Enders and Granger (1998) assuming that commodity prices will be stationary. Further, as propounded by Prebisch (1950) in his influential study, primary commodity prices relative to the prices of manufactured goods would fall during cyclical downturns by more than they would rise during cyclical upturns. To test this type of asymmetry related to speed of adjustment, we make use of the Momentum Threshold Autoregressive (M-TAR) model due to Enders and Granger (1998), whereby asymmetry is addressed by suggesting that there is more momentum in price adjustment depending on whether prices are increasing or decreasing. Applying the Enders and Granger method (1998) and the more recently developed and powerful method of Lee et. al. (2011), we find commodity prices to broadly exhibit stationary behaviour with considerable evidence of asymmetries. However, while asymmetries exist, the type of asymmetric behaviour seems to be contrary to what Deaton and Laroque (1992) and Prebisch (1950) propound. In case of the momentum type asymmetry there seems to be some support to the findings of Cashin et. al. (2002). Overall however, asymmetries do exist, and their effect on developing countries can have non-trivial effects which merit further attention.

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Chapter 4

The Political Economy of Food Policy During Price Spikes

Hannah Pieters Johan Swinnen

Introduction

A large political economy literature has focused on what Kym Anderson (2009) refers to as "distortions to agricultural incentives". Governments are regularly under pressure from agricultural producers and food consumers to intervene in agricultural and food markets. In the longer run, this has led to a series of "patterns" of policy distortions.

However in recent years, much of the discussion on global agricultural and food prices has focused on the volatility of these prices and the associated policy interventions. While economists and advisors point at the importance of reducing price volatility based on efficiency gains, economists and policy advisors have often been critical of these policy interventions, criticizing governments for (a) being ineffective, (b) causing distortions in the economy, and (c) reinforcing price fluctuations, etc. (e.g. Anderson *et al.*, 2013).

The basic economic model with static supply and demand equations and perfect markets is not very adequate to capture and measure distortions and inefficiencies in such conditions of market imperfections and volatility. In this perspective, Pieters and Swinnen (2015) develop a model to analyze to what extent governments have traded off price distortions for reduced volatility in intervening in agricultural markets. They analyze how much distortions a welfare maximizing government would introduce when it cares about stability. They find that several countries have been able to reduce price volatility in the domestic markets while at the same time allowing structural price changes to pass through. However, they also conclude that even when explicitly taking into account this trade-off (and the benefits of reducing volatility), many policy distortions do not seem to be consistent with minimizing volatility on domestic markets and that there is, thus, much room for policy improvement.

Research Question

The objective of this paper is to use a political economy model to explain the policy distortions when one allows for stability concerns and objectives for interest groups and politicians. We develop a Grossman-Helpman-style model to analyze how much distortions a government would introduce when it cares about stability (i.e. if it wants to limit price volatility for domestic producers and consumers) and when its decision is influenced by lobbying of producers and consumers in a situation with limited policy options. We also test to what extent governments have been trading off distortions for stability and to what extent our results are influenced by interest groups.

Methodology & Results

The Model

Consider a government that sets the domestic price such that it maximizes its political objective function. Following Grossman and Helpman (1994), we assume that the political objective function is a weighted sum of the political contributions of consumers, political contributions of producers and social welfare. The government maximizes the following objective function:

$$max_{p}D(1+\alpha^{c})[u^{c}(p^{D})] + (1+\alpha^{p})[u^{P}(p^{D})]$$
 (1)

with α^c and α^p representing, respectively, the lobby power of consumers and producers and u^c and u^p representing consumer and producer utility. Consumer (producer) utility is defined as consumer surplus (profit) minus a welfare cost of price volatility which is dependent on its preference for stability $\delta(\mu)$ and the share of the budgetary cost of the government's price policy.

As a result, the government will set its optimal domestic price by trading-off reduced volatility $(p^{D^*} - p^{-W})$ for distortions $(p^{D^*} - p^{W})$:

$$(p^{D^*} - p^W) = \frac{A}{B} (p^{D^*} - \bar{p}^W) - \frac{A \cdot C}{B(1+C)} (p^{D^*} - \bar{p}^W) + \frac{D}{B(1+C)} (p^{D^*} - \bar{p}^W) + \frac{E - C \cdot F}{B(1+C)}$$
(2)

with

$$A = (\delta + \mu)$$

$$B = D'(p^{D^*}) - S'(p^{D^*})$$

$$C = \alpha^c \gamma^c + \alpha^p \gamma^p$$

$$D = \alpha^c \delta + \alpha^p \mu$$

$$E = \alpha^c D(p^{D^*}) - \alpha^p S(p^{D^*})$$

$$F = D(p^{D^*}) - S(p^{D^*})$$

The first term represents the optimal combination of volatility and distortions when there is no lobbying. The level of distortions accepted by the government for reduced volatility depends on the ratio of the preferences for stability over the marginal distortionary effects of the price policy (factor $\frac{A}{B}$). As shown in Figure 1, the optimal choice of the government (E_{o}) will be more towards the North-West of the trade-off line when consumers and producers have higher preferences for stability and for lower marginal distortions.

The second term takes into account how much each lobby group will be affected by the budgetary effect of a deviation from the international price. If consumers have more lobby power than producers and at the same time bear the largest share of the budgetary costs, the consumer will bargain for a domestic price with more volatility and less distortions (see Arrow 1 in Figure 1).

The third term gives more weight to the relative stability preferences of the producers or consumers depending on their lobby power and their stability preferences. If the consumers have a more powerful lobby group compared to the producers and if the consumers care more about stable food prices, the government will set the optimal price more towards the North-West on the trade-off line. This is represented by the second arrow in Figure 1.

The fourth term consists of a direct lobbying effect of demand and supply reactions on price distortions (factor E) which can be reinforced or weakened due to the budgetary effects of the price policy of the government (factor $C \cdot F$). This is represented by a shift of the trade-off line to the left (see Arrow 3 in Figure 1).

Figure 1: Optimal combinations in a political framework of volatility and distortions



Empirical Results

Even when explicitly taking into account the trade-off between distortions and volatility, many policy distortions do not seem to be consistent with minimizing volatility on domestic markets. As we have shown in the previous subsection, the political economy factors, demand and supply effects and budgetary effects of the government policy may induce government to set prices away from the original trade-off line. To get a feeling about the importance of these potential factors, we first do a simple graphical analysis and later perform a regression analysis. Our results show that the inefficiency of the actual government policy is correlated with the ex-ante policy distortions (which is a proxy for consumer and producer lobby power). However, the results also show that a part of the inefficiency can be explained by measurement error in our distortion indicator.

Conclusion

In this paper we developed a political economy model to derive how much distortions a government would introduce when it cares about stability in a situation with limited policy options. We showed that there is a trade-off between volatility and distortions in situations with limited policy options for politically optimizing governments; and we identified the optimal combinations of distortions and stability for given international price shocks and various preferences. Our political model identifies reasons for being removed from the optimal DV trade-off line. We present empirical evidence which is generally consistent with these hypotheses and find that a low policy efficiency during the price spikes is correlated with exante policy distortions.

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Chapter 5

Price transmission and asymmetric adjustment: the case of three West African rice markets

Stephanie BRUNELIN

Between January 2007 and April 2008, 37 countries across the globe experienced food riots caused by widespread anger over the rapid rise in food prices (Janin, 2009). Overall, these events revealed the high degree of dependency of many poor countries on global food markets.

Most West African countries are highly dependent on imported food, especially rice. Rice consumption has greatly increased over the last decade driven by changing food preferences in the urban and rural areas, by the rapid urbanization and population growth. West Africa's rice production has not been able to match growth in demand resulting in a significant increase in imports. With regional rice imports totaling almost 19 percent of world rice imports (FAOSTAT, 2013), West Africa has become a significant player in world rice markets.
Food import dependency does not threaten food security in periods of low prices of imported rice but it becomes problematic in a context of high world prices of rice. Global rice prices reached a record high in the spring of 2008, with prices tripling from November 2007 to May 2008. The causes of this price spike are complex and are not attributable to a crop failure or a particularly tight global rice supply situation (FAO, 2011). The rise in rice prices is the result of the combined effects of trade restrictions by major suppliers (India), panic buying by several large importers, a weak dollar, and high oil prices.

The effects of the surge in world food prices have varied between developing countries according to their food import dependency and the degree to which prices on world markets were passed through to domestic prices. After the 2008 sharp rise in the international price of rice, the West African domestic prices of rice increased strongly after a delay of a few months varying with the policies implemented by the countries, the grain supply level and the exchange rate. It took 12 and 8 months respectively to the imported rice prices in N'Djamena and Dakar to go down, and in most of the countries, prices remained substantially above precrisis levels.

The paper underlying this policy brief, investigates price transmission between the international price of rice and the domestic prices of imported rice and local rice in three West African countries – Senegal, Chad and Mali – in an attempt to determine the impact of the increases in the world rice prices on the West African markets. The specific objectives of this paper are a) to determine whether domestic prices of imported and local rice respond faster to an increase or to a decrease in the international price of rice b) to test for asymmetry in the transmission of large and small shocks.

A variety of factors, including imperfect competition in the import chain and political interventions attempting to mitigate the impact of rising world food prices, may lead to asymmetry in the transmission of positive and negative shocks. The structure of rice imports in most West African countries is known to be either monopolistic or oligopolistic. Oligopolistic importers are likely to pass on more fully and more quickly shocks that raise their margins that shocks that reduce them, resulting in short-term asymmetric price transmission. In Mali, three main importers make up two-third of all imports in Mali (Baris *et al.*, 2005) while 66 percent of all rice imports flow through only four importers in Senegal (USAID, 2009).

Although most West African countries have officially stopped intervening in rice production and marketing following the structural adjustment reforms of the eighties and nineties, governments continue to intervene. In response to the 2008 crisis, the Senegalese government removed temporarily custom duties on rice imports while the Government of Mali grants a temporary value added tax exemption for imported rice (Mendez del Villar *et al.*, 2010). Additionally, a price control has been imposed over imported rice in both Mali and Senegal in 2008.

While the presence of market power in the supply chain and political interventions attempting to protect consumers are likely to lead to asymmetry in the transmission of positive and negative shocks, the presence of adjustment costs may prevent prices from adjusting for small shocks. If adjustment is costly, traders may respond to small changes in world prices by increasing or reducing their margins, leading to a zero pass through of small movements in world prices to domestic markets. Then, domestic prices of rice will adjust only if the fluctuations in the world prices exceed a critical level

Asymmetric price transmission is assessed through the estimation of a Threshold Autoregressive (TAR) model, based on the idea that large shocks may bring about a different response than small shocks. TAR models are well suited to cases characterized by the presence of market power and adjustment costs. They hypothesized that small deviations from equilibrium are not transmitted and that deviations must reach a critical level before triggering a response. The short-run price dynamics depends on whether the deviations are above or below a critical threshold, allowing the transmission of positive and negative shocks to be asymmetric.

The empirical analysis utilizes monthly retail prices of local and imported rice in Dakar, N'Djamena and Bamako. The results indicate that the world price of rice and the domestic prices of imported and local rice in Senegal, Mali and Chad are integrated in the long-run, with the exception of the local rice in Dakar. In Senegal, the market for local rice is essentially a thin residual market. Farmers produce rice primarily for subsistence and most of them are not commercially oriented. Many Senegalese still consider local rice as inferior in quality to imported rice suggesting that there is very little substitutability between imported and local rice.

The paper finds that the domestic price of imported rice in Bamako and the domestic prices of imported and local rice in N'Djamena are integrated with the world price of rice. In those three cases, domestic prices are affected in similar ways by changes in the world price regardless of the size or the sign of the deviations. By contrast, the process of adjustment is found to be asymmetric in two cases: the local rice in Bamako and the imported rice in Dakar, which are respectively the main staple food in Mali and Senegal.

The price of local rice in Bamako and the price of imported rice in Dakar do not adjust to small positive or negative shocks in the international price of rice. Small deviations from the long-term equilibrium that are not leading to a price adjustment fall into the inner regime, called by Goodwin and Piggott (2001) the "neutral band". Due to the existence of transactions costs, trade may be profitable only outside the band when the transaction costs are lower than the price difference. The neutral band contains respectively 62 and 49 percent of the observations in Dakar and Bamako, suggesting higher transactions costs in Senegal.

The price of local rice in Bamako and the price of imported rice in Dakar respond asymmetrically to large changes from the long-term equilibrium. Our results provide evidence that increases in the world price are incompletely and slowly passed-through to the domestic market, as compared to decreases in Mali. The negative asymmetric price transmission can be attributed to governmental interventions intended to protect consumers. The Malian government intervenes regularly through tax exemptions and food security stock management as to prevent local prices to increase excessively. If this policy favors consumers, it may discourage private actors to invest in the domestic market channel.

By contrast, the price of imported rice in Dakar is more responsive to large increases in the world price of rice than to large decreases. This positive asymmetric price transmission is likely to reflect a situation of market power in the import chain as well as the strong preference for imported rice in Senegal. The domestic price of imported rice adjusts well to large increases in the world price of rice as consumers are reticent to substitute rice with other grains. Since 2008, the Senegalese government has launched national programs to boost local rice production in order to achieve complete food self-sufficiency. Achieving rice self-sufficiency will require greater recognition that the rice market is not driven exclusively by price. Local rice must improve its awareness among consumers and make significant efforts in improving appearance, packaging and cleanliness in order to compete more effectively with imported rice.

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Farm storage and asymmetric maize price shocks in Africa

Elodie Maître d'Hôtel Tristan Le Cotty

We analyze the role of farm storage on price volatility in the context of a developing country where seasonality permeates agricultural markets. Whereas speculative behaviors by stockholders are known to reduce price volatility, seasonal liquidity constraints on farmers' behaviors with regard to stock management modify this general result. Like any stockholders, most farmers stock out grain if they expect a price drop in a close future, but unlike stockholders, they often also sell grain even though they expect a price increase in the next period, for liquidity reasons. As a result, farm stock management does not have the same stabilizing nature as speculative stock management, and notably fails to mitigate price drops.

Price volatility is defined in this paper as the unpredictable part of price moves, and we distinguish between negative price shocks, the variance of unpredicted price drops, and positive price shocks, the variance of unpredicted price increases. Our main result is that under certain conditions compatible with carryovers, on farm stock management increases the occurrence of unexpected price drops. We build upon a conceptual model where farm storage is submitted to seasonal liquidity constraints and where price anticipations error by farmers may lead to carryovers and to subsequent unexpected price drops.

The empirical relevance of those effects is consequently tested with original data from Burkina Faso. We merge historical maize price and household maize storage data to run a dynamic panel analysis over the 2004-2014 period. Carryovers increase the occurrence of negative volatility episodes throughout the year, and even more when considering the period following harvest, from November to March. The significant effect does not hold if we consider the months that are more distant from harvest time, indicating that farm carryovers generate negative price shocks after harvest, but that this effect fades away in the following months.

The paper highlights that carryovers, that result from unanticipated price drops during the lean season, increase the occurrence of unexpected price drops at the beginning of a new agricultural campaign. If we want to avoid massive price drops after harvest, our results appeal for the implementation of policy measures to ensure that farm stocks will be nil at the end of the agricultural campaign or to enable farmers to hold their production just after harvest. Two policies can be suggested.

(1) Enable farmers better access to market information and notably market prices, through more available market information services and better infrastructures. This better access should result in lowering price anticipation errors and thus avoid situations where farmers have consistent carry-overs at the end of the year.

(2) Promote on-farm storage just after harvest, in order to smooth both price drops after harvests and extreme price increases at the end of the season. This is quite a challenge in the context of developing countries because farmers need liquidity at the harvest period and as a result tend to sell most of their production. Thus, encouraging storage through subsidization of storage infrastructures in the villages has to be accompanied by measures to facilitate farmers' access to credit, in order to meet their liquidity needs. Warehouse receipt systems are expanding among developing countries, precisely because these systems allow farmers both access to liquidity after harvests and a better remuneration for their activity because they can store their products and sell latter in the year, when prices are higher. These systems are of great interest, and should be further analyzed.

Food price volatility in landlocked developing countries

Friederike Greb George Rapsomanikis

For a country, geography can be an important determinant of its trade patterns, but also of its economic growth. Landlocked countries often lag behind coastal nations in terms of external trade, growth, and development. Distance from the coast, often poor transport infrastructure, which increases trade costs, and dependence on transit countries hinder integration with the global economy. It costs, on average, twice as much to ship cargo from a landlocked developing country as from one of its coastal neighbours (World Bank, 2008). Limited participation in international trade networks also contains spillovers of technology and hinders competition, both of which can shape growth in the longer run. Together with low development levels landlocked countries experience low life expectancy and educational attainments, and deficient institutional and policy frameworks (Carmigiani, 2012). The Almaty Programme of Action, adopted in 2003, recognized the special needs of landlocked developing countries by establishing a new global framework for developing efficient transit transport systems, taking into account the interests of both landlocked countries and their partners, who often are transit developing countries.

Landlocked developing countries also face significant challenges in their efforts to achieve food security. Often, agriculture in landlocked countries is characterized by low productivity, inflexible production structures and low skill capacity, making these nations dependent on world food markets, with which they are not well-linked. Lack of trade means that small shocks in the supply of or the demand for food can generate wide movements in prices with significant negative consequences for the poor. Such excessive and persistent food price volatility can have significant effects.

In the short run, for food importing landlocked countries, food price shocks can have serious macroeconomic and microeconomic consequences. They can negatively affect the balance of payments, foreign currency reserves and the ability to implement social safety programs. In the longer run, the diversification of activities to minimize exposure to price risk inhibits efficiency gains from specialization in production and hinders the development of the agricultural sector (Kurosaki and Fafchamps, 2002). Income risks may also blunt the adoption of technologies necessary for agricultural production efficiency, as producers may decide to apply less productive technologies in exchange for greater stability (Larson and Plessman, 2002).

In this article, we analyse food price volatility in markets in both landlocked and coastal countries. Our sample consists of monthly prices in 49 countries and 150 food markets for rice, wheat, maize, millet and sorghum between 1991 and 2014. We use data from the FAO Global Information Early Warning System, as well as other data sets such as WITS and form a panel in order to explore the factors that determine volatility in these markets. We do this separately for landlocked and coastal countries. Our objective is to inform policy discussions and propose effective measures that can reduce food price volatility in landlocked countries.

To proxy food price volatility, we use the sample standard deviation of logarithmic returns within two year periods. We analyze this variable as a function of food commodity trade as a percent of the GDP and distance to coast. We also include agricultural value added productivity per capita and food stocks operations. In order to capture the effect of trade with transit and other partner countries on price volatility, through flows and trade agreements, we test a variable that reflects a country's position in the trade network, measured as its eigenvector centrality (Gray and Potter, 2012). This variable positions countries in terms of both the number of nations they trade with and the importance of these within the trade network and, thus, indicates whether they are at the core or the periphery of the trade network. We estimate a mixed model with random effects for markets to account for correlation between observations corresponding to the same market. We maximize the restricted log-likelihood in order to estimate parameters. We find that food markets in landlocked countries are not more volatile than those of coastal developing countries. This may appear to be counter-intuitive, but the extent to which prices in domestic markets are volatile may be a function of the origin of the shock. In landlocked countries with markets not well integrated with the global market or regional trade networks, global price shocks, such as the surge of 2008, may have little effect, while domestic production shocks can generate wide market price movements.

Our results provide a good basis for discussion on policies that may reduce food price volatility in landlocked countries. Increases in agricultural productivity appear to be more effective in reducing food price volatility in coastal countries than in landlocked ones. However, such a result should not disqualify policies that increase agricultural productivity as measures to reduce food price volatility. In our sample, most landlocked countries are also low-income and food deficit countries, and the extent of this deficit, relative to coastal countries, may be such that even significant increases in productivity may not have been effective in reducing food price volatility. Encouraging local food production and supply is vital to improving food security and supporting livelihoods.

More trade and a better trade position can reduce volatility. Having more trade partners matters for landlocked countries. It also matters that these partners have a significant trade positions and are well-integrated. This underlines the importance of trade agreements and effective trade partnerships.

For the markets we examine, food stocks appear to have a statistically insignificant effect on food price volatility in coastal countries, but to be crucial in landlocked ones. Stock operations have a significant negative effect on food price volatility. Although food reserves and open market operations are expensive and often ineffective in containing price spikes, there may be a case for their use as a short term price stabilizing instrument in landlocked countries, where trade is also expensive and food imports may take time to arrive.

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Food prices and household welfare: A pseudo panel approach

Zacharias Ziegelhöfer

The last decade has seen a stark increase in world food prices and food price volatility. From the year 2000 until 2011, food price levels and volatility have more than doubled. Previous research on this topic has concentrated on the effect of high food prices ¹ and has confined its analysis to specific regional and time contexts. This essay attempts to makes two contributions to the literature. First, the analysis distinguishes between permanent shocks (trend), volatility, short- to medium-term changes and sustained episodes of hikes and drops in prices. By doing so, the estimated effects can be attributed to specific components of food price variation. Second, the analysis extends the regional and time perspective. By relying on a pseudo panel approach, an idea first introduced by Deaton (1985), survey data from 38 countries spanning over a period of 20 years can be put to use.

^{1.} See review of literature by Von Braun and Tadesse, 2012.

The empirical analysis combines macroeconomic information on global food prices from the International Monetary Fund (IMF) and the World Bank (WB) with household-level microeconomic data from the Demograhic and Health Surveys (DHS). This results in a pseudo panel containing information on 38 countries during the period from 1991 to 2011. In the pseudo panel approach, cohorts defined on the basis of a time-invariant characteristic are followed over time. The resulting pseudo panel of cohort means may, therefore, suffer from measurement error. To address this issue, an errors-in-variables (EIV) model is applied based on Deaton (1985) and Verbeek (2008). The choice of the appropriate estimator and cohort definition is guided by Monte Carlo Simulations (MCS) which suggest that the Verbeek Nijman 1992) estimator is the best choice for the prevailing data situation.

Based on this methodology, the analysis finds that the fluctuation in global food prices over the mentioned period had a negative impact on household welfare in developing countries. The impact is transmitted through the long-term price trend, short-term changes in prices as well as volatility. There are mixed results on the impact of short-term fluctuations around a trend and episodes of sustained drops in food prices. To illustrate the magnitude of the above effects, the essay puts the parameter estimates in relation to the effect size of education on child health and estimate the impact of the above food price indicators on the rate of child malnutrition.

Overall, increases in the global food price index have a negative impact on household welfare. The effect size is economically significant: when compared to the effect size of maternal education, the observed price increase from the year 2000 to 2010 would offset the positive effect of 3.5 years of maternal education. It is also illustrative to calculate the effect in terms of child malnutrition rate (children who weight less than two standard deviations below a weight for age Z score (WAZ)): the price increase over the same period leads to a 1.5 per cent increase in the rate of child malnutrition in the countries sampled. To trace further how food price variation affects the households in developing countries, the analysis is run based on six decompositions of the original index.

Decomposing the index in the above components, the negative effect operates through volatility, as measured by the CoV, the change in prices from one period to another, the HP trend and episodes of sustained increases in prices. The effects can be considered strong when set in relation to maternal education and malnutrition. The effect of price volatility (CoV) in the year 2008 on child WAZ corresponds to -3.6 years of maternal education and an increase in malnutrition by 2.2 per cent. Given that this effect corresponds to only one year, the effect size can be considered high. Contrary to the CoV, the impact of the HP Trend materializes over a rather long period of time: the increase in HP Trend from 2000 to 2010 is equivalent to the effect of -4.8 years of maternal education and translates in an increase of malnutrition by 2.1 per cent. Living through a period of continued price increases ¹ corresponds to the effect of -3.5 years of education or a 1 per cent increase in malnutrition.

There is mixed evidence on the impact of the short-term fluctuation around a trend (Hodrick Prescott (HP) Filter) and whether continued decreases in prices improve child health. While the coefficient estimates based on the IMF's nominal food price index are insignificant, the estimates based on the World Bank's index in both nominal and real terms are significant. According to the latter results, the variation in the HP Filter has a negative relation with child WAZ: the effect of the maximum deviation from trend in the year 2008 corresponds to -2 years of maternal education and implies an increase in malnutrition by 1 per cent. Based on the World Bank data, periods of subsequent drops in food prices seem to improve child health: the effect size corresponds to 6.5 years of maternal education, or a 1.5 per cent decrease in malnutrition.

To summarize, there is an overall negative relationship between the variation in global food prices and household welfare. The effect is transmitted through shortterm price movements (volatility), medium-term changes (period-to-period change, HP Filter) and permanent shocks to global food prices (HP trend, price hikes). The effects on household welfare are strong considering equivalent education effects and estimated effects of the above indicators on malnutrition rates.

The above analysis shows that policy makers should not only be concerned with the effects of high food prices, but also consider other components of food price variation, in particular volatility, when designing policies and programs which aim to remedy negative effects of food price fluctuations on households in developing countries.

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^{1.} Periods of continued price increases are defined as two or more subsequent upward movements in prices. Periods of sustained drops in prices are defined analogously.

Food price shocks-induced poverty traps. Analysis using a panel dataset from Uganda

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This paper uses longitudinal data collected in Uganda (2005-2012) and develops a modified standard Ramsey model to analyze households' welfare growth and test the assumption that differential exposure to food price shocks leads to different welfare trajectories and to potentially increased risks of poverty traps. The study focuses on two welfare indicators, namely consumption and asset indices, and employs a battery of econometric methods, ranging from parametric GMM fixed effects models to locally weighted scatterplot smoother (LOWESS), local polynomial regressions, and Ruppert et al's (2003) semi-parametric penalized splines to address non-linearities in welfare dynamics, identify and locate critical welfare thresholds, and test for the presence of single against multiple poverty traps. Using the full sample, I find nonlinearities in welfare dynamic pathways and reduction in the growth rates of both consumption levels and assets holdings as a consequence of exposure to food price shocks and different asset shocks. However, there is no evidence of poverty traps or bifurcated welfare trajectories in the data, but instead I identify only a single dynamic stable equilibrium, located slightly above the official poverty line (1 USD PPP per capita/ per day converted in Ugandan Shillings, UShs) at around 30,500UShs of monthly real consumption per adult equivalent and 1.14 Poverty Line Units for asset index. Furthermore, the empirical results reveal that Ugandan households are converging towards specific welfare equilibria, depending on their initial conditions, demographic characteristics, the extent of their vulnerability and differential exposure to food price shocks. Particularly, I found that, in terms of consumption, households highly exposed to food price shocks were expected to move to welfare equilibria located on average at 15.1% lower levels than those less exposed but only at 3.3% lower in terms of assets accumulation.

These empirical findings have straightforward policy implications. First, the fact that the welfare equilibria of most households are located just slightly above the poverty lines (official and asset-based poverty lines) sugges that policy interventions should primarily focus not only on keeping current households located above these thresholds from falling below but also on helping them move towards higher welfare levels. As of those already below these thresholds, and potentially below the poverty lines, safety nets mechanisms need to be enforced in order to extricate them from the low welfare levels they are truck in.

The second implication is related to the impacts of both price and asset shocks, which are found to negatively affect consumption expenditures and assets holdings. As is well documented in the literature, when hit by shocks, poor households may deteriorate their already-critical welfare conditions by modifying for example their consumption behavior to smooth their assets (Amare and Waibel, 2013). One possible way might be to build their resilience to these shocks and other stressors by increasing *ex ante* their capacities to manage risks and by helping them ex post to minimize the adverse consequences of shocks. Stimulating households to engage into diversified activities (for example, combination of farm and non- or off-farm activities) or developing targeted programs that aim at improving the structural characteristics of the country such as better access to land, credit, or insurance markets, improvements in health coverage or infrastructure coverage may also help reduce the vulnerability of households to both food price and asset shocks.

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Was Sandmo Right? Experimental Evidence on Attitudes to Price Uncertainty

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Food price stabilization policies to decrease food price volatility¹ have been an important policy instrument in a number of developing countries after the global food crisis of 2007-08 and the sharp increase of food prices in 2010. Price stabilization measures are often implemented by governments under political pressure, without careful justification for the high cost of implementation of such policies. Recent empirical work finds mixed results on the impact of commodity price risk on household welfare: Bellemare *et al.* (2013) find that there would be a net welfare gain for rural households from price stabilization; Bellemare *et al.* (2015) find that increases in food prices cause food riots, but find no significant effect for food price volatility, suggesting that policy makers need to focus on lowering food price levels rather than food price volatility.

^{1.} We use the terms "volatility", "fluctuation", "risk", and "uncertainty" interchangeably for variability of prices over time. Also, we focus mainly on staple food prices.

To complicate matters, households in developing countries are often consumers and producers of food, which makes it difficult to disentangle the impact of price volatility on the welfare of rural households when using observational data. In order to empirically estimate the welfare impacts of commodity price risk using observational data, high-quality micro-level data is required on each household's marketable surplus and income, as well as on the price of each commodity, and those data are not always available. In addition, the available data do not provide the required plausibly exogenous variation needed to cleanly estimate price risk preferences.

Data and Methods

Given the important policy implication of the welfare impacts of price risk as well as the difficulty of accurately identifying them with observational data, we conducted a series of lab experiments to identify individual price risk preferences. To do so, we focused on the simple case where a hypothetical producer makes production decisions regarding a single output, and we ask the following research questions:

- (i) Do producers hedge against price risk by underproducing, as Sandmo (1971) famously predicted?
- (ii) How do results differ if the distribution of prices is unknown and producers deal with price ambiguity instead of price risk?

We conducted two types of experiments at Cornell's LEEDR lab with 48 students as our subjects. In the first type, we use a two-stage randomized design to first determine whether subjects face a certain or an uncertain output price and, conditional on facing an uncertain price, which of four different distributions the output price will be drawn from, with all four distributions holding the mean output price constant but offering different variances. This first experiment allows identifying the causal effects on output of (i) price risk relative to price certainty and (ii) increases in price risk.

In the second experiment, we follow the same setup as in the first experiment, with the difference being that we do not tell subjects which distribution we draw from when they face an uncertain price—we only tell them about the range of possible prices. This second experiment allows identifying the causal effect of price ambiguity on output decisions.

In conjunction with the price risk experiments just described, we also elicited our subjects' income risk preferences using the method developed by Holt and Laury (2002). This allows controlling for income risk preferences throughout and make sure that our results are truly driven by price instead of income risk preferences.

► Findings

Our results are striking. First, we find that in stark contrast to Sandmo's (1971) prediction, the move from a certain to an uncertain known price (i.e., price risk) leads to an increase in output. Second, conditional on facing an uncertain price, an increase in price risk reduces output. Third, the move from a certain to an uncertain, unknown price (i.e., price ambiguity) either leads to a decrease or an increase in output, depending on whether our subjects' income risk preferences were elicited after or before their price risk preferences were elicited. Our findings are robust to a number of empirical specifications including controlling for random effects, income risk preferences using the Holt and Laury (2002) game, learning effects, outcome in the previous period, and so on.

► Implications for Policy

Our findings could have important implications for food security: On the one hand, if the concept of risk is the true representation of the uncertainty faced by producers in developing countries, then a little uncertainty may be good for food security (since it leads to increases in production), but too much of it is bad for food security (since it leads to decreases in production below the certainty level). If, on the other hand, ambiguity is true representation of the uncertainty faced by producers in developing countries, then uncertainty is all bad news, because it leads to unambiguous decreases in production.

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Corruption in turbulent times: A response to export booms and busts

Joël Cariolle

The effect of output fluctuations on institutions and governance has been mainly addressed through the lens of the resource curse literature (Sachs and Warner, 1995). In fact, theoretical predictions and empirical evidence on the effect of economic fluctuations on governance, including corruption, mainly deal with a "voracity effect" of economic booms in the context of fragile states (Tornell and Lane, 1999; Melhum *et al.*, 2006; Dalgaard and Olsson, 2008; Arezki *et al.*, 2012). In these studies, resource windfalls are detrimental to integrity in the public and private sectors because they foster rent-seeking instead of productive activities (Melhum *et al.*, 2006), when institutional safeguards against malpractices are challenged. To reframe this view into our problematic, corruption is likely to expand when opportunities to personally enrich flourish, and is therefore likely to be pro-cyclical. The reverse hypothesis according to which corruption could be response to adverse shocks, and thereby being contra-cyclical, has however been much less considered. Although there is little evidence, many arguments can be invoked in support to such a relationship. First the literature on queuing models (Lui, 1985; Kulsheshtra, 2007) and auction models (Saha, 2001) of bribery gives us interesting insights into how corrupt behaviors may help "jumping the queue" or being awarded of a rationed public goods. In these models, people compete for scarce resources, which give strong discretionary powers to people allocating these resources, who may therefore personally enrich with bribe-taking. As a consequence, by creating temporarily resource scarcity and by making people competing with each other for their control, transitory adverse shocks may foster what could term "survival corrupt behaviors". The relationship between shocks and corruption could therefore be contra-cyclical, as a "scarcity effect" of adverse shocks on corruption may prevail.

This paper tries to reconcile these two seemingly competing hypotheses. It argues that both positive and adverse shocks may be either conducive or detrimental to corrupt practices, depending on whether institutions are capable of maintaining productive activities more attractive than rent-seeking and corrupt activities. Following the work of Melhum *et al.* (2006, 2003), the prevalence of "opportunistic" and "survival" corrupt behaviors during economic booms and economic busts, respectively, is a question of talent allocation (Murphy *et al.*, 1991), as "producer-friendly" institutions are likely to prevent agents from entering in rent-seeking activities during both economic expansions and contractions. On the contrary, one can expect that opportunistic corruption spreads during positive shocks, and that survival corruption spreads during negative shocks, when institutions are 'grabber friendly'. As a consequence, if institutions matter, the effect of economic fluctuations on corruption may be symmetric – i.e. corruption increases or decreases during both favorable and adverse shocks – and be driven by asymmetric corrupt behaviors (see table 1).

Economic fluctuations Institutions	Positive shocks	Negative shocks
Grabber-friendly institutions	+ opportunistic corruption	+ survival corruption
Producer-friendly institutions	– survival corruption	 opportunistic corruption

Table 1. Institutions and asymmetric corruption responses to shocks.

Data and empirical approach

Because institutional constraints upon malpractices may bind during sharp fluctuations only, the paper focuses on the effect of booms and busts in exports proceeds on corruption prevalence, conditional on the quality of institutions. The analytical framework presented in the previous section suggests that corruption should be expressed as a function of positive shocks, negative shocks, and conditional on a set of controls, including institutional variables:

Corruption = *E*{*positive shocks, negative shocks* | *Institutions, Controls*} (1)

Macro and micro estimations of this corruption equation are conducted using data on firms' bribery drawn from the World Bank Enterprise Surveys and skewnessbased variables of exports booms and busts¹. Tests of the role of institutions in channelling the effect of shocks on corruption are conducted using, on the one hand, democracy variables drawn from the Polity IV and Freedom House, and on the other hand, access to credit variable drawn from the World Development Indicators.

From 19,616 firms' reports of bribery of firms located in 38 developing countries², two dependent variables are used in micro and macro-estimations: while micro-estimations use raw survey data on informal payments, expressed as the firm k's share of total sales, macro-estimations use a measure of corruption incidence based on binary data on informal payments (1 if the firm has declared an informal payment, 0 otherwise)³, averaged at the country-level and expressed as a share of responding firms.

Controls encompass variables measuring export variance⁴, level of economic development, human capital, natural resource rents, the size of the government, and the share of trade in GDP.

Rancière *et al.* (2008) follow the same approach to separate the effect of credit crisis from credit booms by using a variable of negative skewness and a positive skewness of credit growth, respectively. As they say: "the skewness specifically captures asymmetric and abnormal patterns in the distribution of [a variable], and thus can identify the risky paths that exhibit rare, large, and abrupt [variations]" (p.360).

^{2.} Enterprises were interviewed between 2006 and 2011 and asked the following question: "We've heard that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percent of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?"

^{3.} Missing data is not considered as 0.

^{4.} Elbers et al. (2007) have stressed that symmetric and moderate shocks may also have a proper effect on economic transactions, by affecting agents' perception of risk and generating ex ante strategies aimed at reducing exposure to economic fluctuations and lowering income variance. Therefore, I control for this effect by including the long-run rolling standard deviation of exports in the corruption equation.

Empirical results

Baseline, micro and macro-level estimations point to a symmetric effect of export booms and busts on corruption, driven by asymmetric corruption responses to shocks. Micro-level estimation suggests that episodes of export booms increase firms' bribe payments, thereby supporting the hypothesis of opportunistic corruption, while macro-level estimation stresses the existence of symmetric positive effect of exports booms and busts on corruption incidence. Therefore, results support that, in our sample of developing countries, opportunistic corrupt behaviors spread during export booms while survival corruption behaviors spread during export busts.

Empirical tests of institutional channels point to a hump-shaped symmetric effect of export booms and busts on corruption prevalence, conditional on democracy and access to credit. First, regarding the democracy channel, booms and busts are found to have a positive effect on bribe payments and bribery incidence when democracy is weaker. Conversely, export booms and busts have a negative effect on bribery incidence when democracy is stronger. More specifically, improved independence of media from economic influence seems to act as a significant safeguard against corruption responses to shocks. It therefore appears that stronger pillars of democracy make both booms and busts more detrimental to "grabbers" than to "producers".

Second, regarding the role of access to external finance, similar relationships are evidenced. A nonlinear symmetric effect of export shocks on corruption prevalence is observable: below a certain credit threshold, both booms and busts are found to increase corruption, while above it, booms and busts are negatively associated with corruption variables. The dampening effect of access to external finance is particularly significant during export busts, when firms probably face liquidity constraint. Therefore, lack of access to credit makes booms and busts more detrimental to producers rather than grabbers, while an easier access contributes to dampen this relationship, especially during export busts.

Concluding remarks

This paper proposes an analytical framework for the effect of economic fluctuations on corrupt transactions. Using data on firms' experience of corruption with public agents (WBES) and skewness-based measures of instability to test the effect of export booms and busts on corruption prevalence, estimates support the existence of a "voracity effect" of booms, driven by opportunistic corrupt behaviors, and a "scarcity effect" of busts, driven by survival corrupt behaviors, when financial and democratic institutions are failing.

These findings provide an additional argument in support to the reinforcement of state capacity for mitigating the consequences of shocks and policies lowering country's exposure to them. More specifically, policies aimed at improving access to financial markets and supporting pillars of democracy should dampen the positive effect of export booms and busts on corruption prevalence, by keeping productive activities attractive than rent-seeking. Moreover, empirical evidence also suggests that external factors of economic stability, such as aid and remittances (Combes and Ebeke, 2011; Guillaumont and Chauvet, 2001), may be detrimental to corruption and rent-seeking, *ceteris paribus*.

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Food Price Changes, Price Insulation & Poverty

Will Martin Maros Ivanic

World prices of storable foods tend to be volatile, with occasional intense but short-lived spikes and relatively long periods of belowaverage prices. Because movements in the domestic prices of staple foods tend are politically sensitive, many governments intervene to reduce the volatility of these prices by insulating their markets from the changes in world prices. While this can be effective in reducing the volatility of domestic prices, the collective impact of these interventions is to increase the volatility of world prices. In this short note, we first look at the way in which governments intervene to reduce the volatility of domestic food prices. We then consider why they might behave in this way. Next, we turn to the implications of this behavior for world markets and for domestic prices. One possibility is that such interventions are pursued to the greatest extent by policy makers in the countries whose people are most vulnerable to food price shocks, and shift the burden of adjustment on to countries whose people are less vulnerable. We ask whether this was the case in the food price crisis of 2006-8 and find that the collective impact of all the interventions taken was to leave the impact of the crisis on the poor essentially unchanged.

Price insulation in developing countries

Figure 1 compares the movement in the World Bank's food price index for internationally traded foods with movements in a weighted average of domestic food CPIs taken from the FAO website. This graph shows a striking divergence between the two series in periods such as 2006-8, and 2010-11, when world prices increased rapidly. Policy makers in developing countries insulated their domestic markets from the volatility in world markets, allowing only small increases in domestic prices over this period. Another striking feature of this graph is the fact that the longer-term trends in the two series are almost identical. The movement in the two series over a longer period is almost identical.



Figure 1. Indexes of staple food prices

If we look at the prices of individual staple foods over the same period, we see some substantial differences in behavior. In Figure 2, we see that policy makers very strongly resisted passing short term changes in world rice prices into domestic markets. Similarly, in Figure 3, we see strong insulation of domestic prices from short

run movements in world wheat prices. By contrast, in Figure 4, we see much less insulation of domestic markets for soybeans from movements in world prices. In all cases, however, we see transmission of the longer term change in prices into the domestic market. Because these price series are indexes, this does not mean that there is no longer term protection or taxation of agriculture. Rather, what these series show is that protection returns to its longer term level.

When we turn in Figure 4 to soybeans, an important food product, but one that is not a major direct expenditure item for the poor, we see quite a different pattern of behavior. Policy makers appear to be much less concerned about reducing the volatility of domestic prices for soybeans than for they are for core staples such as rice and wheat.





Figure 3. Price insulation for Wheat





An important question is why policy makers might respond like this? The inverse relationship between food price levels and protection rates has been widely observed (Johnson 1973), but the tendency for protection rates to return to their long run level appears not to have received the same degree of attention. One possible explanation for this behavior is provided by recent work on the implications of changes in food prices for poverty—especially in the context of the price surges that can have such dramatic effects on the poor, who spend a large fraction of their incomes on food. This body of work (eq Headey 2014; Ivanic and Martin 2014; Jacoby 2014) shows that unanticipated food price increases can have serious, adverse impacts for poverty, while sustained increases in prices might be helpful once output has a chance to adjust and higher food prices are passed through into wage rates. One parsimonious way of capturing behavior of this type is to use an Error Correction model which, in this case, supposes that governments are averse to sharp changes in domestic prices, but have a longer term goal of maintaining a stable relationship between domestic and international prices. This longer-term relationship might be of the type proposed by Grossman and Helpman (1994), in which policy makers seek to maximize their political support taking into account the economic costs of providing that support—an approach that Grossman and Helpman show leads to a stable relationship between domestic and world prices. Ivanic and Martin (2014) show that this model can represent policy behavior very well. They also show that—as it is used—it is ineffective in stabilizing domestic prices. While domestic prices are stabilized relative to world prices, this intervention destabilizes world prices one for one, resulting in no net stabilization of domestic prices.

Price insulation of the type that we have observed is widely justified as attempting to protect the poor from the adverse impacts of rapid increases in food prices. Not only policy makers offer this argument. Many observers, noting that major economies such as China and India managed to restrain price food price increases in 2006-8 to very low levels, conclude that estimates of the adverse impacts of higher food prices must have been seriously overstated. Given that, it seems important to assess whether price insulation policies were effective in reducing the poverty impacts of higher prices in that period.

Anderson, Ivanic and Martin (2014) examined the impacts of this insulation taking into account not only the direct impacts of insulation on each country's domestic price, but the cumulative impact of all of the price insulation on the world price. When only the direct impacts of intervention were considered, intervention appeared to reduce the adverse impacts on the poor considerably, with 80 million fewer people entering poverty than would otherwise have been the case. However, once the impacts of intervention on world prices were taken into account, price insulation failed to reduce the adverse impact of the price shock on poverty. The insulation itself increased world prices—for simplicity, think of insulation achieved by restricting exports—enough to completely eliminate its otherwise favorable impact on poverty. The collective action problem in this case is strongly analogous to the case where people stand up in a stadium to get a better view of the game. While each person needs to act, the actions of the group as a whole are ineffective in improving the view.

Conclusions

This brief survey or recent work on food price volatility, price insulation and poverty began by looking at countries' policy responses to world price changes. This revealed that countries have tended to insulate strongly against shocks to world prices. However, within a couple of years, they had fully passed the more sustained increases in prices into domestic markets. Further analysis led to the conclusion that this is part of a systematic pattern of response, under which policy makers resist sharp changes in prices, which causes the rate of protection to deviate from its steady-state political equilibrium. Policy makers subsequently reduce this disequilibrium by raising domestic prices to return them closer to their desired rates of protection.

A key question is whether the short run price insulation that is such a key feature of markets for staple foods actually achieves the reduction in poverty to which it is, at least partly, directed. If policy makers consider only the direct impacts of their actions between 2006 and 2008, they would have grounds for congratulation. Reducing the jump in prices appears to have reduced poverty by some 80 million people. However, it is important to keep in mind the collective-action problem that is inherent in using price insulating policies. The higher prices that resulted from countries insulating their markets completely offset the apparent gains, rendering this approach to policy completely ineffective at the global level.

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Food price volatility in developing countries – the role of trade policies and storage

Lukas Kornher, Matthias Kalkuhl Irfan Mujahid

The guest for the causes of food price volatility has produced a large body of literature examining whether financialization of commodity markets, the new nexus with energy markets, or restrictive trade policies prompted food prices to change so extremely (Abbott et al., 2011; Serra and Gil, 2012; Tadesse et al., 2013). Increasing volatility in international markets are a great concern for developing countries. However, surprisingly, there are not many new insights on the causes of food price instability at domestic markets in developing countries. Several papers have analyzed the transmission of international price changes to domestic markets finding mixed evidence with regard to interlinkages between international and national level (Minot, 2011; Baguedano and Liefert, 2014). In contrast to pure time-series approaches, reduced form equation models that control for market fundamentals and policy variables consistently find a positive volatility spill-over from international to national markets (Lee and Park, 2013; Kornher and Kalkuhl, 2013; Pierre et al., 2014).

This literature also provides evidence on the impact of prominent supply and demand factors as well as the importance of transaction costs and governance indicators. Our analysis is situated between time series approaches and structural models by estimating a dynamic panel specification with a large set of explanatory variables.

In response to increasing international price volatility, national governments imposed anti-cyclical trade and storage policies to stabilize domestic markets (Demeke *et al.*, 2009). Policy reactions have their domestic justification, but are accompanied by negative externalities as export restrictions limit supply at international and regional markets (Martin and Anderson, 2012; Laborde *et al.*, 2013). Similarly, sufficiently large stocks guarantee adequate supply and prevent post-harvest prices from spiking, while they also offset inter-annual supply shocks (Deaton and Laroque, 1992; Tadesse and Guttormsen, 2011). State involvement in storage increases national carry-over stocks and can thereby contribute to price stabilization (Jayne *et al.*, 2008; Mason and Myers, 2013; Kozicka *et al.*, 2015). Thus, policies play a crucial role to control price stability. However, there is no study available that shows the theoretical or empirical link of anti-cyclical trade and storage polices on volatility. Closely related to this, the trade regime needs to be considered when analyzing the effects of these policies.

We start off our analysis by providing a stylized theoretical model for domestic price variability. The model is based on the spatial trade equilibrium after Samuelson-Takayama-Judge and the inter-temporal arbitrage condition. The main predictions of the model are as follows: (i) the flexible component of transaction costs (namely trade policies) allows to reduce domestic price volatility below the volatility of international prices, if trade policies are anti-cyclical (import regime) or cyclical (export regime); (ii) increased commodity storage reduces inter and intraannual price instability; (iii) high transaction costs increase the probability of the no-trade regime; (iv) high transaction costs reduce domestic price volatility, if the variability in the no-trade regime is very low.

For the empirical investigation, we employ a comprehensive data set with great country coverage across Africa, Asia, and Latin America. The econometric model chosen is a dynamic panel estimated by system GMM that accounts for persistence of volatility as well as for the unobserved heterogeneity across countries and commodities. Our dependent variable is the logarithmized standard deviation of log returns within one calendar year. The significant coefficient of lagged price volatility in any specification confirms the choice of a dynamic specification. The estimation incorporates several variables novel to comparable research studies: first, trade policy variables that measure anti-cyclical trade policies of the home country and of its major trading partners: second, the share of trade a countries shares with its partners in regional trade agreements; third, transaction costs that are measured as a weighted average of a country's mobile phone penetration rate, percentage of paved roads, the Fraser Index of Economic Freedom, and a dummy variable that accounts for the existence of a commodity exchange in the country;

fourth, a dummy variable that indicates whether a country is characterized by strong state involvement in one of the staple food commodities. Notably, data on beginning stocks and production volumes do not originate from FAOSTAT or USDA, but from the FAO CBS which provides the best existing data for developing countries according to the knowledge of the authors. Different to the existing literature, the estimation is performed for the full set of countries and crops as well as for sub-samples according to trade status (as importer, non-importer, and trade-switcher) and state involvement into food markets (high vs low intervention).

The regression results support earlier evidence that international price volatility strongly influences domestic volatility. In the short run the elasticity suggests a volatility spill-over of around 20 percent which elevates to 30 percent in the long-run. The estimate is in line with existing studies which use a similar approach (Lee and Park, 2013; Pierre et al., 2014). Furthermore, high transaction costs, as consequence of poor institutional quality of agricultural markets, are positively associated with price instability. Among supply and demand drivers, stocks and change in production significantly impact on volatility. An increase in the stocksto-use ratio by one percent reduces price variability by 2.5 percent. The effect of production is weak and appears to be less robust across specifications which was also found in other studies (e.g. Ott, 2014). Most strikingly are the findings with respect to trade policies and regional integration. Using a unique data set on bilateral trade agreements, regional trade appears to have a dominant role in stabilizing national food prices across all types of countries. This contributes to the literature that emphasizes the positive effect of regional integration on trade flows and trade policy volatility (Cadot et al., 2009; Sun and Reed, 2010; Mujahid and Kalkuhl, 2014). With regard to the relevance of the variables, standardization shows that stocks and regional trade integration are the major determinants followed by transaction costs and international price volatility.

Distinguishing between types of countries provides striking results in multiple ways. First, volatility spillovers from international to domestic markets are almost twice as large for importers as compared to exporters and trade-switchers. Second, insulation policies are found to be a successful price stabilization tool not only for large exporting countries, but also for regional traders. Third, transaction costs are particularly important in countries that are hardly involved in international trade. The price stabilizing effect of stocks is notably high in importing countries. Last, market forces, such as supply and demand, exhibit less impact on price volatility in countries that are characterized by public price stabilization programs. Using a two-step estimation procedure to properly identify the effect of high public intervention, no positive effect on market stability is established. Thus, we find that stocks massively diminish intra-annual price volatility, but we find no evidence that these stocks should be publicly owned instead of privately held.

Our analysis gives valuable insights in the effectiveness of policies to reduce domestic food price volatility. It does not, however, assess the costs and the benefits of these policies which need a broader consideration of fiscal costs, welfare benefits from stabilization as well as potential efficiency losses due to high stateintervention. The most important policy implications refer to the role of trade for domestic price stability: trade and improved quality of market institutions – the latter providing an important determinant for the feasibility and extent of trade through transaction costs – provide an important tool to moderate domestic supply and demand shocks. Admittedly, it simultaneously makes a country prone to international price risks. Throughout long time periods, markets at the international level are less volatile than in most developing countries (Kornher, 2014) and importers exhibit lower price volatility than non-importers. In rare events of excessive price spikes at international markets, policy makers are tempted to use anti-cyclical trade policy to insulate domestic price increases at the expense of their trading partners. Regional trade agreements provide a vehicle to stabilize regional markets and to reduce domestic volatility substantially. Hence, recent developments to create or enhance regional trade in Asia or Africa provide a promising approach to reduce food price volatility in these countries without additional market distortions.

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Chapter 14

Trade Policy Coordination and Food Price Volatility

Christophe Gouel

During food price spikes, food exporting countries frequently use export restrictions to insulate their domestic markets from high prices on the world market. Their use can be so widespread that the high levels reached by international prices could be seen as a consequence of these interventions (Dawe and Slayton, 2011), and the restrictions can be so stringent that they can lead to the near disappearance of the world market as happened to the rice market over nine months in 1973 (Timmer, 2010). Food importing countries also act: they decrease their tariffs to protect their consumers but when world prices are low, the situation is reversed and importers raise their import duties. In summary, in food markets, countries routinely adjust their trade barriers to insulate their domestic markets from international price variability (Anderson and Nelgen, 2012). The lack of commitment to leaving borders open can reduce trust in the world trade system and lead to costly policies. Importing countries that expect food exporters to restrict their exports in times of scarcity will move away from the specialization consistent with their comparative advantages in order to ensure greater self-sufficiency, or will carry expensive public stocks. For example, the current large-scale public interventions in the Asian countries, through which many countries attempt to achieve self-sufficiency in major staples, can be explained largely by their experience in the 1972/73 food crisis (Rashid et al., 2008).

Possible cooperation if governments value food price stability?

In recent research (Gouel, 2014), I addressed the guestion of how multilateral trade policy coordination is affected if governments value price stability in their domestic markets in addition to the traditional terms-of-trade motive for trade policy. I also addressed the related question of whether this framework implies a difference in the ability to reduce in a cooperative equilibrium import tariffs versus export taxes, given that both should be reduced by the same amounts if governments are concerned only by terms of trade as in Bagwell and Staiger (1990). My paper shows that the price smoothing objective implies that importing and exporting countries have diametrically opposite incentives to deviate from cooperation this contrasts with trade wars that are motivated by terms of trade which tend to promote symmetrical trade policies. The paper shows also that in food commodity markets where prices tend to follow a positively skewed distribution (Deaton and Laroque, 1992), exporters have a greater incentive than importers to deviate from cooperation which helps to explain why it is more difficult to discipline export taxes than import tariffs within the World Trade Organization (WTO). This is an important policy issue given the recent turmoil in food markets. The widespread use of export restrictions in the 2007/08 food prices spike, 1 and the Russian ban on exports in 2010 following a devastating drought, spurred calls for WTO disciplines on export restrictions (FAO et al., 2011, HLPE, 2011). These proposals were received coldly by several food-exporting developing countries (Mitra and Josling, 2009), and were not considered in the agreement reached at the 9th WTO Ministerial Conference held in Bali (WTO, 2013).² So far, according to agricultural draft modalities (WTO, 2008), in the case of another agreement there would not be any significant strengthening of the disciplines on export restrictions. Thus, given the importance of export restrictions for influencing trust in world markets, and food policies in the long run, it is essential to understand what is preventing a trade agreement on this issue.

Methodology

To improve our understanding, I build a two-country partial equilibrium trade model in which governments adjust their trade policies to stabilize their domestic prices. The resulting model is used to characterize the static Nash equilibria, and the nature of a self-enforcing agreement on time-varying trade policies. The model draws heavily on Bagwell and Staiger's (1990) work to analyze how self-enforcing agreements can discipline countercyclical trade policies. An agreement is selfenforcing when cooperation is sustained by the threat of future punishment if the

^{1.} In a survey of country responses to the food security crisis, Demeke *et al.* (2009) show that 25 developing and emerging countries in a panel of 81 restricted or banned exports.

^{2.} This was not a new issue: proposals to regulate export restrictions were rejected by many member countries at the beginning of the Doha Round negotiations (WTO, 2004).

cooperation is violated, without the need for an external enforcement mechanism. Bagwell and Staiger (1990) show that the threat of a return to a non-cooperative situation is sufficient to obtain tacit cooperation among the countries involved in repeated interactions. However, this cooperation is not necessarily synonymous with free trade, because when trade shocks are large enough the incentive to deviate from cooperation would become too high in a situation of free trade. Gouel (2014) adapts this model to a setting suitable to analyze trade policies applied to food products. In order to answer the research question, we need to introduce two features absent from Bagwell and Staiger's (1990) model.

Firstly, to investigate the impact of price fluctuations on trade policy coordination, a particular structure must be placed upon the social welfare function. Bagwell and Staiger (1990) focus on trade policies motivated by terms-of-trade gains, and explain changes in trade policies by changes in potential terms-of-trade gains arising from idiosyncratic supply shocks. For food products, terms-of-trade theory may not be sufficient to explain the behavior of trade barriers. Examples of deviations from this theory are the export bans imposed by many countries during the recent food crisis which precluded any gains from trade, and the export subsidies applied by wealthy countries in periods of low prices which deteriorate the terms of trade of the countries using them. In addition, terms-of-trade theory implies that trade policy adjustments are a function of trade volume rather than of the world price because trade volume characterizes the potential gains from manipulating terms of trade. However, Anderson and Nelgen (2012, Table 1) show that protection of food products is negatively correlated with deviations from trend in the international price of the products in question. So to account for the extent of trade policy adjustments in food products, and to characterize the payoff frontier of self-enforcing trade agreements, we need a model where governments are motivated not just by terms-of-trade gains since exploitation of the terms of trade is not sufficient to explain the offsetting of international price variations by trade policies but want also to stabilize domestic prices. To introduce the observed reaction of trade policies to the world price, it is necessary to consider other economic and political-economy motivations. Countercyclical trade policies can be rationalized as insurance instruments when accounting for market failures in risk management (Gouel and Jean, 2015). Their existence might also be explained by political-economy considerations. For example, the loss-aversion framework of Freund and Özden (2008) is applied by Giordani et al. (2014) to account for priceinsulating trade policies. Given the variety of potential motivations for these policies (Anderson et al., 2013), and the focus of the paper on the strategic interactions of countries, I adopt a tractable reduced-form, social welfare function that accounts for the economic and political-economy motivations described above.

Secondly, in contrast to Bagwell and Staiger's model which is concerned only with idiosyncratic risk (i.e., potential trade volume in free trade due to the difference of supply shocks), I introduce aggregate uncertainty (i.e., potential price in free trade due to the sum of supply shocks) which is crucial to add world price volatility to the model. So in the proposed model, price volatility is driven by stochastic supply shocks in both countries. The two risks correspond also to different motivations to use trade policies. If trade policy is motivated by manipulation of the terms of trade, it varies with trade volume. If it is motivated by smoothing prices, it varies with the world price. Introducing aggregate uncertainty allows us to consider also the well-known stylized facts that staple food prices tend to have positively skewed distributions, with more prices below the mean than above it but with occasional spikes. This feature is often explained by the effect of competitive storage but for simplicity, it is represented by negatively skewed supply shocks. If the distribution of free-trade world prices is positively skewed, an importing country in trade war uses its trade policy more frequently than does an exporting country because of the concentration of prices below the mean; however, an exporting country has a greater incentive to deviate from a cooperative trade policy because positive deviations from the mean price will be larger than negative ones. So an exporting country is more likely than an importing country to retain in cooperation the right to use its trade policies. This result could explain the difficulty to reach an international agreement which would discipline export restrictions.

These extensions of Bagwell and Staiger's model come at a cost. The reducedform social welfare function penalizing price volatility combined with aggregate uncertainty implies that in tacit cooperation equilibria, importing and exporting countries have incentives to deviate from cooperation at different periods: exporters will deviate when prices are high and importers when prices are low. This breaks the symmetry of the model, and we lose the ability to characterize the cooperative solution analytically. Therefore, once the equations characterizing the payoff frontier of self-enforcing trade agreements have been defined, I proceed with numerical simulations. These simulations are central to showing that a positively skewed price distribution makes disciplining export taxes more difficult than disciplining import taxes.

Contributions

This work demonstrates a standard feature of self-enforcing trade agreements: the need for active trade policies in periods of severe shocks to maintain the incentives to cooperate in every state of nature. While repeated interactions allow countries to coordinate over cooperative trade policies, periods of unusually high trade volume, or very low or very high prices, are periods of deviation from free trade. So even in a cooperative agreement, it may not be possible to completely alleviate counter-cyclical trade policies. These deviations from first best differ from the literature in that, because of the smoothing motivation deviations are asymmetric: exporters deviate when the world price is high, and importers deviate when the world price is low. This implies that even in cooperation, exporters may be able to shift the burden of adjustment to high prices to importers, and conversely importers may limit the impact of low prices on their economy by using tariffs.

Policy discussions have devoted much attention to export restrictions and their role in recent food price spikes. To prevent future price spikes, many authors advocate the adoption of WTO disciplines on export restrictions which currently are very weakly regulated. However, a few recent papers have pointed out that disciplines on export restrictions, although potential useful at the global level, are unlikely to be achievable within the WTO framework. For Abbott (2012), this is because policy makers will not agree to renounce their right to stabilize their markets. For Cardwell and Kerr (2014), the dispute settlement system cannot enforce such disciplines because export restrictions are of short duration compared to the time taken to settle disputes, and because complainant countries may not be in a position to retaliate owing to insufficient bilateral trade levels. Gouel (2014) also contributes to the policy discussions on export restrictions. In this paper, there is no formal distinction between export restrictions and tariffs. The former are the policy used by exporters to protect themselves from international scarcity, and the latter are the policy used by importers but both contribute to shifting volatility to partners' markets. However, despite this apparent symmetry between trade policy instruments, export restrictions under repeated interactions may be more difficult to avoid than tariffs because of the asymmetry of the price distribution. Commodity prices are positively skewed and prices are concentrated below the mean, but with occasional spikes. This matters a lot in self-enforcing agreements because it means that the exporter will have a bigger incentive than the importer to deviate from free trade.

Conclusion

This work shows that export restrictions are more difficult to discipline in trade agreements than tariffs, and the reluctance of food exporting countries to open negotiations on this issue may be a sign of their inability to commit to not using export restrictions given the incentives they are offered during food price spikes. This does not mean that cooperation that would significantly reduce export taxes cannot be sustained. Given that WTO negotiations operate under the principle of a "Single undertaking" – an approach that precludes separate agreements on some of the negotiation items – other areas of negotiations could bring sufficient incentives for the exporters to cooperate. However, that exporting countries have refused to make the topic part of the Doha agenda shows that the stakes related to this issue are very high, and progress on this front is unlikely considering the stalemate at the Doha Round negotiations.

The theory developed in Gouel (2014) opens the possibility of some empirical investigations. For example, this is the case of the value of the parameter characterizing the preference for price stability. It is calibrated in the paper but could also be estimated given that with the slope of the demand function it is a key parameter characterizing the extent of the transmission of world to domestic prices which is a frequent topic of investigations. Another prediction of our theory is that the skewness of the price distribution should be different between exporting and importing country. Exporting countries are able to protect themselves from high world prices which will tend to decrease the skewness of their domestic prices; while the converse applies to importing countries which are able to protect from low prices, increasing the skewness of their domestic prices. This difference in price distribution could be the foundation for empirical tests.

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Chapter 15

Consistency between Theory and Practice in Policy Recommendation by International Organizations for Extreme Price and Extreme Volatility Situations

Maximo Torero

Introduction

Food prices have increased significantly in the past few years, with particularly sharp spikes seen during the 2007/08 season. There is some agreement on the causes of such price increases: (a) weather shocks that negatively affected agricultural production; (b) soaring energy and fertilizer costs; (c) rapidly growing income in developing countries, especially in China and India; (d) the devaluation of the dollar against most major currencies; (e) increasing demand for biofuels; and (f) changes in land use patterns. While there is no consensus on the relative importance of each of these culprits, it is widely agreed that most of these factors will further increase food prices in the medium and long run. Prices may become more volatile as well, as evidenced by the subsequent food crisis in 2010. Climate change will induce more weather variability, leading to erratic production patterns. Moreover, the volatile nature of the market is likely to induce possible speculation and exacerbating price spikes. Additionally, in an effort to shield themselves from price fluctuations, different countries may implement isolating policies, further exacerbating volatility.

Looking at the volatility at global level is important because although the food price spikes of 2008 and 2011 did not reach the heights of the 1970s in real terms as shown in Figure 1, price volatility—the amplitude of price movements over a particular period of time—has been at its highest level in the past 50 years. This volatility has affected wheat and maize prices in particular. For soft wheat, for example, there were an average of 41 days of excessive price volatility a year between December 2001 and December 2006 (according to a measure of price volatility recently developed at IFPRI¹). From January 2007 to June 2011, the average number of days of excessive volatility was more than doubled to 88 a year. Despite this there has been no analysis of how global price volatility is affecting local relative prices (see Figure 2).



Figure 1. Real price evolution. Index=100 in 1960

High and volatile food prices are two different phenomena with distinct implications for consumers and producers. High food prices may harm poorer consumers because they need to spend more money on their food purchases and therefore may have to cut back on the quantity or the quality of the food they buy or economize on other needed goods and services. For food producers, higher food prices could raise their incomes – but only if they are net sellers of food, if increased global prices feed through to their local markets, and if the price developments on global markets do not also increase their production costs. For many producers, particularly smallholders, some of these conditions were not met in the food price crisis of 2011.

^{1.} See Martins-Filho, C, M. Torero, and F. Yao, 2014.



Figure 2. Periods of Excessive Volatility

Note: This figure shows the results of a model of the dynamic evolution of daily returns based on historical data going back to 1954 (known as the Nonparametric Extreme Quantile (NEXQ) Model). This model is then combined with extreme value theory to estimate higher-order quantiles of the return series, allowing for classification of any particular realized return (that is, effective return in the futures market) as extremely high or not. A period of time characterized by extreme price variation (volatility) is a period of time in which we observe a large number of extreme positive returns. An extreme positive return is defined to be a return that exceeds a certain pre-established threshold. This threshold is taken to be a high order (95%) conditional quantile, (i.e. a value of return that is exceeded with low probability: 5 %). One or two such returns do not necessarily indicate a period of excessive volatility. Periods of excessive volatility are identified based a statistical test applied to the number of times the extreme value occurs in a window of consecutive 60 days. **Source**: Martins-Filho, Torero, and Yao 2014.

Apart from these effects of high food prices, price volatility also has significant effects on food producers and consumers. Greater price volatility can lead to greater potential losses for producers because it implies price changes that are larger and faster than what producers can adjust to. Uncertainty about prices makes it more difficult for farmers to make sound decisions about how and what to produce. For example, which crops should they produce? Should they invest in expensive fertilizers and pesticides? Should they pay for high-quality seeds? Without a good idea of how much they will earn from their products, farmers may become more pessimistic in their long-term planning and dampen their investments in areas that could improve their productivity. The positive relationship between price volatility and producers 'expected losses can be modeled in a simple profit maximization model assuming producers are price takers. Still, it is important to mention that there is no uniform empirical evidence of the behavioral response of producers to

volatility. By reducing supply, such a response could lead to higher prices, which in turn would hurt consumers.

It is important to remember that in rural areas the line between food consumers and producers is blurry. Many households both consume and produce agricultural commodities. Therefore, if prices become more volatile and these households reduce their spending on seeds, fertilizer, and other inputs, this may affect the amount of food available for their own consumption. And even if the households are net sellers of food, producing less and having less to sell will reduce their household income and thus still affect their consumption decisions.

Finally, increased price volatility over time can also generate larger profits for investors, drawing new players into the market for agricultural commodities. Increased price volatility may thus lead to increased – and potentially speculative – trading that in turn can exacerbate price swings further.

Despite the conceptual importance of the effects of price volatility, consumer welfare is notoriously difficult to measure due to income effects associated with price changes. In addition, the fact that in many low income countries economic agents are concomitantly consumers and producers of food creates added concerns.

Besides the inherent difficulties in adequately measuring consumer welfare, most empirical models for the dynamic evolution of returns for major agricultural commodities lack flexibility in modeling the conditional volatility (conditional standard deviation) of returns. Restrictive modeling of volatility can produce inconsistent return forecasts and inaccurate assessments and policy recommendations regarding the link between volatility and consumer welfare.

This situation imposes several challenges. In the short run, the global food supply is relatively inelastic, leading to shortages and amplifying the impact of any shock. The poorest populations are the ones hardest hit². As a large share of their income is already being devoted to food, the poor will likely be forced to reduce their (already low) consumption. Infants and children may suffer lifelong consequences if they experience serious nutritional deficits during their early years. Thus, the short-term priority should be to provide temporary relief for vulnerable groups.

In the long run, the goal should be to achieve food security³. The drivers that have increased food demand in the last few years are likely to persist (and even

^{2.} There is a general concern that increasing food prices have especially adverse effects on the poor. However, until recently, there was no rigorous evidence of this. On the one hand, there would most probably be negative effects on poor urban consumers who spend a considerable portion of their budget on food. But on the other, there are gains to farmers who benefit from increased prices for their output. In general, this impact depends on whether the gains to net agricultural producers are larger than the losses to consumers. Directly dealing with this issue, Ivanic and Martin (2008) and Ivanic, Martin and Zarman (2011) find that the food crisis has led to significant increases in poverty rates of developing countries.

^{3.} Food security is a situation in which "all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs, and food preferences for an active and healthy life" (World Food Summit, 1996). Even when increases in food production are not a sufficient condition for food security, they are indeed a necessary condition (von Braun et al 1992).

expand). Thus, there will be escalating pressure to meet these demand requirements. Unfortunately, increases in agricultural productivity have been relatively meager in recent years. In this line, "the average annual rate of growth of cereal yields in developing countries fell steadily from 3 percent in the late 1970s to less than 1 percent currently, a rate less than that of population growth and much less than the rise of the use of cereals for other things besides direct use of food" (Delgado et al, 2010, p 2).

There is a wide array of options to achieve these short- and long-run objectives, and there are no one-size-fits-all policies. Most policies come with significant tradeoffs and each government must carefully weigh the benefits and costs they would face. For example, governments might try to make food more readily available by reducing food prices through price interventions. While this policy might achieve its short-term goal, it can potentially entail fiscal deficits and discourage domestic farmers' production. Other policies not only have domestic consequences but can entail side effects for other countries. In their efforts to insulate themselves from international price fluctuations, some countries might impose trade restrictions; if a country is a large food exporter, the government might impose export taxes, quantitative restrictions, or even export bans. Albeit increasing domestic supply and lowering national prices, these policies would reduce the exported excess supply, induce even higher international prices, and hurt other nations. In addition, the "right" policies depend on the particular institutional development of a country. Middle-income countries might already have safety networks for vulnerable populations which can trigger prompt aid to those most in need in times of crisis. However, countries with lower incomes do not have such mechanisms readily available. Finally, the effectiveness of different policies will vary depending on the market characteristics of the commodity in which the government is intervening (i.e. the market structure for wheat is very different from that of rice, which is different from that of soybeans, etc.).

In this regard, this paper describes some of the most important policies International Organizations like the World Bank, IFAD, AFD, IADB, has prescribed to different countries during the food crisis of 2007/08. The understanding of such policies is important for at least three reasons. First, food crises are very sensitive episodes that affect the basic needs of entire populations, especially those of the world's poorest. As such, they require timely and sensible measures. Second, increasing food prices and price volatility are likely to remain an important challenge in the medium and long run. Third, food policies are usually complex; they need to be assessed to consider their domestic impact, the trade-offs that they entail with respect to other objectives, their consequences for other countries, and their feasibility in particular contexts.

Consistency of key policies proposed and implemented

The question that this paper tries to answer is how consistent or inconsistent the operational policy recommendations have been with respect to: (a) Proposals of International Organizations and the G8's document prepared for the Ministers of Finance Meeting in 2008 and (b) the different policy recommendations proposed by key researchers and analyzed in detail in the previous two sections. The review focuses on the short-term, medium, and long-term policies proposed. In terms of short-term policies, two mechanisms are emphasized: support for the poor and price stabilization (with an emphasis on trade restrictions and food reserves). In terms of medium- and long-term policies, we focus on the recommendations linked to increasing agricultural productivity through productivity gains and elimination of post-harvest losses.

With this objective in mind, we analyze as an experiment the portfolio of loans of the Global Food Crisis Response Program (GFRP) operations detailed in Table 1, covering operations in 13 developing countries.

Country	Project ID	PAD	ICR
Mozambique	107313	1	1
Djibouti	112017	1	1
Honduras	112023	1	N/A
Haiti	112133	1	N/A
Bangladesh	112761	1	1
Sierra Leone	113219	1	1
Madagascar	113224	1	1
Rwanda	113232	1	N/A
Burundi	113438	1	1
Philippines	113492	1	1
Guinea	113625	1	1
Mali	114269	1	N/A
Cambodia	117203	1	1

Table 1. Documents Analyzed for GFRP Operations

Note: PAD is the Project Appraisal Document and ICR is the Implementation and Completion and Results Report.

In support of the poor, Targeted Cash Transfers (TCT) and Conditional Cash Transfer (CCT) programs already in place clearly constitute first-best responses for several reasons: (a) they prioritize assistance for targeted groups, (b) they do not entail additional costs of food storage and transportation, (c) they do not distort food markets, and (d) in the case of CCTs, they explicitly prevent human capital deterioration. When TCTs and CCTs are not available, governments may also implement other types of assistance programs, although this could bring some inefficiency. Therefore, in poor countries where TCTs and CCTs are not yet in place (such as most Sub-Saharan Africa), it is essential that during non-crisis years, countries invest in strengthening existing programs - and piloting new ones - to address chronic poverty, achieve food security and human development goals, and be ready to respond to shocks. Across the different Global Food Crisis Response Programs (GFRPs), we see these policies implemented by the World Bank, specifically in Philippines, Djibouti, Haiti, Cambodia, Guinea, Burundi, and Madagascar.

In terms of short-term price stabilization policies through trade policies and management of food reserves, we identify important inconsistencies in what was recommended in the official position by the World Bank, through the GFRP framework document and in the G8's document prepared to the Ministers of Finance Meeting in 2008, and in post-2008 recommendations. Clearly, the official recommendations in 2008 were more flexible, especially in regards to trade policies and physical reserves, and in some cases allowed short-term interventions that could end in pervasive market distortions. As a result, most of the operations under the GFRPs were consistent with the official policy recommendations with the exception of Cambodia, Guinea, Sierra Leone, and Rwanda.

On the other hand, if we look at the post-2008 recommendations, all of them will avoid any potentially pervasive market distortions. Even more, regarding trade policies, most of the work of the World Bank will advise against any trade restrictions (on both the import and the export side). In that sense, if we assess ex post the GFRP operations, we find that in many of countries, the policies implemented as a result of the GFRP created additional trade restrictions other than export bans, which was the only bad policies identified in the GFRP framework document. This was the case for Bangladesh, Philippines, Mali, Guinea, Burundi, and Sierra Leone.

Nevertheless, and as explained, it is important to mention that what the GFRP framework recommended in 2008 relative to what was recommended post-2008 is in a certain way justifiable as a short-term measure given that all in all, trade policies may be an effective instrument for short-term price stabilization purposes in some nations: those facing considerable political unrest, lacking adequate food distribution networks, with no safety nets available, etc. However, they may have important beggar-thy-neighbor consequences and may fuel price increases of important commodities. The 2007/08 food crisis – especially in the case of rice – is quite illustrative in this respect. Insulating trade policies imposed by importers and exporters (as well as high-income and developing countries) were indeed responsible for a considerable share of price spikes. However, even when the aggregate

effect of the actions of these broad groups is quite large, most of the turmoil was likely caused by large exporters and importers. In this sense, if the argument is that such policies create further imbalances for others, policy recommendations should distinguish between larger and smaller countries; from all the countries where we see these inconsistencies, the Philippines is the only one falling into the category of a significant importer of rice where the World Bank should be clearly against import tenders and quantitative restrictions, given they clearly helped to exacerbate international prices in the rice market.

With respect to food reserves, the discussion seems to highlight the need for food reserves to ease the effect of shocks during periods of commodity price spikes and volatility. There seems to be some consensus around this idea. The disagreement stems from the specific mechanisms to implement food reserves. As in the case of trade interventions, the most appropriate choices are likely to depend on the characteristics of the specific market under intervention, the country's capacity to cope with crises, and the possibility of establishing international coordination mechanisms. While it likely does not make sense to establish national buffer stocks in most grain markets, it may be more valid in a few cases, such as in the rice market. Again, however, regional reserves with strong governance and clear triggers are preferred. However, it is important to mention that the GFRP framework is not extremely clear on this in difference to what was recommended post-2008. It is in that sense that when analyzing the operational plans of the GFRPs, proposals can be identified that promote country level reserves as buffer stocks, as in the case of Bangladesh where the stocks were increased from 1 to 1.5 million MT of rice, the NFAs in Philippines, and Guinea. It could also be argued that these reserves were consistent with the official position of the World Bank through the GFRP framework, although clearly these type of policies are problematic in countries where the necessary conditions for these reserves to work don't exist. Additionally, buffer stocks usually entail high costs and market distortions and are prone to corruption. Thus, most countries - especially those with weak institutions and scarce resources should probably refrain from using buffer stocks.

Finally, with respect to the medium- and long-run policies, we see significant investment in the GFRPs (for example, the provision of infrastructure and public goods in Mozambique, increasing seed availability in Mali, and the rice intensification program in Madagascar). In addition, and as recommended in the GFRP framework document, we also see the important presence of input subsidies similar to those that have failed in Malawi with a fiscal cost of around 3% of the GDP. These plans envisage the implementation of a market smart approach to input subsidies. Such a strategy is characterized by: (a) targeting poor farmers; (b) not displacing existing commercial sales; (c) utilizing vouchers, matching grants, or other instruments to strengthen private distribution systems; and (d) being introduced for a limited period of time only. Albeit outlining a sensible rationale, it is unclear how these principles would be implemented in practice in poor countries like in the GFRPs in Haiti, Cambodia, Mali, Sierra Leone, and Rwanda. Poorer countries– which

likely have the least developed input markets– may find it difficult to target only those farmers in need. Additionally, subsidy programs that would strengthen, rather than displace, the private sector are likely to require complex mechanisms. Institutional weaknesses of poor countries may render them unfeasible, aside from the fiscal costs.

It is important to note that in many countries, input markets are not well developed, as they are hampered by various policy, institutional, and infrastructure constraints that can only be overcome over time, while improvement in access to inputs would provide substantial benefits in the short run, given the crisis circumstances. Is in that sense that the "smart subsidies" proposed under the GFRP framework could be conceptually justifiable although as a short term measure given it could also create fiscal problems as previously mentioned based on the Malawi experience. Moreover it is of central importance that any "smart subsidy" policy include the five key characteristics mentioned in the previous paragraph. Furthermore, a long-time horizon is required to apply the "first-best" policies, namely, the alleviation of constraints (such as infrastructure, missing credit markets, etc.) which inhibit the development of efficient input markets.

Therefore, although this "second best measure" in the face of existing constraints as stated in the GFRP framework document could be justifiable in the short term the key is to assure all other needed elements are in place for its success and specially that investment to alleviate the key constraints of the input market are also started at the same time. All of these arguments are conceptually valid, although their applicability in any given country cannot be taken for granted; in most cases, applicability was not actually and explicitly verified in the assistance programs funded under GFRP and the key four characteristics of the proposed "smart subsidies" strategies were not validated in advance.

In summary, when assessing the consistency of the specific loans and policies prescribed officially by the World Bank (WB) for selected countries during the 2007/08 food crisis, we identify that given the significant flexibility of the World Bank official recommendations, most of the loans comply with what was in the GFRP framework. However, when analyzing the consistency of those recommendations to the research results published by the World Bank post-2008, we found significant inconsistencies, especially in short-term policies. As a result, is extremely important for the World Bank to carefully assess the risks and costs of the implementation of the official, more flexible recommendations, of the GFRP against what is currently being advocated at the Bank and to carefully assess how to avoid these inconsistencies in the future.

Table 2. Summary of Operations

	Official position of WB during 2007/08		Policies recommended by the WB after 2008	
	Consistent	Not Consistent	Consistent	Not Consistent
Mozambique	Х		Х	
Bangladesh	Х			Х
Philippines	Х		Х	Х
Djibouti	Х		Х	Х
Honduras	Х			Х
Haiti	Х		Х	Х
Cambodia	Х	X (export ban)	Х	Х
Mali	Х	Х	Х	Х
Guinea	Х	X (export ban)	Х	Х
Burundi	Х		Х	Х
Madagascar	Х		Х	Х
Sierra Leone	Х	Х	Х	Х
Rwanda		Х		Х

Conclusions

The world faces a new food economy that likely involves both higher and more volatile food prices, and evidence of both conditions was clear in 2007/08 and 2011. After the food price crisis of 2007–08, food prices started rising again in June 2010, with international prices of maize and wheat roughly doubling by May 2011. This situation imposes several challenges. In the short run, the global food supply is relatively inelastic, leading to shortages and amplifying the impact of any shock. The poor are the hardest hit. In the long run, the goal should be to achieve food security. The drivers that have increased food demand in the last few years are likely to persist (and even expand). Thus, there is a significant role for international organizations like the World Bank, IFAD, AFD, IADB to play in increasing the countries' capacity to cope with this new world scenario and in promoting appropriate policies that will help to minimize the adverse effects of the increase in prices and price volatility, as well as to avoid exacerbating the crisis.

In this regard, this paper describes some of the most important official policies that international organizations prescribed to different countries during the food crisis of 2007/08. In addition, it compares those policies to what the scientific evidence

on their potential costs and benefits. The review focuses on the short-term, medium-, and long-term policies. In terms of short-term policies, two mechanisms are emphasized: support for the poor and price stabilization (with an emphasis on trade restrictions and food reserves). In terms of medium- and long-term policies, we focus on the recommendations linked to increasing agricultural productivity through productivity gains and elimination of post-harvest losses.

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Commodity market instability and asymmetries in developing countries: Development impacts and policies

Risk, defined as exposure to uncertain future events, is part of everyday life, and people and countries have learned to deal with it over centuries. However, there is a growing realization that uncertainty and risk maybe crucial to a country's growth and development as well as its welfare. Commodity market risks in particular are well known to affect development and welfare in a variety of ways and it is important to understand these so as to prioritize policy actions, and to design strategies to avoid the undesirable parts of the consequences. Commodity market shocks may have both asymmetric patterns and asymmetric impacts, namely differing in booms and busts, or create irreversibilities that may hamper subsequent development. While considerable research has taken place in the past to understand the influences of commodity market shocks, asymmetries and irreversibilities have not been studied much. It was to this general topic that a conference was addressed in June 2015 by Ferdi. This book is a collection of the policy briefs edited after the conference.

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