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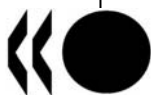
STABILISATION POLICIES IN DEVELOPING COUNTRIES AFTER THE 2007-08 FOOD CRISIS

Please note that the last sentence of paragraph 47 has been slightly adjusted.

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Note by the Secretariat

The project "Agricultural policy choices in developing countries" is mandated under Output Area 3.2.1, Intermediate Output Result 4.3 of the 2009-10 PWB of the Committee for Agriculture. This document is one of the background reports prepared as part of the project. It was prepared by Professor Philip Abbott, Purdue University and revised in light of comments made by delegates at the 15-17 November 2010 Working Party on Agricultural Policies and Markets and at the 29-30 November 2010 Global Forum on Agriculture. This paper was declassified on the responsibility of the Secretary-General of the OECD at the March 2011 meeting of the Working Party on Agricultural Policies and Markets.

TABLE OF CONTENTS

STABILISATION POLICIES IN DEVELOPING COUNTRIES AFTER THE 2007-08 FOOD CRISIS ...	4
Abstract	4
Introduction	4
Policy responses to world food price spikes	6
Stabilisation policy debates	8
Roadmap	8
Economic environment	9
World price volatility	9
Domestic versus international volatility	12
Market imperfections and risk	15
Price transmission	16
Objectives	23
Basic economic welfare	24
Addressing market failure	25
Social objectives	26
Policy instruments	28
Stocks	29
Trade policy	31
Institutional arrangements	36
Market institutions	36
Governance	39
Conclusions	40
Policy recommendations	41
Future research agenda	42
REFERENCES	45

Tables

Table 1. Trade based policy measures commonly adopted (as of 1 December 2008)	7
Table 2. Disaggregation of variance components in producer prices for maize, selected African countries (%)	13
Table 3. Variability and covariance of maize production in Africa, 1995-2004	35

Figures

Figure 1. International grain price indices	5
Figure 2. Annualised price volatility and cash prices of wheat	10
Figure 3. Rice and wheat prices in stabilising regimes – China and Morocco	18
Figure 4. Tradable versus non-tradable grain prices in Burkina Faso	19
Figure 5. Tradable versus non-tradable grain prices in Mali	20
Figure 6. Grain prices in volatile domestic markets	21
Figure 7. Objectives relevant to stabilisation policy choices	24

STABILISATION POLICIES IN DEVELOPING COUNTRIES AFTER THE 2007-08 FOOD CRISIS¹

Abstract

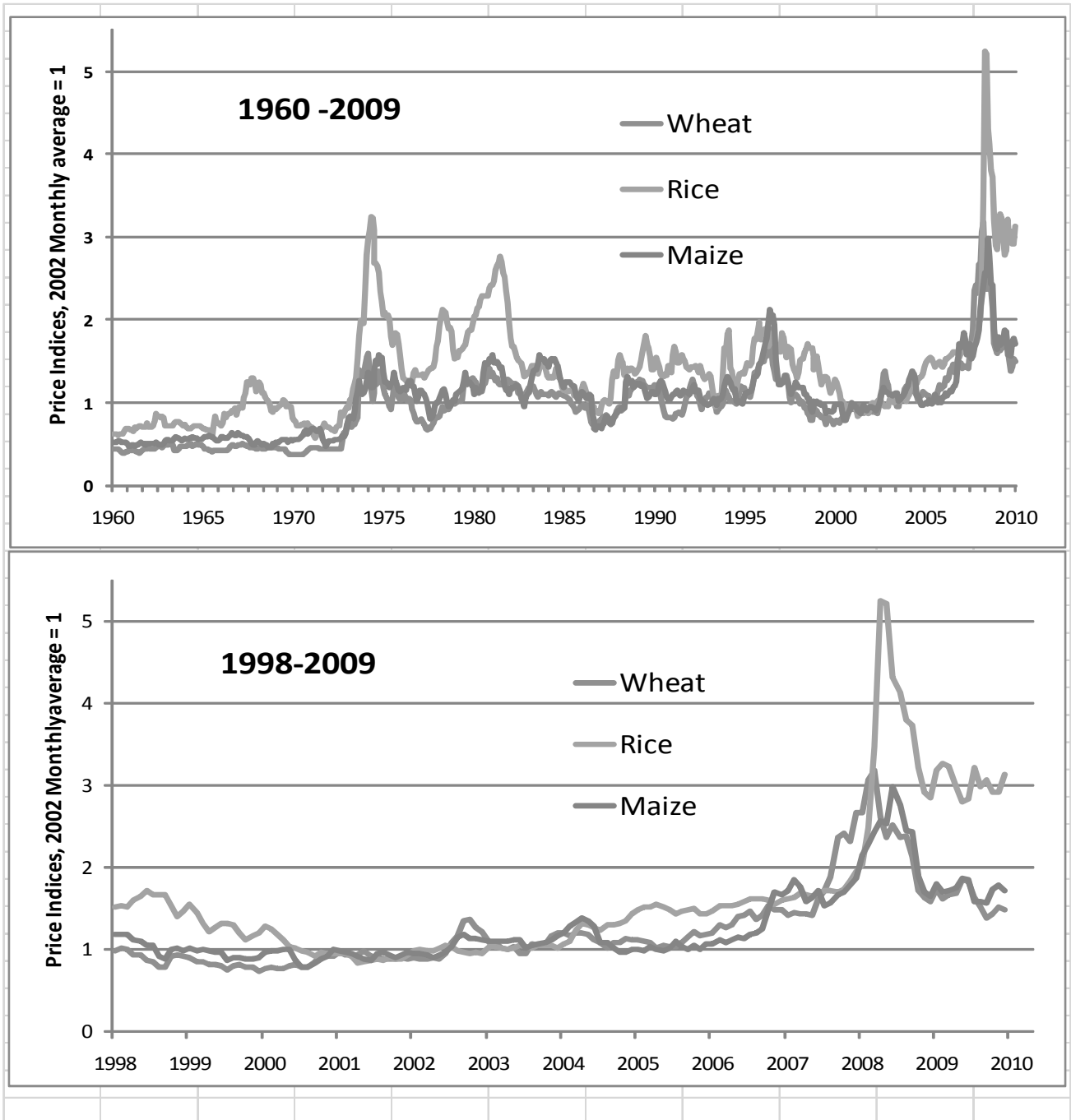
1. During the 2007-08 food crisis very high and volatile world grain prices brought stabilising policy responses by many developing country governments. The isolationist policies pursued contradicted “best practices” risk management strategies that focus on long run agricultural development, trade liberalisation, safety nets and private market solutions to risk. Some have criticised those recommendations in the wake of the food crisis, as countries that opened their borders were vulnerable to high import costs and pass-through to high consumer prices. Domestic market outcomes were conditioned to varying degrees by lagged, imperfect price transmission, transactions costs and weak market integration in addition to policy responses. Stabilisation of domestic markets also spilled over into greater international market instability. It is unlikely that international markets will offer sufficient stability if a single country keeps its border open when extremes occur, however, unless most large exporters and large, self-sufficient producers participate – including China and India. If world price spikes like those observed in 2008 are an infrequent but real event, policy recommendations need to take into account a more realistic characterisation of world price distributions. Following Anton’s risk management framework, stabilisation policy is called for when market failures occur, putting markets in the tail of the price distribution, even if “best practices” involving market based approaches to risk management should be followed during normal years. His market failure layer, where government intervention is needed, is deeper in developing countries and dependent on the extent of marketing institutional development. While the policy regime should rely on liberal trade in most years, it should be recognised that short run dynamics mean short-run stocks policy remains a viable concern, due to delays in import arrival, imperfect information on the harvest, and inter-seasonal price dynamics. Moreover, trade policy adjustments are likely to be perceived as necessary when infrequent world price spikes reoccur. The challenge to implementing such a regime is that consistent, predictable and transparent governance is needed so that interventions make outcomes better, not worse.

Introduction

2. After a prolonged period of stability starting about 1998, international grain prices began to rise in 2007 and spiked in 2008 (von Braun, 2008). Between October 2006 and January 2008, world wheat prices rose 74%, while world rice and maize prices increased 27% and 45%, respectively. Wheat prices rose another 19% to their peak in March, 2008 and maize prices rose another 39% from January 2008 levels, peaking in June. The most spectacular rise was for rice, as world rice prices increased another 157% by April, 2008. Figure 1 shows the relative stability of these prices between 1998 and 2006 and then the dramatic price increases in 2007 and especially 2008 (IMF, 2010).

1. This paper was prepared as a report for the OECD. The author is grateful for comments received from Jonathan Brooks and Jesus Anton during preparation of this report and from participants at the 2010 OECD Global Forum. The views expressed and any errors or omissions are solely those of the author and should not be attributed to the OECD.

Figure 1. International grain price indices



Source: IMF, International Financial Statistics, 2010.

3. The FAO (2008b) and USDA (Rosen *et al.*, 2008) have estimated that between 75 and 133 million additional poor people suffered from hunger and malnutrition as a result of these world price increases. The World Bank (2008a) estimated that an additional 105 million people suffered extreme poverty. Initial expectations were that high prices would persist (OECD and FAO, 2008), but global recession reduced the spikes (Abbott, Tyner and Hurt, 2008 & 2009). Price levels remain elevated relative to earlier this decade, global recession means poverty and hunger problems persist, and many believe we are now in an era of more volatile food prices (von Braun, 2009; Delgado and Townsend, 2009). Food

policy changed in many countries to counteract these outcomes. While the food crisis has abated, food security issues persist and food policies need to be re-examined.

Policy responses to world food price spikes

4. This food crisis of 2007-08 brought substantial responses by national governments and by the international donor community to address poverty and hunger, to renew efforts aimed at increasing agricultural productivity, and to protect consumers broadly. While the international community has focused on safety nets in the short run and fostering growth in agricultural production in the medium to long run (UNHCTF, 2008; Viatte, *et al.*, 2009), national governments of developing countries pursued a number of policies to stabilise domestic markets and to isolate their consumers from events in world grain markets (Abbott, 2009). An FAO study (Demeke, Pangrazio and Maetz, 2009), which examined policy responses in 81 developing countries, found that 43 countries reduced tariffs and 25 countries imposed export taxes or restrictions to mitigate the effects of higher international prices. Table 1 shows that the FAO also found domestic measures (*e.g.* cutting taxes on food, subsidies, and stocks releases) used to complement these trade measures aimed at preventing transmission of world price variability to domestic markets. Domestic political objectives, including concern for urban consumers and quelling food riots, took precedence over exacerbating instability in international markets (Wodon and Zaman, 2008). In the case of rice, several authors (*e.g.* Timmer, 2008a&b; Dawe, 2008; Diouf, 2008) highlighted the importance of export bans by key traders leading to the especially strong spike in world rice prices. Thus, the food crisis set a new stage for stabilisation policy in developing countries, in which trade liberalisation looked to be an ineffective option and so was rejected by many governments. Government stabilisation goals, and even public marketing institutions, had persisted in many developing countries (Cummings and Gulati, 2009; Jayne and Tschirley, 2009), but some countries used new trade policy instruments to (partially) isolate domestic markets. Moreover, many countries used stocks releases that theory suggests should be ineffective at changing prices in an open economy.

Table 1. Trade based policy measures commonly adopted (as of 1 December 2008)

	Africa	Asia	Latin America	Overall
Countries Surveyed	33	26	22	81
Market Interventions				
Trade Policy				
<i>Reduction of tariffs and customs fees on imports</i>	18	13	12	43
<i>Restricted or banned export</i>	8	13	4	25
Domestic Market Measures				
<i>Suspension/reduction of VAT or other taxes</i>	14	5	4	23
<i>Released stocks at subsidised prices</i>	13	15	7	35
<i>Administered prices</i>	10	6	5	21
Production Support				
Production Support	12	11	12	35
Production Safety Nets	6	4	5	15
Fertiliser and Seed Programs	4	2	3	9
Market Interventions	4	9	2	15
Consumer Safety Nets				
Cash Transfers	6	8	9	23
Increase Disposable Income	4	8	4	16

Source: Demeke, Pangrazio and Maetz, 2008.

5. Policy responses by developing country governments often constituted a reversion to past policy regimes, or at least past policy objectives. Structural adjustment programs of the IMF and World Bank had reduced the role of the state in grain markets in many instances, and had encouraged a greater role for the private sector (Abbott, Andersen and Tarp, 2010). Continuing desire for stable domestic markets led the World Bank to identify best practices for risk management in agriculture in a privatised market setting (Byerlee, Jayne and Myers, 2005) and to work with developing countries to adopt new market based institutions (CRMG, 2008). They encouraged establishing and using private risk management institutions including futures markets, crop insurance and forward pricing, and argued that trade liberalisation was an important component of that strategy. They downplayed the role of public stockholding, and of policies pursued by governments to stabilise domestic prices. Galtier (2009a&b) argued that this approach failed in the face of the 2007-08 food crisis, and that a new strategy with a greater role for government is called for. Countries had not implemented to any significant extent the private sector risk management strategies advocated by the World Bank (CRMG, 2008; Galtier, 2009). The trade and domestic policies adopted in the face of the crisis (Demeke, Pangrazio and Maetz, 2009) served to isolate markets, and were often the kinds of policies used in the pre-structural adjustment era. They reflected a set of national objectives that favoured domestic price stabilisation and were less concerned with implications for greater instability in international markets that such policy responses would bring (Abbott, 2009).

Stabilisation policy debates

6. Subsequent debate has looked at both appropriate trade and domestic policy for developing countries, and at initiatives to stabilise international markets. Sarris (2009) has proposed both greater use of futures markets by developing countries, and establishing an international clearing house along the lines used by commodity exchanges to insure contracts are honoured in world markets and world market supplies are reliable. Von Braun and Torero (2009) have proposed an international virtual reserves scheme to combat world price spikes. Galtier (2009a&b) argued for a complementary combination of domestic trade and stocks policies to preserve stability in domestic markets. Timmer (2008a&b) has argued that it is unrealistic to expect Asian rice traders to back away from the public stabilisation schemes that kept world price spikes out of their domestic markets.

7. Substantial bodies of literature have examined domestic stabilisation policy in developing countries, international alternatives to those regimes, and private risk management alternatives to public stabilisation initiatives. Anton (2009) has argued that a holistic approach to risk management is needed, where stabilisation policy takes into account private market strategies, rather than pursuing piecemeal price or income interventions. Numerous studies have examined what happened in 2007-08 in specific developing countries and how policies and markets coped with the world price increases (see Abbott, 2009 for a review), emphasising the extent to which price stabilisation objectives were pursued. Weak institutional development and preference for price stability have prevented broad-based, holistic approaches to risk being pursued extensively in most developing countries.

8. Past literature has been quite critical of public stockholding, and stabilisation policy managed via stocks or trade policy. Seminal work by Newberry and Stiglitz (1981) argued that international stockpiling and price stabilisation would be ineffective and costly in stabilising producer welfare. The various international commodity agreements were judged to be failures on both economic and political grounds (Sarris, 1998; Gilbert, 1996). Stockpiles tended to be held for long periods, due to the asymmetric nature of world price and domestic production distributions, leading to high stabilisation costs. Moreover, especially for international schemes, parties to commodity agreements did not agree on the basic objectives of those institutions. As early as 1984 financial alternatives were being explored due to the perceived high transactions costs of stockpiling alternatives (Huddleston *et al.*, 1984). Work persisted in looking at international stabilisation schemes until the early 1990s, due to the persistent interest in stabilisation in developing countries (*e.g.* Braverman *et al.*, 1992; Abbott *et al.* 1993). After that time two strands of literature have dominated. One has focused on risk management strategies in a private market setting (see Byerlee, Jayne and Myers, 2005 and Anton, 2009 for reviews). Another is the considerable work examining agricultural policies in developing countries, where issues relevant to stabilisation policy and the role of the state in agricultural markets have remained relevant (*e.g.* Jayne and Tschirley, 2009).

Roadmap

9. This paper will examine stabilisation policy from the perspective of a developing country government, focusing on domestic policy alternatives and implications for trade policy. The key question is whether developing country governments should intervene to stabilise their domestic markets, and if so, what policy instruments and institutions should they employ? In particular what (if any) role should public stockpiling and/or trade policy play? Issues related to international market stabilisation will arise, since they influence decisions taken by national governments, but emphasis will be placed on domestic policy in light of recent events in international markets, and possible changes in the economic environment within which those policies are set.

10. This paper will first explore those changes in the economic environment. It will examine whether world markets are now more volatile, and whether that international market volatility is now more

important than domestic sources of volatility (e.g. droughts). It will consider the evidence that has been assembled, particularly over the last two years, on the extent to which world prices were transmitted to domestic markets, and if not what blocked that price transmission. Then issues related to the objectives behind stabilisation policy will be explored. That section will consider the disconnect between objectives of international donors and national governments. In light of these objectives, issues related to the choice of policy instruments will be discussed. Particular emphasis will be placed on trade policy and stockpiling. Then the institutional arrangements that condition the effectiveness of policies will be examined, with emphasis on those market institutions (public and private) that affect trade and stocks. The conclusions will summarise policy recommendations and suggest an agenda for future research.

Economic environment

11. The World Bank (CRMG, 2008) has asserted that there is considerable un-hedged risk in developing country agriculture, and many factors beyond world price variability contribute to that risk. Anton (2009) has argued that the multiple sources of risk in agriculture need to be addressed in a holistic fashion, taking into account interactions among risk sources. Most developing countries have a long way to go to follow those recommendations, but are most concerned with both domestic production variability and variability in the costs of imports to meet food needs. They have pursued partial strategies focusing on price stabilisation, which is in part a consequence of the state of institutions - like commercialisation of agriculture and financial markets. In the absence of the kinds of market institutions found in OECD countries, price stabilisation has been pursued both to balance consumer and producer interests and to mitigate poverty and hunger. While in the longer run it is clearly beneficial to have private market institutions develop, and policies are needed to facilitate that, for now the concerns that drove countries to stabilise domestic market prices persist and may even be stronger.

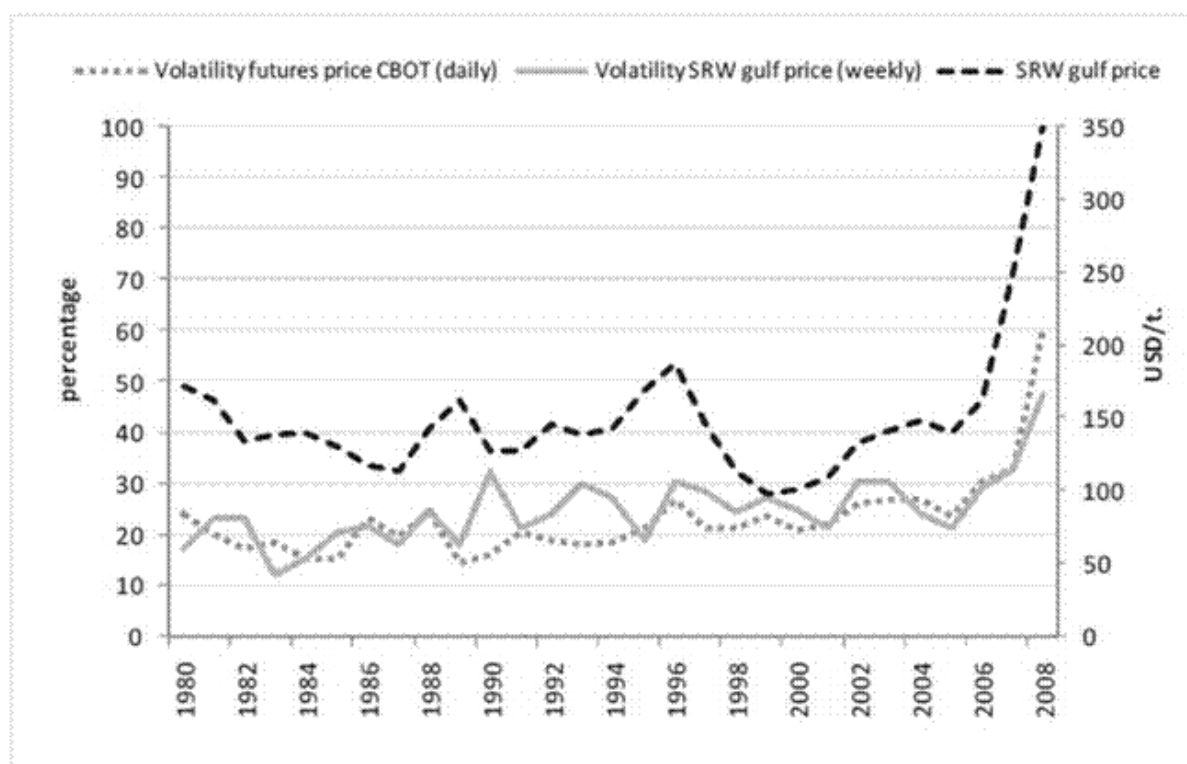
12. The price dynamics of 2007-08 have led some to assert that international commodity markets are now more volatile and the tradeoffs between trade policy alternatives and domestic measures including stockpiling are different, with concern over international price instability once again mattering (von Braun, 2008; Delgado and Townsend, 2009). Three issues related to domestic versus international sources of risk to agriculture and to food security are examined in this section - Has world price volatility increased, and is the distribution of world prices now somehow different? Does world price variability now matter more than domestic inter-seasonal and inter-annual price variability? And has the transmission of world price variability to domestic markets changed?

World price volatility

13. Figure 1 included two graphs of world grain prices over time, encompassing different periods (1998 to 2009 and 1960 to 2009) to highlight the fact that one's time perspective is critical to assessment of world price volatility. If one has a short memory limited to the previous decade, the events of 2007-08 stand out as exceptional. But a longer perspective shows that world grain prices have exhibited both long periods of stability, like 1998 to 2006, and periods of substantial volatility more like the 2007-08 period. Had we deflated world prices, the variability and peaks of prices in the 1970s would appear more volatile even than recent years. It was recognised in the work on stocks in the 1970s and 1980s that prices were unlikely to follow normal distributions, and that distributions characterised by long periods of low stable prices and brief periods of high prices make stabilisation via public stockpiling strategies costly. This is because large production shortfalls may be infrequent, and distributions may be asymmetric. Moreover, private stockpiling mitigates effects of production shortfalls except in circumstances where prior production or policy has reduced stocks to low levels, contributing to the dynamic of short peaks followed by long periods of low prices. The observed result has been large stocks held over several years, and the rare event that production is low when stocks are also low.

14. Coefficients of variation are the measure most commonly used to assess price volatility (*i.e.* Balcombe, 2009; Gilbert, 2009; Hazell, Shileds and Shields, 2005). As mean prices increase an increase in variances of those prices should not be surprising, as would occur with neutral inflation. An increase in a coefficient of variation is therefore a more meaningful measure of increased volatility. Anton (2009) used a very similar concept of volatility, based on the per cent change in prices between consecutive periods, to show that by this standard there was a dramatic increase in international grain price volatility in 2007 and especially in early 2008. Figure 2 shows his volatility measure for Chicago Board of Trade (CBOT) nearby wheat futures prices as well as weekly SRW Gulf prices alongside the SRW Gulf wheat price. From 1980 until 2006 his volatility measure hovered between 20% and 30% of mean price, and jumped to nearly 60% in early 2008 for daily CBOT prices. The FAO (2008a) similarly noted this rise in volatility of international and US prices, especially in early 2008, for rice, maize and soybeans as well as wheat. Evidence is less compelling for prices after the mid-2008 peaks, relative to a longer history of price behaviour.

Figure 2. Annualised price volatility and cash prices of wheat



Source: Anton, OECD, 2009, using data from the International Grain Council and Chicago Board of Trade.

Causes of volatility and high world prices

15. While observations of price behaviour led some to simply examine price variability, others have sought to relate both spikes and variability to causal factors behind high prices. The debate over the causes of price increases in 2007-08 remains controversial, with some areas of agreement. Abbott, Hurt and Tyner (2008, 2009) argued that three sets of factors lay behind high food prices. Supply and utilisation trends resulting in low stocks gave rise to conditions where supply shocks (*e.g.* droughts) mattered more than in earlier years. Exchange rate depreciation and possibly speculation led to financial pressures raising prices, especially in dollar terms. Price increases have been more than the proportional changes in response to exchange rate fluctuations that are suggested by the law of one price, suggesting overshooting may be occurring. Emergence of the biofuels industry and US biofuels mandates linked oil prices and agricultural prices more tightly than before, so oil price increases were passed to grain and oilseed prices – at least for a

time. Gilbert (2009) has argued that common factors such as exchange rates, financial speculation and monetary policy must be more important than supply shocks given the coincidence of price increases across commodities. Mitchell (2008), on the other hand, attributed much of the price increase to biofuels, which most directly affects corn and oilseeds.

16. Debate on the role of speculation remains controversial. Von Braun and Torero (2009) as well as Gilbert (2009) argue for its importance, while Irwin *et al.* (2009) and Wright (2009a&b) believe this factor played a minor role. Some analysts (*e.g.* Timmer, 2008a&b) have included hoarding by domestic agents such as farmers, traders and consumers as part of the “speculative behaviour” that led to the world price spikes of 2008. For example, Timmer argued that rice exports fell in Vietnam as a result of an export ban, but domestic prices spiked nevertheless as those domestic agents held onto rice in anticipation of future high prices and the lifting of the ban. In assessing the role of speculation in the food crisis a distinction needs to be made between this type of speculation - strategic behaviour of agents engaged in the physical market - versus behaviour of financial “speculators” on futures markets who may not hold positions or have commercial interest in physical markets. While anecdotal evidence of both types of behaviour has related them to price spikes, their relative importance remains controversial.

17. Most analysts agree that isolationist policies pursued by many countries made world price peaks and market instability greater than they would otherwise have been. Thus, stabilisation policy pursued by national governments not only responded to, but also contributed to the world price spikes that occurred.

Conditional variance of world prices

18. Balcombe (2009) has attempted to incorporate this information on causes of world price spikes into his assessment of whether or not volatility has increased for many agricultural commodities. He used time series econometrics on monthly data to sort out measures of price variability conditioned by the factors identified as contributing to the 2007-08 food crisis. He found that price variability for grains depends on exchange rates, oil prices and stocks. Once these factors are taken into account, variability is not significantly higher now than in earlier periods, especially if one looks over a longer time horizon.

19. A lesson to be drawn from Balcombe’s (2009) results is that volatility is conditional on market circumstances, and that the distributions of prices need to be understood allowing for differing levels of volatility, driven by those market factors. Uncertainty in markets has increased due to the uncertainty of these factors linked to grain prices, and that these causal factors are themselves very difficult to predict. Wright’s (2009a&b) assessment of the role of stocks in determining price volatility is a simple illustration of one factor. His point is that when stocks are large they elastically adjust to quantity shocks, reducing volatility. When stocks are low adjustment becomes more inelastic and prices are more volatile. Hence, the perceived low world stocks in 2007-08 would have contributed not only to high prices but also to higher volatility. But this seems to have occurred at higher stocks-to-use ratios than in the past. Events like the biofuels mandates may also bring structural changes in the factors driving international grain prices. Inspection of oil prices versus grain prices over the last several decades reveals little correlation during the long period of low oil prices starting in the late 1980s, and delayed impacts on the level and volatility of corn prices that became stronger once ethanol plants were online in 2006.

20. A related question is whether high prices and high volatility occur together, taking into account the expectation that differences in means result in differing variances, but not necessarily differences in coefficients of variation. This depends on what caused high prices. If prices rise because increased costs push output prices – for example, high crude oil prices leading to high fertiliser prices result in high grain and oilseed prices – then it is possible that volatility need not be higher, and depends on the volatility of those input prices. But agricultural prices and hence input costs may be driven by demand, so some have dismissed this argument as an important cause of the high prices in 2008. (Abbott, Hurt and Tyner, 2008).

If increased demand (*e.g.* due to biofuels demand) necessitates higher prices as an incentive to greater production, again volatility need not be higher. But if high prices coincide with low stocks, it is likely that volatility is higher with high prices. Stocks not only signal price levels, but are also the shock absorber reducing price volatility (Wright, 2009a&b).

Domestic versus international volatility

21. Policy makers who are considering trade policy alternatives to stabilise domestic markets need to be aware of these nuances in the distribution of international grain prices. In 2005 the World Bank observed that domestic price variability was largely due to domestic factors (Byerlee, Jayne and Myers, 2005). Trade liberalisation was recommended as an alternative when variability in world market prices was at a relatively low level. Policy needs to take into account the infrequent but potentially large changes in world prices, which occurred not only in 2007-08 but also in the 1970s and to a lesser extent in the mid-1990s. They need to recognise that there will be episodes of high, volatile prices and of low, stable prices, driven by external factors. They should pay attention to related markets that have caused price increases in the past, aware that new mechanisms arise. They should expect infrequent but large spikes when relying on international markets to smooth domestic markets. It is likely that we may return to a period of stability like 1998 to 2005, where domestic factors dominate, but that spikes in world grain prices can reoccur. Macroeconomic, financial market and energy market factors will influence this distribution. Stocks dynamics, both domestic and international, will also be important.

Domestic variability

22. While following best practices, and liberalising trade, may have been problematic strategy during the recent food crisis, the notion that domestic sources of risk and volatility dominate is likely to remain correct in most years. Hazell, Shields and Shields (2005) used several methods and data sources to show the relative importance of domestic production variability versus international price variability. They report coefficients of variation for world rice, wheat and maize prices as well as similar measures for domestic prices in various wheat and maize producing developing countries. In the cases of 18 maize producers, three showed much higher variability in domestic prices relative to world prices for 1971 to 2002, while 7 showed lower variability. In the cases of 7 wheat producers, 2 showed much larger variability while 5 showed much smaller variability over that same period. Differences in domestic volatility depend not only on domestic versus international factors, but also on the extent to which countries stabilise and/or are integrated into world markets. There are several cases with high domestic production volatility yet price volatility less than international price volatility.

23. Hazell, Shields and Shields (2005) also attempt to distinguish contributions to price volatility due to domestic production variations versus international price variability. Table 2 shows that the variance of border prices contributes more than 10% of domestic producer price variance in only 4 of 18 cases, and more than 25% in only 2 cases. Moreover, there is little evidence that variances in border prices contributed more importantly to domestic price variances after trade reforms. Their data overlap periods when world price dynamics and domestic policy regimes may have changed, and much of the variation in domestic prices remains unexplained in their analysis. But their evidence strongly supports the notion that domestic factors matter more than international prices in most years. Evidence to be presented later on price transmission, used to measure the relationship between world and domestic prices, will tell a similar story, except that persistently high world prices can get transmitted to domestic prices with a lag. While it would be useful to broaden country coverage and bring this research up to date, the relative stability of world grain prices until 2007 means that the conclusions drawn in this earlier study likely remain valid until the 2007-08 period. Which characterization holds in the future depends on our new understanding of world price distributions, considered above, and a subject meriting further research.

Table 2. Disaggregation of variance components in producer prices for maize, selected African countries (%)

Country	Period of Analysis	Variance of Border Prices	Variance of Domestic Production	Covariance and Unexplained	Total
Botswana	1974–1995	1	49	50	100
Ethiopia	1971–2002	1	22	77	100
		(2)	(34)	(64)	
Malawi	1980–2002	8	1	9	100
		(43)	(4)	(53)	
Mali	1988–2002	2	28	70	100
		(1)	(32)	(67)	
Mozambique	1985–2002	25	2	73	100
		(2)	(1)	(97)	
Namibia	1980–2002	3	11	86	100
		(1)	(1)	(98)	
Niger	1971–1995	5	57	38	100
Nigeria	1971–2002	12	26	62	100
		(7)	(16)	(77)	
Rwanda	1971–2002	5	1	6	100
		(10)	(4)	(86)	
Tanzania	1971–1995	19	15	66	100
Uganda	1980–1995	1	10	89	100
Zambia	1985–1995	37	5	58	100

Note: Figures in parentheses are for post-reform periods beginning 1991.

Source: Hazell, Shields and Shields, 2005.

Seasonality

24. If domestic production variability is usually the more important source of instability in a developing country, then it is necessary to understand the short run dynamics of price and production in order to properly design and evaluate policy. Moreover, in poorly integrated traditional markets it may be the case that inter-seasonal price variability exceeds inter-annual price variability, especially in the absence of government intervention. Parastatal grain marketing boards arose in part to combat these price dynamics. The continuing pervasive extent of government intervention in grains markets of developing countries means that extreme inter-seasonal price variability is seldom observed in practice. It is more likely to occur in isolated markets, where data are not collected, as well. There is considerable variability, however, in the extent to which countries succeed at stabilising their domestic markets across seasons.

25. The extent of inter-seasonal price variability depends crucially on domestic storage markets, which can be quite imperfect. Consider the case of an annual crop, such as wheat or coarse grains, for which production typically occurs once a year, while consumption occurs regularly over the entire year. (Rice would need to consider multiple crops per year.) Stocks must exist to smooth consumption over time, and it is never the case, even in OECD countries, that countries deplete stocks just at the moment the next harvest arrives. Carry-over stocks into the next crop year are often used to gauge supply-utilisation balance and hence inform market price determination. A non-linear relationship is believed to exist between prices and expected carry-out stocks, with lower stocks yielding higher price increases in response to a given quantity shock, characteristic of more inelastic demand when stocks are low (Williams and Wright, 1991; Caifiro *et al.*, 2010). Prices are typically lowest just after harvest, and then increase until the next harvest, when they fall again. This movement of prices over time creates incentives to store. Thus, the extent of price variation over time depends on storage costs, and hence the efficiency of the domestic storage system. Traditional systems might be characterised by mostly on-farm storage in primitive conditions, with high losses and incentives to smooth the consumption of the farm family, but not as much for urban markets. The more commercialised is the market, the greater is the role of marketed surplus, and so too is the role of commercial storage.

Parastatals and storage

26. When governments replaced traders with parastatals, they also managed stocks. In both developed and developing countries, varying roles have been played by public stocks versus private commercial stocks to smooth consumption and inter-seasonal price variability. One consequence of privatisation of grain parastatals under structural adjustment programs is greater reliance on private storage, but weak institutions and market imperfections may limit how well those private storage systems function after reform.

27. Both public and private stocks will follow the inter-seasonal price dynamics conditioned by expectations on upcoming harvests and on storage costs. The better functioning are private stocks, the less is the variability of domestic prices, and the easier it would be for public interventions to stabilise prices. Better domestic private storage means lower transactions costs, and probably smaller post-harvest losses. Policy needs to specify rules to manage stocks and trade together, to reduce inter-seasonal price spikes, and to rebuild stocks after bad years. But inconsistent signals from government interventions can disrupt the functioning of private storage markets and timely delivery of supplies and imports (Jayne and Tschirley, 2009).

Stocks and trade over the short run

28. Both the peak price before the next harvest is realised and the price after harvest are informed by expectations on upcoming production. If the next harvest is expected to be poor, peak prices can be very high as stockholders hold onto grain for the next crop year, and prices after that poor harvest will fall less than in good years. In extremely bad years prices may not fall at all. The period of peak prices before harvest is when food security issues can be most severe, as food is most expensive for those who must purchase to meet their needs. In West Africa there is a French name for this hungry period – “soudure” – and farmers may employ cropping strategies to realise an earlier harvest at higher cost to mitigate this hunger. Private coping strategies in traditional markets can vary from crop management decisions to holding large on-farm stockpiles in anticipation of potential shortfalls (Plateau, 1991). Parastatal market managers would also intervene to reduce these price peaks, when demand could become extremely inelastic so that quantity (or expectations) changes would have larger than normal price implications. Managing inter-seasonal stocks, both on-farm and nationally, is a delicate balance, because it is often the second year of drought that causes the most serious malnutrition, when stocks were run down in the prior year to maintain consumption, but are now too low to manage future prices and consumption.

29. One implication of this short run perspective is that stocks are an integral part of agricultural markets, and annual carry-over stocks always exist, though they can be public or private to varying degrees. Carry-over stocks are the result of inter-seasonal price dynamics, and inter-seasonal stockholding. The more commercialised the market, the greater is the role of private stocks and the easier is the job of inter-seasonal market stabilisation, as that is already being done to some extent by the private market.

30. A more nuanced view of the role of international trade is called for, as well. If one takes only an annual perspective, it is often argued that imports can make up for production shortfalls and there is no need for carryover stocks, especially public reserves stocks. Only when domestic prices fall between parity bounds – when marketing transactions costs mean it is too expensive for the country to either import or export, so prices fall between these two border prices – would stocks influence domestic prices in that model. Under most circumstances, theory would suggest that, for small trading countries, domestic prices should equal international prices plus or minus border interventions (*e.g.* tariffs). This, and high costs of stockholding, led to the recommendation that imports and trade policy were a better alternative than stockholding strategies to stabilise domestic markets (McIntire, 1981). But imports do not arrive instantaneously, nor necessarily continuously throughout the year. As a season plays out, and expectations change, both domestic prices and plans for later imports vary with these changing expectations. Early warning on the upcoming harvest is crucial to insure that imports arrive in a timely manner to smooth domestic prices. Predicting harvest in advance can be difficult, and this task usually falls to the government, as information is a public good. Poor information and mistakes show up in greater domestic price variability. Stocks interventions may be used to quell price peaks until imports arrive, and rebuilding stocks via imports can reduce the consequences of two bad harvests in a row. Trade policy to stabilise prices must take into account inter-seasonal price dynamics, as well as lags in import delivery and the reliability of information on domestic market conditions.

Market imperfections and risk

31. Newberry and Stiglitz (1981) argued that the justification for price stabilisation policy (or other, possibly better risk management strategies) was due to market imperfections. Missing or incomplete storage, insurance, futures or credit markets are the rationale for government interventions, and the nature of market failure should guide the type of intervention pursued. They argued in 1981 that extensive imperfections existed in developing country grain markets, and recent surveys still share that assessment (Byerlee, Jayne and Myers, 2005; Anton, 2009; CRMG, 2008). The extent and nature of these market imperfections varies by country, and probably imperfectly with the stage of development, depending on the

extent of commercialisation of agricultural markets. Investments in infrastructure (roads) and institutions (e.g. market information systems and legal frameworks) condition the extent of market failures. Traditional and commercial agricultural markets differ in a number of dimensions, and storage is clearly one of them. Traditional markets may have many small traders, and high transactions costs. As markets evolve large traders exploit scale economies but may have market power. They also bring better access to credit, which is crucial to effective risk management, and to commercial storage options. According to Anton (2009), imperfections persist even in developed countries, influencing the design and effectiveness of both public and private risk management tools. While institutions evolve to offer insurance and forward pricing options in developed country markets, stabilisation issues in public policy design persist.

Risk layers and market failure

32. In his conceptual framework for risk management Anton (2009) identifies three layers of risk faced by farmers (and countries). The risk retention layer occurs in the middle of the distribution and is managed by farm or household strategies. In both developed and developing countries farm households and consumers will have cropping and saving strategies to cope with these events. In the developed country context, the insurance layer is further out in the distribution and can be addressed by private market instruments such as crop insurance or forward pricing. Anton identifies the extreme tails of the distribution as the market failure layer, where intervention is required. If one thinks about adapting this to developing country circumstances, where countries set policy to intervene and private market institutions are immature, the best practice recommendation would be to adopt a liberal trade policy, with the insurance layer being used to smooth domestic production variability. The market failure layer is deeper in developing countries, and dependent on the state of institutional development. If the country lacks risk management institutions, the insurance layer may be part of the market failure layer. One might think of the food crisis of 2007-08 as an event in the market failure layer, where extremes in the international market were encountered, and trade could no longer provide the stability desired by an importing country. By that analogy, interventions of governments to stabilise, and to change trade policy in the face of the infrequent spikes in world prices, is a strategy to address such market failure. Parastatal grain board managers have described their task in this context, in which they need to adopt strategies to cope with catastrophic events (like 2008), but will allow smaller variations in market prices.

Price transmission

33. Price transmission has been studied extensively to explain developing country response and impacts of high international food prices in 2007-08 (e.g. Dawe, 2009; Daviron, *et al.*, 2009; Torrero, 2009; WFP, 2009). Studies have examined both the effect of world price changes on domestic prices, and on the extent of domestic market integration – including between urban and rural areas.

34. Price transmission elasticity estimates in a simplified, ideal world equal unity. Hence, prices in integrated markets would be expected to move under a proportional relationship. Transactions costs, policy interventions, and reversals or cessation of trade flows can complicate measurement of price transmission, and lead to estimated price transmission elasticities less than one. Nevertheless, if one takes trade flows and transactions costs into account, these parameters can inform the extent of both domestic and international market integration (Brooks and Melyukhina, 2005; Balcombe, Bailey and Brooks, 2007).

Border price transmission

35. Border price transmission estimates the extent to which changes in international prices result in changes in domestic prices, or how well integrated a country is into international markets. According to the annual modelling perspective, differences between border and domestic prices should depend on trade policies (tariffs) and transactions costs. While trade policies often vary to stabilise domestic markets, and

were used to this end in the face of the 2007-08 food crisis (Demeke *et al.*, 2009; Abbott, 2009), less endogenous variability is expected in transactions costs. But landlocked countries with high transactions costs would be found by these measures to reflect imperfect integration into world markets, and apparent failure of the “law of one price”. To the extent that imperfect price transmission reflects poor domestic-world market integration, it is capturing one of the important market imperfections relevant to stabilisation policy, and to the role trade policy may play in stabilisation. It also highlights the persistent role played by governments in domestic grain markets.

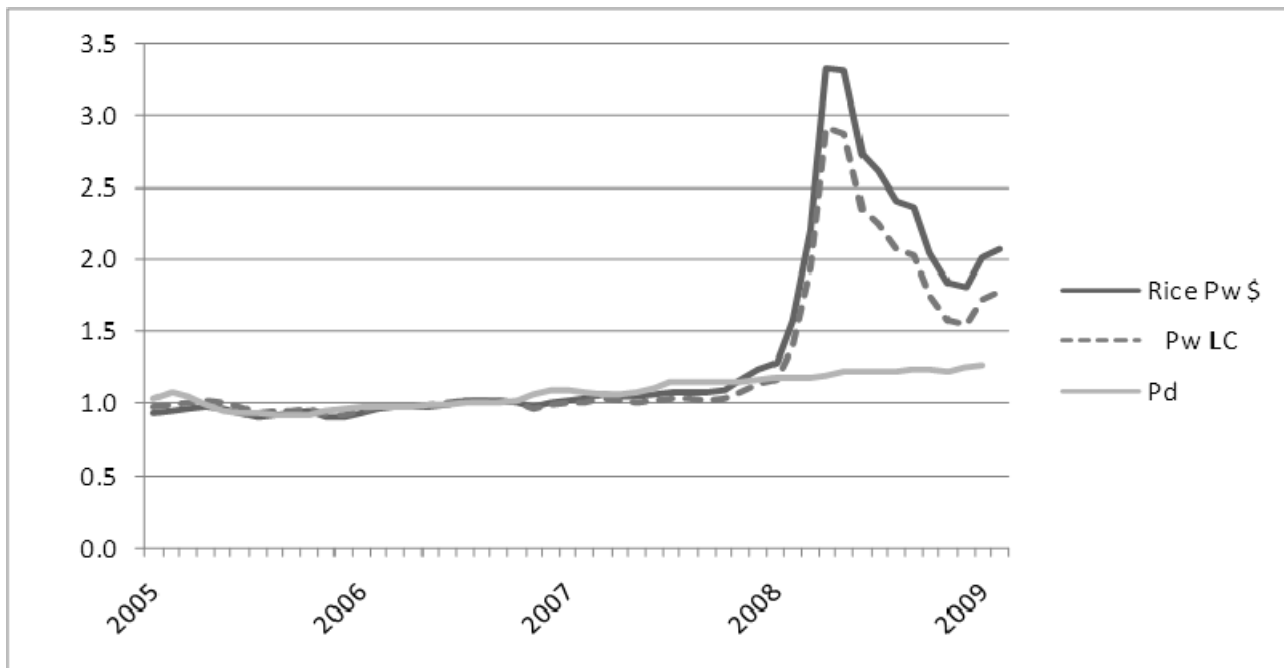
36. Estimation of price transmission elasticities is complicated by the dynamics that have been observed in the relationships between domestic and world prices (Baffes and Gardner, 2003). Modern time series econometric methods demand long series, over which price transmission relationships may not remain stable. Many of the studies of the 2007-08 event relied on simple methods due to the very short duration of data series available. Lags were evident in the response of domestic prices to the world price shocks in most cases (Abbott and Borot di Battisti, 2009). While it is expected that it may be eventually too costly for a country to resist changes in world prices for an extended period, in the short run domestic prices may move more slowly than world prices, or may be volatile but independent of world prices. Short run lagged adjustment dynamics may be the result of either government interventions, poor market integration, or both.

Evidence on border price transmission during the food crisis

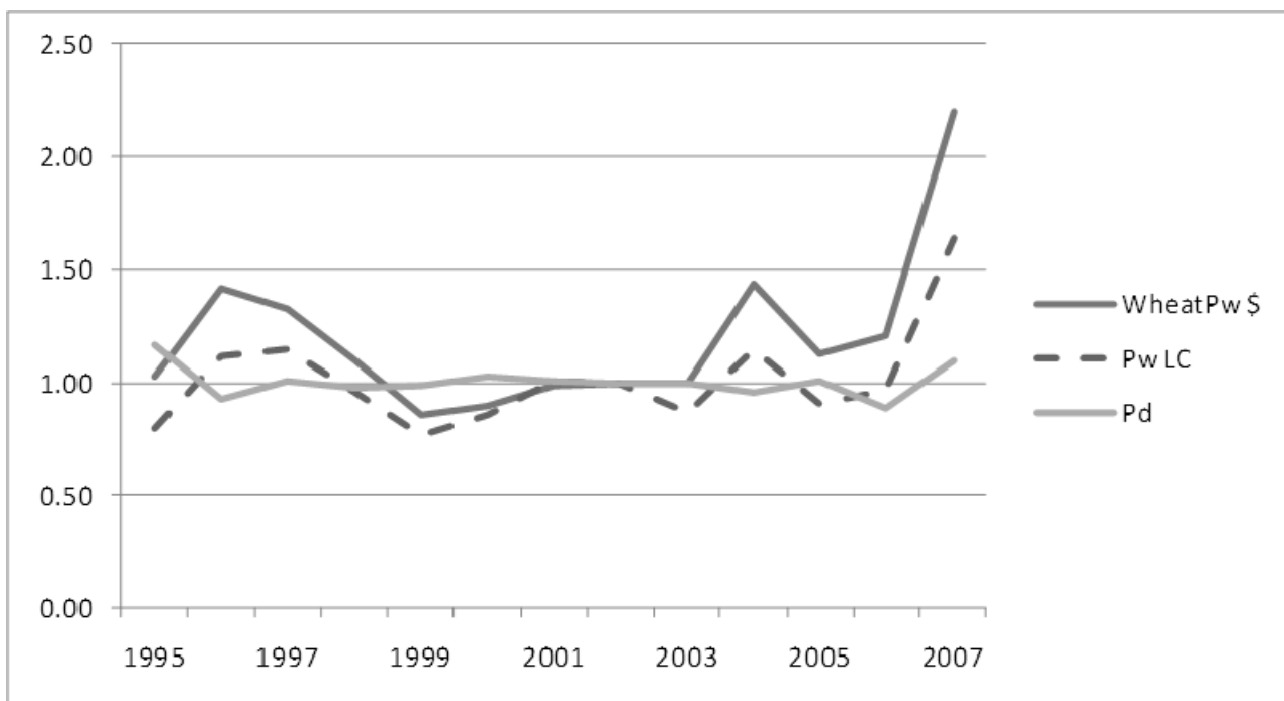
37. Parastatal grain marketing boards were notorious for implementing pan-territorial, pan-seasonal pricing strategies, creating stable prices for farmers (to the extent that the policy regime was stable). These pricing policies were heavily criticised for ignoring transportation costs and incentives to store. While privatisation eliminated these institutions for many countries, it often did not eliminate the desire for stability, so government interventions to stabilise markets continued or returned. Price transmission evidence from several countries exhibits a number of different cases, depending on the circumstances in that country. Three regimes are used in Figures 3-6 to highlight differing outcomes not only across countries, but also between crops within a country (depending on tradability of the commodity). Figure 3 illustrates effective price stabilising regimes in China and Morocco. Figures 4 and 5 show the consequences of tradability for Burkina Faso and Mali, contrasting rice with sorghum. Figure 6 demonstrates consequences of volatile domestic markets, poorly integrated with world markets, for Malawi and Ethiopia. In each graph domestic prices are compared to world prices measured in both dollars and in domestic currency, as exchange rate variations also influence border price pass-through.

Figure 3. Rice and wheat prices in stabilising regimes – China and Morocco

Chinese Rice – $\epsilon_{Pw>Pd} = 0.15$



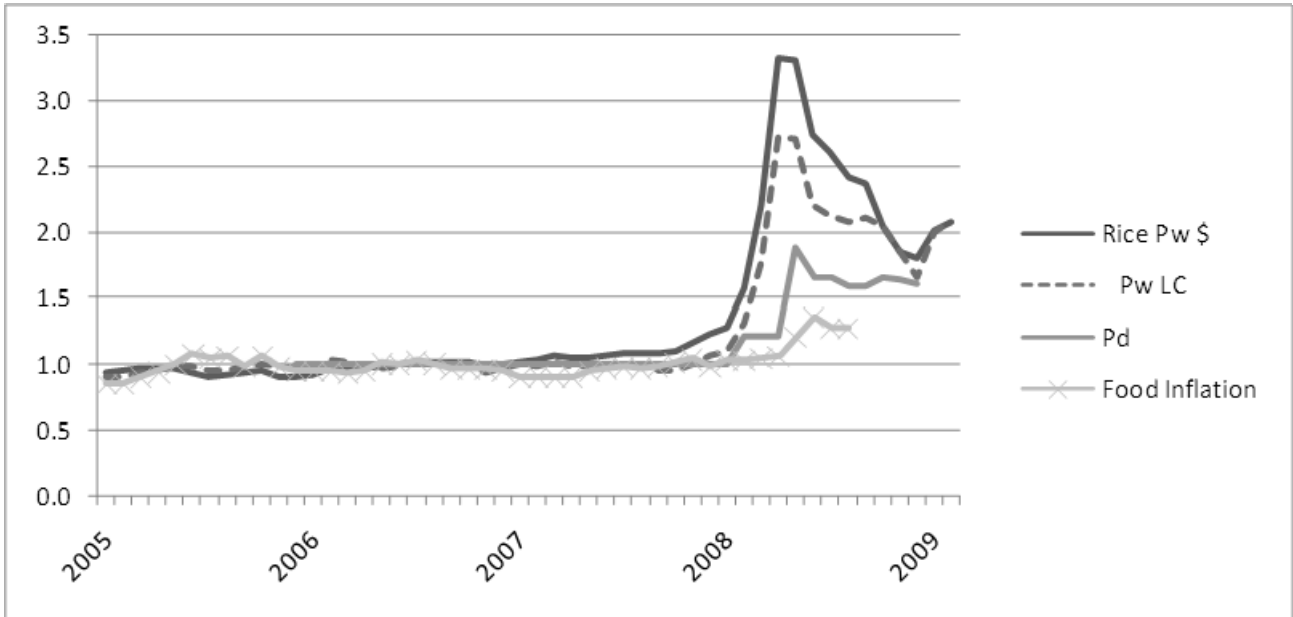
Moroccan Wheat – $\epsilon_{Pw>Pd} = 0.02$



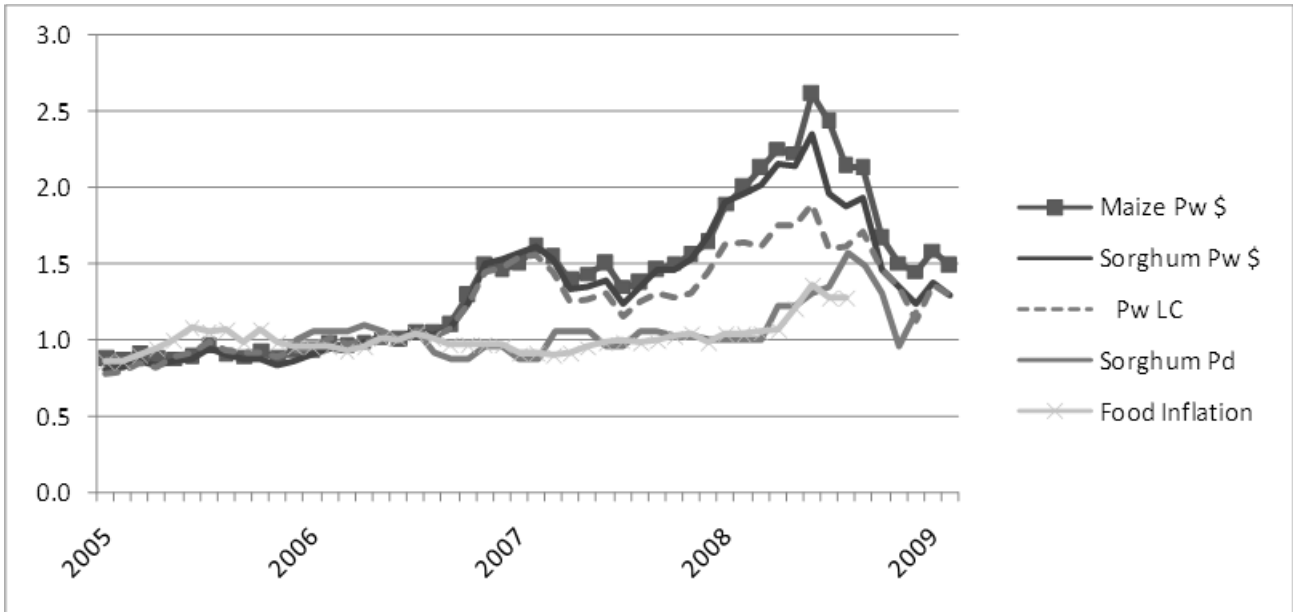
Indices calculated from data in IMF, *International Financial Statistics*, 2010; FAO, *GIEWS*, 2009; and Tyner, Serghini, and Ourai, 2010.

Figure 4. Tradable versus non-tradable grain prices in Burkina Faso

Rice – $\epsilon_{Pw>Pd} = 0.45$



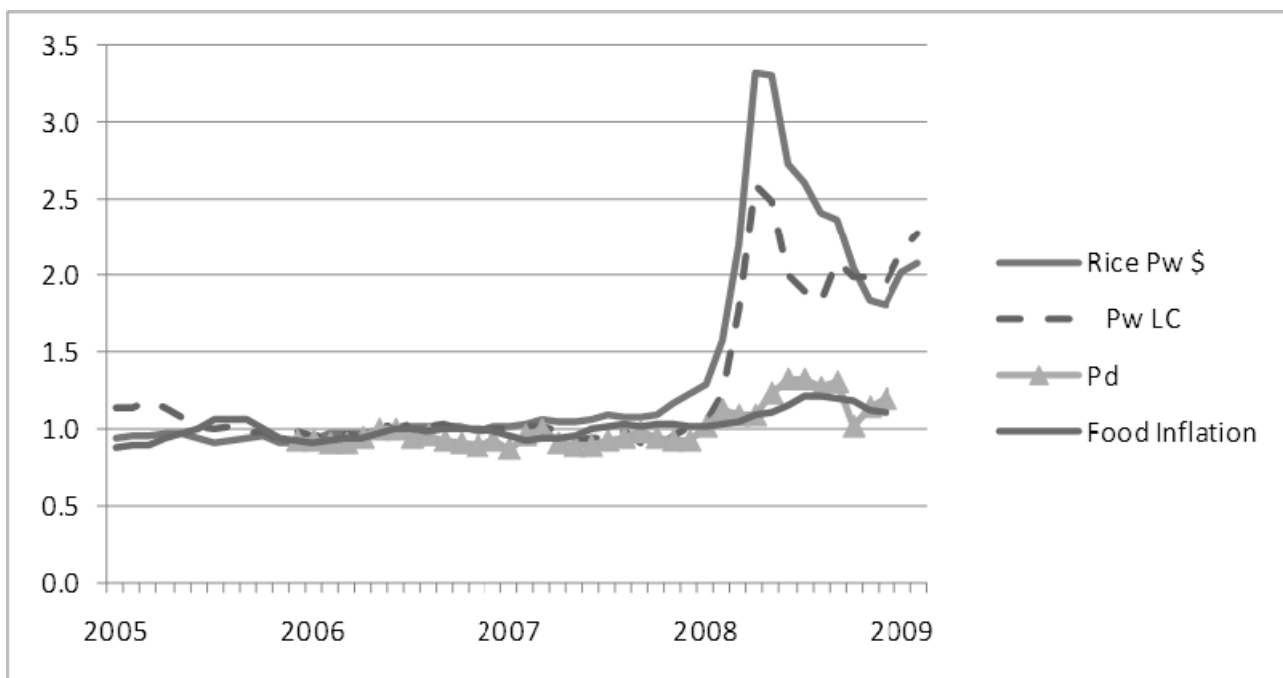
Sorghum – $\epsilon_{Pw>Pd} = 0.30$



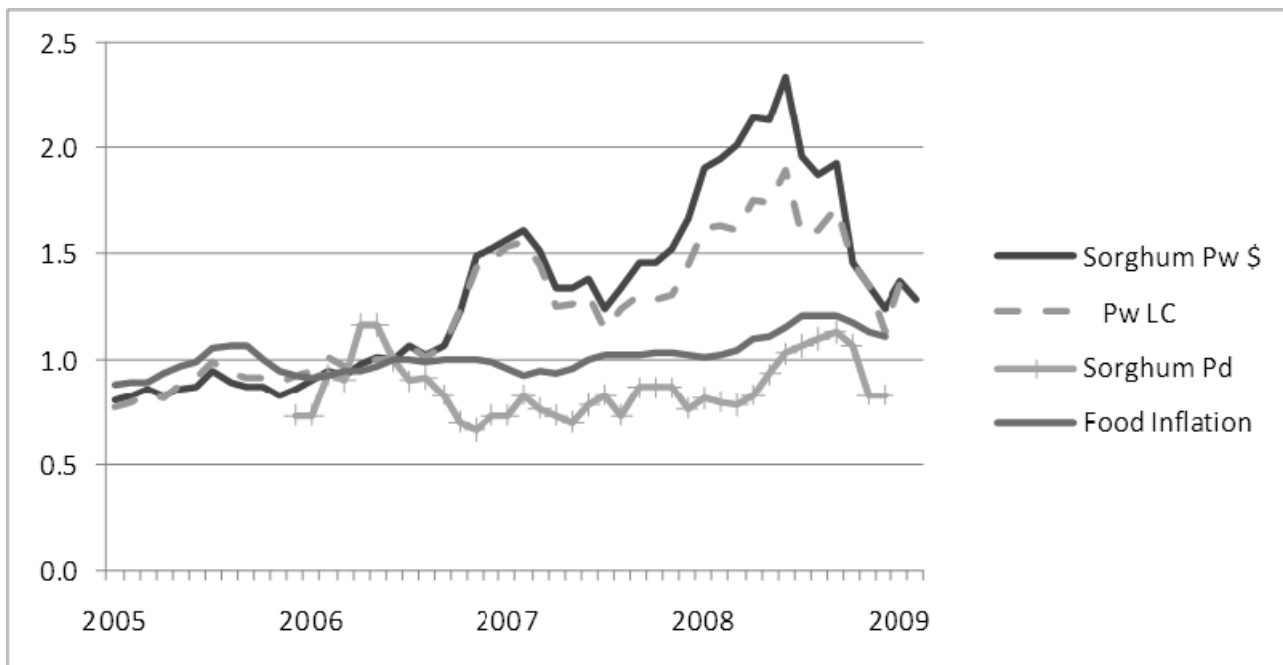
Indices calculated from data in IMF, *International Financial Statistics*; FAO, GIEWS, 2009; and Fulponi, OECD and FAO, 2009 for food inflation collected from various national sources. Adapted from Abbott and Borot de Battisti, 2009.

Figure 5. Tradable versus non-tradable grain prices in Mali

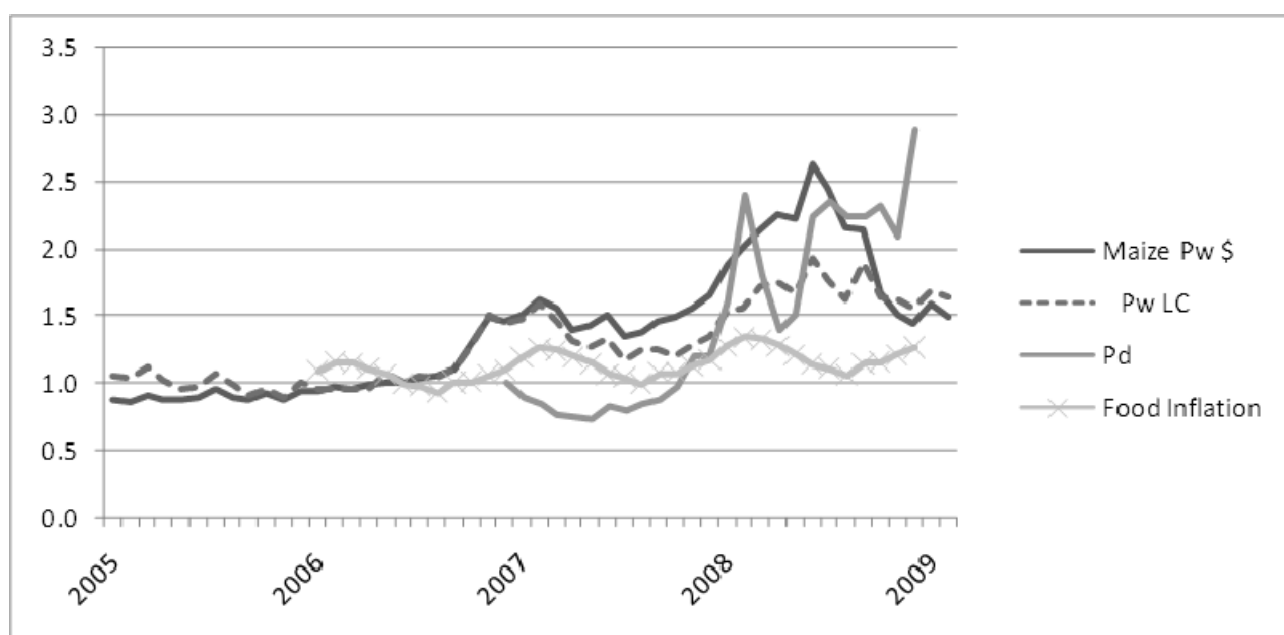
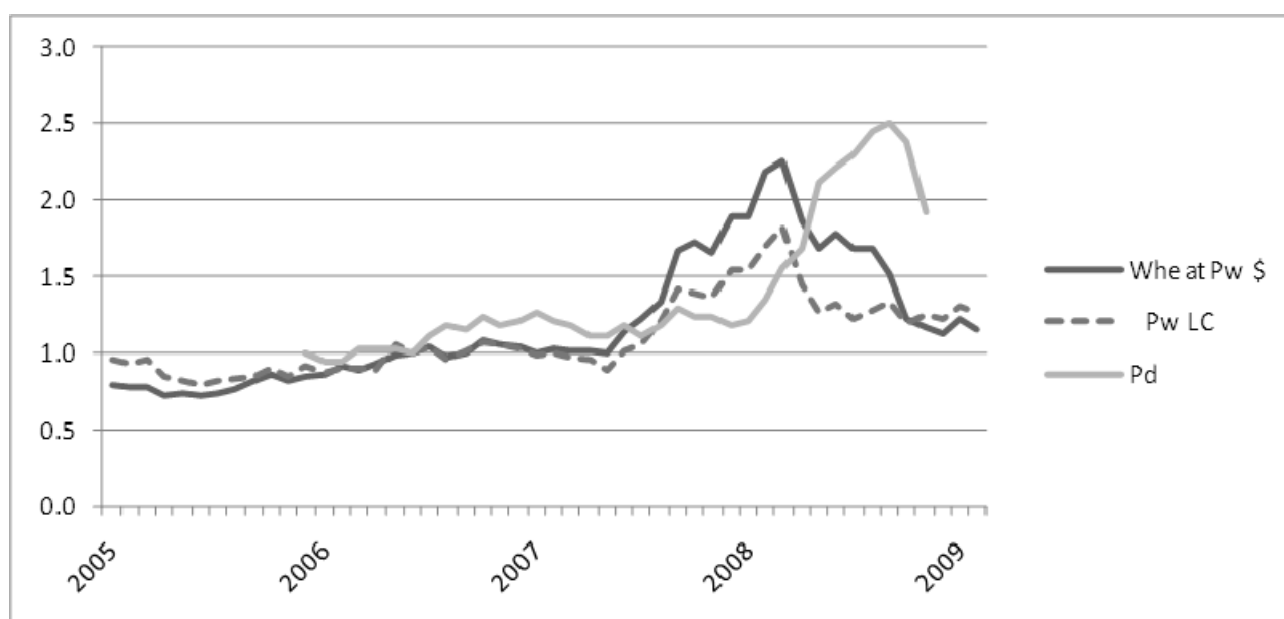
Rice – $\epsilon_{Pw>Pd} = 0.22$



Sorghum – $\epsilon_{Pw>Pd} = 0.03$



Indices calculated from data in IMF, *International Financial Statistics*; FAO, GIEWS; and Fulponi, OECD for food inflation collected from various national sources. Adapted from Abbott and Borot de Battisti, 2009.

Figure 6. Grain prices in volatile domestic markets – Malawi and EthiopiaMalawi Maize – $\epsilon_{Pw>Pd} = 2.25$ Ethiopian Wheat – $\epsilon_{Pw>Pd} = 0.79$ 

Indices calculated from data in IMF, *International Financial Statistics*; FAO, GIEWS; and Fulponi, OECD for food inflation collected from various national sources. Adapted from Abbott and Borot de Battisti, 2009.

38. Price patterns in China reflect the stabilising policies typical of many Asian countries (Timmer, 2008; Cummings and Gulati, 2009). Figure 3 shows that Chinese domestic prices were essentially unaffected by world market events. The small rise in Chinese domestic rice prices is more likely due to inflation than to the spike in world prices. The estimated price transmission elasticity is only 0.15 over the period when world prices rose dramatically. Other countries have also sought to stabilise domestic

markets, with varying degrees of success that depends in part on the credibility and effectiveness of government policy. Morocco is an example of a successful North African country in this respect, as shown in Figure 3. Morocco has for a relatively long period maintained a very stable domestic wheat price in spite of institutional change driven by structural adjustment reform. Morocco faces high domestic production variability and imports a substantial share of its food needs. Its government is committed to a stable domestic market, however (Tyner, Serghini, and Ouraich, 2010). In the face of the 2007-08 food crisis, it began by cutting high wheat tariffs, and resorted to subsidies when the tariff had been driven to zero. The estimated annual price transmission elasticity for Morocco is 0.02 from 1995 through 2007.

39. The cases of Burkina Faso and Mali illustrate price transmission for a non-tradable staple (sorghum) versus an imported grain mostly serving urban consumers (rice). In several African countries, effects of world prices were more strongly felt on rice than on domestic staples (Abbott and Borot de Battisti, 2009), following the patterns in Figures 4 and 5. Rice prices in Burkina Faso increased over 60% in 2008, but they lagged world price increases. They increased much less than even the local currency border price, and persisted at a higher level as border prices fell, though some margin between border and domestic price changes remained. In the case of sorghum lags were much longer, and it is difficult to sort out pressures from inflation versus border price changes. In the case of rice, the price transmission elasticity was 0.45, whereas it was 0.3 for sorghum. Both tariff and domestic tax reductions were used to stabilise the domestic price in 2007-08, but changes in those instruments were small relative to the world price shock. Mali produces rice and is less dependent on imports, so it saw more stability than Burkina Faso, with its rice price increase limited to about 25% and its transmission elasticity only 0.22. Sorghum prices in Mali also were more variable than in Burkina Faso, but largely unrelated to world prices, as the transmission elasticity was 0.03. In both cases there were long lags between border price changes and domestic price changes.

40. Figure 6 illustrates the cases of Malawi and Ethiopia, where there are highly variable domestic prices, but with changes that don't correspond well with world price changes. There is considerable controversy in the literature on what is driving Ethiopian food markets (Negassa and Jayne, 1997; Loenig, Dureval and Birru, 2009). Before the food crisis imports were small, and were often food aid rather than commercial purchases. Domestic production variability seemed to drive prices before 2007, but domestic price increases in 2007 and 2008 coincided with world price increases in spite of adequate domestic supply or little evidence of more important commercial imports. Malawi also exhibits price variability apparently driven largely by domestic factors, but with pressure brought on the domestic market by high world prices during the crisis. Malawi was also influenced by South African maize prices, which did not exhibit the same spikes as US prices (NAMC, 2009). Jayne and Tschirely (2009) argue that mismanaged stabilisation efforts by the government help to explain erratic outcomes in Malawi.

41. Privatisation and structural adjustment brought not only privatisation of storage markets, but also greater openness to trade. Many countries increased substantially their share of domestic consumption supplied by imports after these reforms. But transmission of border prices to domestic markets often remained incomplete. Both Baffes and Gardner (2003) and Hazell, Sheilds and Shields (2005) did not find significant increases in transmission of border prices to domestic prices after trade liberalisation. This suggests imperfect market integration persists as policy barriers are removed. The extent of stabilisation evident in some developing country border prices is greater than could be achieved by the border and even domestic policy changes that were used to stabilise domestic markets (Abbott and Borot de Battisti, 2009).

42. In each of the cases illustrated here, and in many other developing countries, spiking world prices put pressure on both domestic markets and on governments to intervene. While trade policy tools seemed to be of limited effectiveness, price transmission was incomplete and lagged behind world price changes. There is substantial variability among findings on price transmission across both countries and commodities, due to differences in policy effectiveness, government commitment, and the state of

domestic market institutions. In general, Asian countries effectively stabilised while African countries were less able to resist world market pressures, but important exceptions exist in each region.

Domestic market integration

43. Price transmission is used to gauge domestic market integration as well as integration with world markets. Studies of the 2007-08 food crisis looked at pass-through of border prices to both the farm gate and to urban consumer prices. In some instances, border prices increased urban consumer prices much more than farm gate prices (Torrero, 2009 from IFPRI studies of Latin America). In other cases little difference was detected, with border price changes passed to farmers or with urban and rural prices integrated with one another, but not with border prices (Daviron *et al.*, 2009; Dawe, 2008, WFP, 2009). Past studies of domestic market integration have found variable results, depending on the extent of infrastructure, institutional development and policy. Greater commercialisation is likely to lead to better market integration, so greater pass-through, at least of urban prices to rural areas. It is not uncommon even to find differences across regions within a country. More remote regions may be poorly integrated with urban and world markets, but where roads have been built, and markets developed, domestic price transmission is higher. Where price transmission is greater, and market integration is better, production shortfalls are more likely to be made up by supplies in neighbouring regions.

44. One model which can reconcile some of these findings, particularly the lags in price transmission, is average cost pricing by large private grain traders. That model presumes high fixed transactions costs and scale economies in marketing and distribution, a likely circumstance. In the face of rising world prices, traders would only slowly raise prices to their customers, and continue to pay low prices to farmers in their own country. Keeping prices paid to farmers low would make this strategy more affordable. Arbitrage opportunities would force world and domestic prices to converge over time, but with few traders in a market this could be a slow process. Parastatals may have employed such a strategy, and are less likely to face new entrants and pressure from arbitrage opportunities than private traders. Whether this is a correct model remains to be tested, but this behaviour can help to account for the degree of stability observed in many developing countries' grain prices following the 2007-08 food crisis, the greater change in urban versus rural prices, and lags in price adjustments. Both scale economies in marketing and distribution and market power of traders need to be considered in formulating stabilisation strategies. Trade modellers to date have preferred to model these markets as competitive, but there is some evidence from agricultural export markets supporting the assumptions behind this explanation.

Objectives

45. Policy debates often involve interest groups and analysts arguing cross-purposes, and stabilisation policy debates are no exception. Before evaluating policy instruments used to stabilise domestic prices, and alternatives that address risk more broadly, it will be useful to examine the issues and national goals that lead countries to stabilise. Several questions must be addressed – why do countries so often stabilise, should they stabilise, and if so, what should they stabilise?

46. Figure 7 illustrates the various objectives that may be taken into account as national governments formulate and implement stabilisation policy. Most economic analysis starts with basic economic welfare – consumer surplus, producer surplus and government revenue or cost. In order for interventions to be justified, in most cases either some market failure needed to influence these basic outcomes, or a social objective function needed to weigh these criteria differently or address additional social goals. Early work on stabilisation policy focused on basic measures of economic welfare, while more recent literature examines why stabilisation seems to persist in agricultural policy regimes.

Figure 7. Objectives relevant to stabilisation policy choices

Basic Economic Welfare

- Producer Surplus – Net farm Income
- Consumer Surplus – Utility
- Government Revenue – and so government cost

Correcting Market Failure

- Distribution infrastructure
 - Market Information
 - Commercial Storage
- Credit – Missing or incomplete markets
- Risk aversion
 - Insurance and Risk Management – lagging private institutional development
 - Risk and agricultural production decisions

Social Objectives

- Income Redistribution – Political economy
 - Farmers versus consumers
 - Special interests matter
 - Willingness of government to incur costs
- Food security – of urban constituencies
- Poverty – rural and urban
- Stability as a preference
 - Price stability
 - Macroeconomic spillovers – agricultural stability implies macro stability
- Avoiding Extremes – in distribution tails

Basic economic welfare

47. Debate on stabilisation policy initially focused on whether producers or consumers would realise higher welfare under a price stabilising regime, relative to when there was no intervention. The question addressed was whether stabilisation could raise basic economic welfare, either of specific agents or of a nation. It was found that agents' welfare depended on the source of shocks (supply or demand), the specification (shape) of supply and demand curves, hence specification of welfare functions, and the nature and extent of transactions costs. For example, linear supply and demand held different implications for welfare outcomes of producers versus consumers under stability than did a constant elasticity specification. This literature also asked if net social welfare could increase in the absence of distortions, but with price instability.

48. Newberry and Stiglitz's book (1981) was considered one of the definitive works addressing these issues in a theoretical framework. Anton (2009) and Byerlee, Jayne and Myers (2005) both reviewed the extensive literature on welfare implications of stabilisation and examine broader risk management strategies. High transactions costs and asymmetric distributions mean that net welfare gains are unlikely unless stabilisation corrects other distortions, but there may be both winners and losers under a stabilisation regime.

49. Early in the literature Newberry and Stiglitz (1981) argued that price was the wrong variable to stabilise, even if it is the most politically expedient choice. Revenue or income is a more appropriate choice for farmers, and from a national perspective consumption or social welfare should be in the objective function. Moreover, Newberry and Stiglitz (1981) argued that price stabilisation can destabilise farm income under the right circumstances. Like Newberry and Stiglitz, much of the literature has

examined farm income effects more so than national welfare. But prices are easily observable and have been used to balance competing political interests. Most work subsequently considered the nature and extent of market imperfections, and how price stabilisation or other risk management strategies interacted with these market failures.

50. Focus on farmers in design of stabilisation policy arose because agricultural commodity income is a large part of their income, and because rural poverty is more prevalent than urban poverty (World Bank, 2008). The recent food crisis, however, probably impacted urban consumers more so than farmers or even rural consumer, because urban price increases were likely not to be fully transmitted to farmers. While most rural residents may be net food buyers, if they were farmers they did not have to buy their entire grain requirement. In 2005 the World Bank (Byerlee, Jayne and Myers, 2005) recognised before this crisis that consumer welfare is an important component of policy assessment. Actions taken by developing country governments reflect concern with urban consumers broadly, and not just the extreme poor or farmers (Abbott, 2009). These decisions show that social objective functions take into account income distribution, so go beyond basic welfare functions.

Addressing market failure

51. A principal justification for government intervention is to address market failure or missing markets. In the case of domestic grain markets, as noted above, it is likely that in developing countries there are missing or imperfect risk and insurance markets. Moreover, imperfect credit and financial markets, and lagging institutional development affect the conditions for storage and trade. Parastatal marketing boards arose in part to address those and other market failures, including the possibility of market power of domestic traders. Pan-seasonal and pan-territorial pricing addressed weak market integration, so the state not only stabilised, but also addressed other market failures. But it has been argued that even where these public institutions work well, at least at attaining stabilisation goals, state run markets are an inefficient, costly alternative. As structural adjustment brought private trade in place of parastatals, some markets have run more efficiently, while some of the market failures these entities previously addressed have become apparent. Storage and finance markets demonstrate the need for institutional development and policy interventions, but stability as a consumer or producer objective also persists. Galtier (2009) notes that the private risk management strategies advocated by the World Bank (CRMG, 2008) have not taken hold or addressed the desires for stability in these markets. Others argue that desires for stability led many governments to return to stabilisation after structural adjustment reforms (Byerlee, Jayne and Myers, 2005).

Risk aversion

52. If agents are risk averse, then reducing the variability or extremes that agents face raises their welfare. Both price stabilisation schemes and private risk management strategies seek to realise such welfare gains, by reallocating risk from those who are risk averse and to speculators who prefer high potential reward over risk reduction. Therefore, to the extent that risk aversion characterises either farmers or consumers, their objective functions value these “risk benefits” of stabilisation. Public intervention is required when private markets, such as insurance and futures’ markets, are imperfect or missing. Early on as structural adjustment programs eliminated parastatals, the World Bank advocated private market strategies, focusing on futures market options. Literature now finds futures markets to be more appropriate for traders than small farmers, and numerous problems arising from moral hazard, adverse selection and basis risk plague the design of crop insurance alternatives (CRMG, 2008; Byerlee, Jayne and Myers, 2005).

53. Another market distortion that stabilisation may address relates to incentives to invest in agriculture and so the rate of growth of agricultural production. Boussard (2004, 2006) has long argued

that success of European Union agriculture, and the shift from importing to exporting, derived more from stability of prices than from high prices. Several authors have argued that the success of the green revolution in India and elsewhere was supported by the stable price regimes that were in place (Cummings and Gulati, 2009). Risk averse farmers would make decisions in favour of lower yield but more stable crops, would use fewer purchased inputs, would invest less, and would be less likely to commercialise if prices were not stabilised (Timmer, 2002). It may simply be the case that agricultural production under stability grows faster.

54. Byerlee, Jayne and Myers (2005) argue that estimates of the welfare gains to farmers from stabilisation, done mostly for export crops, are found to amount to only about 2% of the value of agricultural production. While poor countries who depend on a single staple, and who are landlocked or spend a high fraction of foreign exchange earnings on food, may be vulnerable, empirical estimates of the value of these effects have proven difficult. The extent to which countries pursue stabilisation policies means that either they see these benefits as being more valuable than these estimates suggest, or that they operate under a different objective function than is presumed in standard analysis. For example, they may be implicitly pursuing income redistribution objectives.

Social objectives

55. Another rationale for policy intervention beyond market failure is that social objective functions may differ from the basic welfare measures of economic models, based on private objectives summed. We have already seen risk aversion (which was coupled above with risk market failure), and from a consumer perspective food security may also be a national objective that policy addresses. Political economy models highlight that consumers and producers may be counted differently in social welfare functions. It is not uncommon in developed country agricultural policy models to apply higher political weight to producer welfare than to consumer welfare. Hayami and Anderson (1986) describe a transition from higher weight on consumer welfare to higher weight on producer welfare as economies develop and as agriculture becomes a smaller share of an economy. Consumers have historically counted heavily in developing countries.

56. Abbott (2009) argued that the differing responses of developing country national governments and the international donor community is explained in part by differing social objective functions, and in particular differing emphasis on the political weights attached to urban consumer welfare versus small farmers and the extreme poor. International donors emphasised safety nets and agricultural production investments, with emphasis on small farmers. Their objective function weighs more heavily both rural residents and the extreme poor. National governments clearly put more weight on urban consumers, and have a higher poverty threshold than is evident from international donor recommendations.

Poverty and food security

57. Addressing poverty is another dimension to the social welfare function that may lie behind stabilisation policy. The poor may be more vulnerable to risky events, and may have access to fewer strategies to cope with the risks they face. The consequences of high price, high food cost or low price, low income scenarios may also be more severe. If prices are high and diets are inadequate, malnutrition may bring both short and long run costs. At the extremes, survival may be at stake. Malnutrition may also affect labour productivity and an individual's capacity to work. The poor also spend a larger share of their income on food. Thus, food insecurity is an important special aspect of poverty (Rosen and Shapouri, 2009; FAO, 2008b). One goal of price stabilisation schemes is to avoid or reduce malnutrition, famine and even poverty.

58. Strategies to address food insecurity and poverty often target food consumption of specific groups, as do food aid, food subsidies and food for work programs. Recommendations for safety net strategies generally recommend targeted income subsidies over general food subsidies, leaving flexibility for consumers and more efficiently allocating resources to the poor. The consequences of malnutrition mean that food interventions may be more highly valued than income interventions, and food interventions may be more easily supported from a political perspective. If poverty is the main concern, however, targeted programs are likely to be more efficient than stabilisation policies.

Avoiding extremes

59. Both the poverty dimension of national government objectives and the asymmetric nature of grain production and price distributions mean that social goals may emphasise avoiding the tails of food price distributions. Moreover, governments are likely less concerned with the small risks associated with small variations in price around its mean and are more concerned with the consequences of extreme variations. Parastatal grain managers often saw as their goal avoiding extremes and so catastrophes (the tails of distributions, or the market failure layer in Anton's (2009) framework) rather than reducing variances of prices.

60. National policies often reflect this nature of their social welfare function by choosing price bands policies - that is, choosing to keep prices above a floor price, below a ceiling price, or within a range. While the nature of their objective function leads to this policy choice, economists have been critical due to potential, theoretical outcomes under such a regime. Wright (2008a&b) argues that when price bands are in place there are incentives for speculators and traders to store in a way that causes prices to stay near the policy set price bands more so than a distribution without intervention would yield. Salant (1983) went further, arguing that price bands and complementary storage policies invite speculative attacks. Their arguments presume speculators with financial resources can intervene, and transactions costs to do so are low. These conditions are more likely to apply in developed country and international agricultural markets. One of the few advantages of poorly developed storage markets is that the likelihood of such speculative attacks is very low, so governments may be able to utilise price bands with fewer problems from the private market.

61. Price bands also influence expectations for producers, for better or worse. If producers are risk averse, price floors may elicit greater production growth than would otherwise occur. Again following Anton's framework, the strongest argument for government intervention is in the market failure risk layer, also supporting policies aimed at avoiding catastrophic market extremes. The challenge is for governments to intervene to avoid extremes in a transparent and consistent manner, cognizant of the incentives the regime creates.

Cost

62. Government cost is also a component of the relevant objective function, and evidently gets a high weight from some developing country governments (and even higher weight from many economic analysts). Cummings and Gulati (2009) argue that the flaw of Asian parastatal grain market management is its high cost, but it is evidently a cost many Asian governments choose to bear. On the other hand, as many governments pursued costly tariff and tax reduction strategies to stabilise domestic grain markets in 2008, they also asked for "fiscal space" in the form of loans from the World Bank to make up lost revenue. This fiscal space alternative accounted for a substantial share of the expenditure by the World Bank in its GSRP program, its response to the 2007-08 food crisis (World Bank, 2008a). Governments that stabilise have historically continued to import to meet food needs, in spite of the costs due to high world prices. Import demand functions are often very inelastic during crises, as a result. Thus, the importance of costs probably varies widely across national governments, and depends on either the ability of the government to pay high

costs, or its ability to attract foreign aid to cover some of those costs. Structural adjustment reforms were often the product of inability of a country to finance these costs rather than buy-in to a more market oriented grain market regime.

Macroeconomic spillovers

63. Timmer (2002) in particular has also emphasised that there may be macroeconomic spillovers from stability, particularly in countries where agriculture remains a large share of gross domestic product and employment, or grains are a wage good. He uses Indonesia as an example of a country that gained a greater degree of macroeconomic stability, and avoided some of the losses from recession, by stabilising its large and important agricultural sector. Food price shocks can contribute to business cycles, and food price stability can influence investment incentives and so economic growth (Dawe and Timmer, 2005). But cross-country studies have not found a systematic relationship between commodity price fluctuations and economic growth (Macbean, 1966; Deaton, 1992; Kannapiran, 2000).

64. Policy objectives vary widely across countries, and between national governments and international perspectives. Any policy recommendations will need to reflect the objective function chosen. For purposes of subsequent analysis here, we will take the perspective of a national government in a poor developing country, where arguments for stabilisation are strongest, and which include both urban and rural interests. In spite of the potential (theoretical) problems, policies that intervene at extremes are probably a better reflection of the objectives of those governments. Market failure is sufficiently likely to justify some effort by governments to protect against those extremes. The 2007-08 food crisis would clearly be the case of such an extreme event, and of failing markets.

Policy instruments

65. Best practices for risk management and stabilisation policy outlined by the World Bank (Byerlee, Jayne and Myers, 2005) emphasise long run investments that allow the private sector to better cope with meeting food needs of the population. Their second element is to promote diversification and investment strategies such as irrigation, drought tolerant varieties and cropping mix strategies, in order to reduce output volatility while increasing production. This comes after a recommendation simply to improve overall productivity, their first recommendation. Heavy emphasis is placed on long run food availability rather than coping with crises at hand. Their next recommendations addresses institutional development of private food markets, including infrastructure, market information, regulation and coordination, and specific private market based risk measures such as forward pricing and crop insurance, intended to make markets work to better share instabilities. They state that "... direct public interventions in food markets to manage price risk should be a last resort" (Byerlee, Jayne and Myers, 2005, p. xiv). They want resources reallocated from a short run "firefighting" focus to a long run, private sector led approach. The only short run measures advocated are safety nets to address poverty concerns in the face of price spikes, preferring cash transfers to food aid. In their view, safety nets should promote private sector development rather than distort markets.

66. Their recommendations are largely based on the observation that domestic shocks dominate. They argue that trade liberalisation serves as a stabilising force, since world market volatility is less than domestic sourced volatility. The events of 2007 and 2008 seriously challenge this underlying perspective. National governments in the face of these events rejected the best practices advice and pursued expensive short term measures to mitigate the effects on domestic markets of world price shocks (Abbott, 2009). Earlier analysis of the distributions of world grain prices and domestic production was intended to argue that in most years, the best practice approach of focusing on domestic sources of volatility remains the best strategy, but that governments need to be prepared to address the real, if infrequent world price increases that will occur. Safety nets are important since the poor are most vulnerable, but governments face

concerns of a much broader constituency, including urban consumers not among the extreme poor. The question then becomes how (or whether) to use trade policy or stocks, the short run policy instruments historically used to stabilise, to address those infrequent world price shocks.

Stocks

67. Two types of stocks are maintained by governments, serving different purposes. Food security stocks or *emergency reserves* are best thought of as working or “pipeline” stocks serving safety net programs. Food distribution schemes, food for work programs or other food aid initiatives require stocks be held to insure timely delivery of food in those programs. *Strategic reserves* are used to stabilise the market price of a commodity. Stabilising stocks may be publicly owned and managed, or may be privately held commercial stocks governed by rules set by national governments. Historically in developed countries it has not been uncommon to find both public and private stocks strategies combined to stabilise markets. The rules are probably more important than who owns the stocks, but if the government is to intervene sporadically, it is probably best to base any strategy on privately held stocks, that will exist in any case. Consistent and transparent rules, and institutional improvements to insure well-functioning private storage markets, are prerequisite to using a private stocks strategy.

Strategic reserves or trade?

68. Analysis of strategic reserves is generally done on an annual basis and under the assumption that a developing country is a small country in international grain markets (*i.e.*, a price taker). That analysis begins with the supply-utilisation accounting identity relating production, trade, use and stocks:

$$S_t + Q_t + M_t = C_t + S_{t+1}$$

where S_t is carry-in stocks in year t , Q_t is production, M_t is net imports (negative if exports), C_t is consumption (use), and S_{t+1} is carry-out stocks in year t , hence carry-in stocks in year $t+1$. Several insights follow from this identity, which must hold. Carry-in stocks are predetermined and production is stochastic and determined ahead of consumption. Consumption can be very inelastic, so carry-out stocks are typically the most elastic adjustment mechanism clearing the market, but stocks adjustments become less elastic as those stocks become low. Trade and/or stocks can clear the market each year, and if the small country assumption is appropriate, world price determines domestic price while trade (M_t) clears the market. If this is the right paradigm manipulation of stocks only impacts the trade level and not the domestic price – so stocks are ineffective as a tool for domestic price stabilisation under this perspective.

69. If world and domestic prices are not linked as would be the case if the country were a price-taker, because world and domestic markets are poorly integrated, transactions costs are prohibitively high, and/or the country’s price is between parity bounds, then stocks will clear the domestic market and can be manipulated to adjust domestic price. If a country is a net importer and a price-taker, $P_d = P_w + T + cm$ where P_d is the domestic price, P_w is the world price, T is a specific tariff and cm are transactions costs to bring imports from the world market. If a country is a net exporter, $P_d = P_w - ce - Te$ where ce are transactions costs to bring exports to the world market and Te is an export tax. In a small country case P_w is fixed. Parity bounds mean that the domestic price lies between the price at which it would export and it would import: $P_w - ce - Te < P_d < P_w + Tm + cm$. In this case there is no trade. In landlocked countries, where cm and ce (transactions costs) are large, hence prohibitive, there can be a wide range of domestic prices that result in no imports or exports ($M_t = 0$). Policy (Tm and Te) can also influence the range of prices within which a country is self-sufficient. All of this assumes the law of one price assumptions hold, and that markets are integrated when the domestic price is outside the parity bounds set by world price and transactions costs.

70. Within this framework linking P_w and P_d , and if P_w exhibits low volatility, there would be only a few cases where stocks are an effective tool to manage domestic prices. Therefore, under this theory one should observe countries choosing either stocks or trade, not both, to stabilise. If one instrument is effective, the other is not. Trade is likely to be the better choice, unless world and domestic markets are not well integrated.

Observed public stockholding

71. Examination of supply and utilisation data for developing countries will reveal that different countries adopt different strategies, but that most use a mix of trade and stocks to maintain consumption in the face of production variability. In a study of 18 developing countries in the mid-1990s, Abbott, Patterson and Young (1998) found that stocks adjustments to production shortfalls were statistically significant in 16 cases, making up between 20% to 50% of shortfalls in most cases. Trade adjustment was also statistically significant in all but a couple of cases and typically made up a similar fraction of production shortfalls. Thus, contrary to the dichotomy of the typical trade model, countries have used a combination of stocks and trade policies, with stocks being an important adjuster even when trade occurs.

72. Earlier evidence on market integration questions the small country assumption in which the law of one price holds, showing at least short run deviations as world prices change. Price transmission is quite incomplete. Moreover, a perspective looking at a shorter time frame and seasonal effects, in which imports arrive only with a lag, and short term uncertainty on production and hence import needs exists, allows for short run dynamics to set a role for stocks. Lags in import delivery and transmission of world prices to domestic markets influence how far the domestic price can differ from import (or export) parity prices. In markets where domestic production volatility dominates, as was seen for the Ethiopian and Malawian cases, substantial deviations are observed even when there may eventually be international trade. Price deviations depend on how effective are domestic storage markets and on public perceptions as to the extent that government will intervene to stabilise. In cases where government intervention is credible (China, Morocco) even seasonal prices will remain stable.

Short run stocks management

73. From the short run perspective, stocks are inevitable. Stocks will never be driven to zero as harvest arrives, and the extent of carry-over will be influenced by expectations on harvest, with prices smoothing consumption across crop years. The extent to which prices are smoothed, or are volatile, depends on domestic storage institutions, expectations on government intervention, and expectations on the extent to which trade will eventually make up shortfalls. As noted earlier, poorly developed marketing and storage institutions can result in greater instability of inter-seasonal prices than of inter-annual prices if governments do not intervene.

74. The policy challenge in this environment is to manage short run domestic price dynamics given trade opportunities and given the state of domestic institutions. Rules and incentives will govern the extent to which stocks are carried over in any year, whether they are public or private. The stocks themselves need not be owned publicly, but for the government to control (or at least influence) reserve or strategic stocks via policy rather than ownership, then well-functioning private storage markets are needed. Empirical research has focused on inter-annual rather than inter-seasonal dynamics, so does not inform well how to make tradeoffs in this short run dynamic context. Policy recommendations must then be based for now on basic principles, bearing in mind this shorter run perspective. One of the “best practice” recommendations that stands up here is that development of market institutions, such as better market information and addressing imperfections in risk markets, surely are needed. Legal reforms, such as warehouse receipts, will facilitate private storage market development. But public good aspects remain for

market information, including early warning on crop forecasts in addition to sharing market price information widely.

75. Pan-seasonal pricing is problematic in this context, in that it suppresses incentives to store. When parastatals stored, those temporal incentives may have mattered little, but as long as private agents also store, distortions to the seasonal pattern of prices will distort stockholding. Even successful stabilisers build in storage incentives to their pricing strategies.

Infrequent price spikes and stocks

76. The challenge of the 2007-08 food crisis is that a seemingly new distribution of world food prices was revealed, and when the price rose volatility may have increased. The basic assumption about relative volatility of domestic production versus world prices may no longer be valid. A longer historical perspective might suggest this was not a new distribution, but the infrequent spikes that characterise these markets. In principle, countries could hold stocks in anticipation of these spikes, and use those stocks to keep domestic prices from rising in such instances. In practice, those stocks would need to have been held for a very long time, incurring substantial opportunity costs. The stocks literature looking at world markets turned to financial alternatives rather than physical stocks to seek to avoid those costs. From a short run perspective it means each year keeping carry-out stocks at a sufficiently high level to be ready in case world prices spike in the future, and so trade becomes a too costly stabilisation option. Trade may be needed to rebuild stocks in bad years, with the goal to enter each new year in normal rather than shortage status.

77. In the context of research on international stocks, the search for financial (and trade) alternatives to avoid the opportunity costs, and losses, from holding physical stocks at high levels or for long periods have been considered (Huddleston *et al.*, 1984; von Braun and Torero, 2009). Moreover, institutions have existed in the past at the International Monetary Fund and at the European Union to insure foreign exchange was available so that trade policy alternatives could replace stocks. These programs were little used, as the conditions required to obtain this financing were stringent and high food import costs did not always coincide with low foreign exchange availability.

78. The high transactions costs of stockholding matter to both strategic reserves and to emergency reserves held to manage safety nets. These costs mean to the extent possible, longer run stabilisation strategies should rely as much as possible on trade rather than stocks. But the feasibility of trade alternatives depends on how well integrated a domestic market is to international markets.

Trade policy

79. Nearly three decades ago McIntire (1981) at IFPRI recommended that variable levies rather than stocks be used to stabilise domestic grain markets of developing country importers. If the price linkage defined earlier from the law of one price applies, so that $P_d = P_w + T + cm$ for an importer, in principle tariff changes can counteract any world price changes to keep the domestic price stable. If a country is an exporter, an export tax can play a similar role – and was used to this end frequently in 2008. There are limits to these tools, in the case of imports, when world prices rise and the tariff goes to zero, and in the case of exports when world prices fall and the export tax is zero. Byerlee, Jayne and Myers (2005) had argued against variable levies as a stabilisation tool in part because a very high tariff, hence a very large persistent distortion, was required to protect against possible large world price increases. In each case a subsidy may then replace the tax when large world price changes are encountered, nullifying their argument. Subsidies to stabilise are costly, but cutting taxes and tariffs also reduce government revenue. The price linkage formula applies in each case, assuming T can be negative in the case of an import subsidy or export tax. In the face of rising prices, tariff reductions bring revenue losses, whereas export tax

increases bring revenue gains. As prices increase a nearly self-sufficient country might also switch from being an exporter to being an importer. In that case reducing tariffs could switch to increasing export taxes.

80. Cost is always the concern with these border price instrument regimes. The advantage to variable levies over stocks is that holding and transactions costs need not be borne in more normal years, the more frequent case. Thus, trade strategies are expected to be less costly.

Price bands

81. A popular strategy to accomplish stabilisation was a price bands regime, where governments intervene and vary policy instruments only when floor or ceiling prices are breached. Chile used this instrument successfully until it was required in the mid-1990s to comply with WTO requirements that these stabilising tools no longer be used. Many of the tariff, tax and subsidy changes in 2007-08 are best viewed in this context, as they were not varied until extreme price increases were faced. In the price bands regime interventions only occur when market extremes are faced. As noted earlier, price bands have been criticised, particularly in theoretical literature (Wright, 2009a; Salant, 1983) because these regimes are vulnerable to speculative attacks. Private marketing agents can buy until capacity constraints are met, and then sell when prices eventually rise above the bands. This is more likely to occur in well-organised market with large, well informed traders, so may be less of a concern in poorer countries, and where market imperfections are important. Speculative attacks may also be less likely when price bands are implemented via variable tariffs, as capacity constraints are less likely to bind, though financial constraints could bind. This strategy fits well a national objective that emphasises avoiding catastrophes.

Observed use of trade policy to stabilise prices

82. The variable levy regime was practiced explicitly and effectively by the European Union to stabilise domestic prices until the 1995 Uruguay Round WTO agreement, and has been used implicitly since to continue to maintain stable domestic prices. In the mid-1990s the EU also switched to export taxes when world prices went well above domestic price targets. It did not do this in 2008, but did cut its tariff as world grain prices rose. This case demonstrated the power of variable levies to stabilise. It also raised a major concern – that countries who stabilise domestic markets via trade export their instability onto world markets (Bale and Lutz, 1979). Trade policy stabilisation is a beggar-thy-neighbour regime. Explicit variable levies are now WTO illegal. The WTO prohibition on variable levies arose because of the consequences of this policy on trade partners. Governments can change “fixed” tariffs, however, as the EU has shown. Following banning of variable levies by the WTO in the 1995 Uruguay Round Agreement, the EU has used a “fixed” levy that it changes as often as bi-weekly, based on market conditions. Safeguards as an alternative are controversial, and one of the issues that prevented reaching a new WTO Doha Round agreement. Safeguards also address low prices and import surges, but not high prices. WTO commitments were seldom a concern as policy responses were implemented in 2007-08 (Abbott, 2009).

83. Both tariff reductions and export taxes were used frequently by developing countries to stabilise domestic prices in the face of the rising world prices (Demeke *et al.* 2008). Two principal concerns of grain importers during the 2007-08 food crisis were reduced revenue (loss of “fiscal space”), and that tariff changes could not be large enough to offset the large world price increases. A few countries resorted to food subsidies to counteract the very high world prices, at considerable expense. Some traditional importers also introduced export taxes or bans to prevent supplies from leaving domestic markets. Domestic policies can also have trade effects, so reductions of domestic taxes or domestic subsidies could be used like trade policies to control prices. Demeke *et al.* (2008) observed that such domestic policy changes were also frequently used in 2007-08 by developing countries. These taxes and subsidies were also small relative to the world price increases that occurred, limiting their effectiveness, and domestic measures were applied to a larger quantity (all consumption, not just imports) so are more costly in terms

of revenue loss than are tariffs. Table 1 showed the variety of instruments used in 81 developing surveyed by Demeke *et al.* (2008), and the frequency of use of these alternative instruments.

Quantitative trade controls by parastatals

84. Prior to the 1995 URAA, or until their structural adjustment reforms, many developing countries utilised quantitative controls administered by parastatal marketing boards to effect a similar outcome. These institutions persist, particularly in Asia where structural adjustment conditionality was not as serious. Parastatals can be thought of as implementing endogenous quotas that vary with domestic supply. Some countries (*e.g.*, Morocco) contemplated switching to variable levies to accommodate structural adjustment conditionality until the URAA made variable levies illegal. The well-known tariff equivalence to quotas means that these different instruments can achieve nearly the same ends, as long as instrument settings can be changed as needed on a frequent basis. When a parastatal manages trade, even the revenue and welfare effects are similar, as any quota rents accrue to the government. Tariff equivalence means stocks or tax/subsidy interventions can also be used to implement price bands regimes, so stocks strategies were also used, and were more popular before structural adjustment reforms.

85. Several criticisms of parastatals and the use of quantitative controls rather than price measures (*e.g.* tariffs) led to elimination of these institutions in countries subject to structural adjustment reforms. Quantitative controls are less transparent than tariffs, if easier to implement. More importantly, these measures proved costly. It was believed that public marketing boards were less efficient than private marketing agents. These boards often were not only stabilising, but also subsidising specific interest groups. Their elimination may have brought greater efficiency to certain market functions (*e.g.* delivery from the farm gate to the port). Other functions that exhibited a public goods aspect (research, extension, disease protection, market information) or imperfect markets (credit and inputs) were not replaced or remained inefficient. Asian countries not subject to financial pressures have retained these institutions and the use of quantitative trade interventions (*e.g.* China and India). Cummings and Gulati (2009) argued that these were effective at stabilisation, but incurred a very high cost. These countries also held large stocks, and stocks variations were greater than import or export variations, not only during the crisis but also in many earlier years. In the face of world market extremes quantitative measures, especially complemented by stocks measures, don't face the same constraints that zero tariffs imply. Quantitative measures result in weak integration with world markets, and policy interventions are focused on domestic outcomes.

How important was trade policy as a stabiliser in 2007-08?

86. Trade policy instruments were frequently used in a manner similar to McIntire's recommendation to stabilise and isolate domestic markets in 2007-08. But these measures in theory were simply not large enough to counteract the large world price changes being faced. Reality differed somewhat from theory, as seen in the price transmission evidence. While domestic prices increased, these increases were often substantially less than world price increases, even after tariff and tax reductions are taken into account. Moreover, stocks measures were also used frequently in combination with trade measures. Any evaluation of trade policy effects needs to take into account the extent of imperfect integration between domestic and world markets that varied across countries. While in a few cases the weak price transmission and apparent imperfect market can be explained by policy changes, in many cases explicit disconnects between world and domestic prices, beyond policy interventions, must be taken into account. Greater market integration, and more complete linkages between urban and rural prices is likely to be found where private market institutions to help stabilise farm income as well as consumption are further developed. Better market integration also allows for better sharing the localised shocks to domestic production, at both local and international levels. Weak market integration allows for greater use of stocks to manage price, however.

87. Trade policy measures pursued also contributed to world price instability, and to the extent to which world prices rose, at least for rice (Timmer, 2008a). The extent to which pervasive stabilisation

policy across developing country importers contributed to the extent of price increases is simply not known. While it is certain that the actions of large self-sufficient traders, most rice exporters and a few large exporters contributed significantly to international instability, the combined role of small developing country importers is less well understood. A small trader closing its border may have an infinitesimal impact on world prices, but combined actions of many small traders make for more inelastic world markets. This also depends on the extent to which stabilisation achieved was due to policy versus imperfect integration. Imperfect integration also prevents a country's instability from being exported to world markets. Techniques better informed on country trade behaviour than the simple price transmission approach, used first by Tyers and Anderson (1992), are needed to assess the international effects of countries' stabilisation measures. Better models are also needed to assess just how stable world markets would be if countries kept borders open. National goals dominate in these policy decisions, so countries like China and India, which effectively stabilised in 2007-08, are unlikely to open their borders in the face of world market crisis unless a high degree of stability is expected there. There is little reason now to believe that world markets can be counted on for adequate price stability, certainly unless the large exporters and large, self-sufficient grain producers leave their borders open. A lesson from the 2007-08 food crisis seems to be that international markets on occasion will be unreliable.

Reliable supply from world markets

88. High world prices mean imports to stabilise a domestic market cost more. That import levels declined very little showed that many countries are willing to bear that cost. A larger problem evident in the 1973-74 food crisis, and in the rice market in 2008, is that supplies may be unavailable from the world markets at any price. In those circumstances countries relying on international trade to stabilise or even supply domestic markets cannot achieve their domestic goals. The food security consequences of that outcome may be unacceptable. Sarris (2009) proposed an international clearing house to address this concern. But holding stocks to guarantee availability in world markets for rare events is likely to be extremely costly. What is needed is credible commitments beyond a couple of major exporters to make supplies available to importers. The US did this in 2007-08, as farm interests objected strongly to export restrictions of the 1970s, so US legislation prevents trade embargos (IATRC, 1986). That was not sufficient to assure supplies in the world rice market, where price increases were most extreme, and the US is only a small player.

Regional trade

89. Regional trade agreements may make prospects to rely on liberalised trade to stabilise domestic markets an effective option in some cases. Byerlee, Jayne and Myers (2005), using data from FAOSTAT, show that correlations of maize production across southern African countries is low (see Table 3), so that trade could be (and is to some extent now) used to stabilise those domestic markets. But South Africa is the dominant producer, and its prices are correlated with corn prices on the Chicago Board of Trade in most years, with high transmission of those world prices to South African domestic prices (NAMC, 2009). South Africa was shifting from an import to an export position in 2007-08, so it exhibited no spike corresponding to international corn prices then (NAMC, 2009). With multiple seasons per year and irrigation, supply risks are lower for rice in Asia, but coincident weather patterns could limit effectiveness of regional trade.

90. In some cases the world market for a country is its neighbour. Some of the decisions taken by rice exporters in "world markets" were because they were exporting more to neighbours. For example, in Afghanistan imports came (at least in some regions) from Pakistan (usually a net importer), not the large exporters to world markets. During the 2007-08 food crisis India committed to supply Bangladesh in spite of its partial export bans, helping to offset production shortfalls in Bangladesh. Regional integration makes liberal trade policy a better stabilising option in most years. But regional trade is still at risk when world prices spike.

Table 3. Variability and covariance of maize production in Africa, 1995-2004

National and Regional Production Variability, Eastern and Southern Africa		Correlation Matrix for Maize Production in Southern Africa, 1995–2004				
Country/Region	CV of Maize Production, Years	Zimbabwe	Zambia	Malawi	South Africa	Mozambique
Ethiopia	12.6	1.00	0.42	0.12	0.44	-0.31
Kenya	8.9		1.00	0.09	0.38	0.11
Tanzania	11.2			1.00	0.17	0.24
Uganda	8.2				1.00	0.41
East Africa	5.8					
Malawi	21.6					1.00
Mozambique	4.9					
South Africa	20.3					
Zambia	30.6					
Zimbabwe	40.9					
Southern Africa	17.9					

Source: FAOSTAT.

Source: Calculated from FAOSTAT.

Source: Byerlee, Jayne and Myers, 2005 using data from FAOSTAT.

91. Open trade policy regimes in most years are likely to contribute, if imperfectly, to domestic grain market stability and food security. The policy issue is what to do during the infrequent events when world prices spike. National stabilisation goals are likely to dominate, so repeat of the policy responses in 2007-08 is very likely. Countries that can afford to do so will protect their domestic consumers. Greater reliance on trade could bring more stable world markets as well, but that approach demands that exporting suppliers are reliable, even in crisis. Stocks are likely to continue to be used together with trade, especially when integration with the world market is weak. But stocks are a poor alternative to guard against very infrequent events.

Institutional arrangements

92. If the private sector is to play an increasing role in domestically stable grain markets, institutional development is a key element of any set of policy recommendations. There is a critical role to be played by national governments in fostering the development of institutions that are imperfect or incomplete in the least developed countries, and that need to mature as development proceeds. The role of public goods also needs to be revisited, recognising the lesson that some activities will not be taken up by private agents when the government reduces its involvement in grain markets. The difficult problem of how to phase reforms and liberalisation is resolved only slowly as private sector institutions develop. Some of the World Bank's (Byerlee, Jayne and Myers, 2005) "best practices" recommendations are best seen as a longer term goal unlikely to be achieved quickly following reforms. The two issues briefly examined here are what institutions need to develop in light of stabilisation goals of governments, and what is the appropriate role of government as that development proceeds?

Market institutions

93. Private sector institutions are needed for long run agricultural development, better marketing and distribution, input provision, storage, credit and risk management. Public sector institutions must provide public goods, possibly in different ways than in the past, including market information, research, extension, and infrastructure. Private institutional development is also likely to require public sector actions to foster institutional development. For example, new legal frameworks may be needed to permit credit and insurance schemes to develop.

Parastatals and reforms

94. Following structural adjustment reforms and privatisation of parastatal grain marketing boards, at one point recommendations were that the government should withdraw almost completely from grain markets. Few activities were recognised as public goods that a government must provide. A prevailing view was that in many instances government did more harm than good. Even provision of market information was viewed for a time as something to be addressed as a largely a private sector activity, at least by some foreign aid donors. Subsequently, it has become clear that the private sector quickly takes on certain activities, but some activities have a sufficient public goods nature that they are not undertaken by private agents. The private sector readily takes over basic marketing and distribution functions, such as sales to or purchases from international markets, but the efficiency of those activities depends on the state of infrastructure and legal institutions. Activities likely to need government assistance or direct provision that are related to storage and stabilisation include both basic infrastructure, such as roads, and legal and institutional "infrastructure" such as market information and legal frameworks that facilitate private marketing and storage. Warehouse receipts are an often cited example that enables commercial storage and trade by allowing transactions to take place without the commodity physically moving. Market information, another critical element, includes not only insuring widespread and accurate price information at a point in time, for more efficient distribution, but also early warning on production or international market events. Timely information throughout the crop year helps not only commercial trade but also

decisions by farmers. Legal institutions were unnecessary when government physically handled domestic trade, and must advance if commercial storage mechanisms are to develop. Credit and finance are also necessary for both storage and input markets to develop, and have proven slow to evolve after privatisation of agricultural markets.

95. Some of these examples, like market information, are clearly public goods that government must provide, while others will become private if marketing institutions develop. Stabilisation is not the only objective that necessitates these reforms, but they are necessary not sufficient conditions for better integrated markets, especially within the domestic market. These changes are not about stabilisation policy per se, but bringing commercialisation and more integrated markets, allowing private storage to play a more active role and reducing intervention needed by governments. They may also make interventions more widely effective.

96. In the wake of structural adjustment reforms the World Bank (CRMG, 2008) has promoted development of private arrangements to enable farmers and traders to manage risk, including forward pricing and crop insurance. These were initially seen as a substitute for public stabilisation. Countries and developing country farmers have been quite slow to adopt these institutions, however (CRMG, 2008; Galtier, 2009a&b). In many cases domestic marketing institutions have been immature, preventing adoption of these approaches.

Futures markets

97. Scale and transactions costs were recognised early on as issues in the use of futures markets as a stabilisation tool for developing country farmers. Since the size of contracts on the Chicago Board of Trade (CBOT) is large relative to production by small scale farmers, and especially poor farmers of less than 2 hectares, intermediaries were needed to create contracts of appropriately small size for farmers. It was feared that transactions costs as a fraction of price could be quite large for scaled down contracts, and few examples of successful intermediaries arose. Cooperatives were one approach proposed, but these largely political institutions (in Africa) have been ineffective trading agents in many cases, and were not ready to take on a role as contractor for insuring or stabilising transactions. The weak legal framework and imperfect financial markets post structural adjustment also made creation of institutions to scale down contracts for farmers problematic. Most discussions with the World Bank on implementing this approach ended up being with public institutions (CRMG, 2008).

98. Even in developed countries, farmers have been reluctant to utilise futures markets (Carter, 1999). The timeframe of contracts for which futures markets are not thin is of a short duration. It is more reliable to hedge for a few months than across years. The number of contracts held for long duration is much smaller than for an upcoming harvest, and there is relatively little information about future prices in those long term contracts, beyond information on price for the upcoming or recent harvest and storage costs out from that. Farmers cannot effectively stabilise prices across years, even in developed countries, and make limited use of forward sales at planting. Futures markets are indispensable tools for the large traders, especially on international markets (e.g. Cargill and ADM), who want to minimise price risk as they buy, hold or transport, and then sell at a later time, but collect only small margins. But forward pricing for farmers is often through intermediaries who are traders and who have storage (e.g. grain elevators), and who engage in futures market transactions on farmers behalf. The World Bank recognised after a decade of effort on this approach that futures and options are better suited to traders than farmers (CRMG, 2008). In the longer run, as countries develop and markets become more commercial, traders will offer forward pricing options to farmers. But developed country experience suggests even then these will be for transactions within a marketing year and not as an inter-annual stabilising tool.

99. Byerlee, Jayne and Myers (2005) had argued that futures and options transactions should be practiced by private agents, not government. They note that trader capacity to utilise these institutions is very low in Africa, however. Traders in only a few countries have utilised this option, but new futures markets have actually arisen in China, India and South Africa. Basis risk means prices on the CBOT may not be highly correlated with domestic prices. If traders or farmers hedge on the CBOT, that may bear no relation to the revenues or costs they realise on their farming or trading operations. For local traders, forward pricing is needed on the prices they actually face, which may differ from world prices. CBOT prices may be more appropriate for import costs or export revenue than for domestic price stabilisation, especially if domestic volatility drives domestic prices in most years. Moreover, where local futures markets have developed recently (in China, India and South Africa), domestic markets are very large and domestic trading institutions are more mature than in most developing countries. It appears that futures markets work better in these settings when the markets are those of the country in question, and large scale needs to be achieved for these new institutions to arise.

100. As traders evolve, so does commercial storage. As marketing institutions mature, forward pricing means more efficient domestic storage. Thus, policies to assist in development of institutions to take advantage of forward pricing, and to facilitate commercial trading, are advantageous, but only become options as marketing systems mature.

101. Sarris (2009) has recently proposed the use of futures and options as a means by which developing countries can minimise foreign exchange risk. He has shown that countries would have benefited from use of forward pricing during the recent food crisis, keeping foreign exchange costs under control and more predictable in the face of rising world food prices. But the key issue is who will engage in those transactions? Is a parastatal entity necessary or can some other institutional arrangements exist? Sarris does not elaborate a private institutional framework, so the government remains the logical institution to benefit from this approach. The World Bank has pursued this approach with governments, but with only a couple of decisions taken to actually buy futures contracts (CRMG, 2008), and there have been some rejections of proposals.

Crop insurance

102. There is more interest now in crop insurance for developing countries, the risk management/stabilisation alternative the World Bank now emphasises (CRMG, 2008). A major issue in design and implementation of crop insurance is moral hazard. That is, there needs to be a payoff criterion that is relevant to a farmer's operation, but which does not permit shirking or failure to pay for inputs so that lower yields result in a pay-out. It is difficult for insurers to get reliable information to use to gauge when pay-outs on policies should occur, as well. Pay-out criteria are set based on weather indices or outcomes over large areas, where outcomes may not coincide with on-farm outcomes. Moreover, only farmers at high risk may choose to purchase insurance, the problem of adverse selection. Basis risk, that local prices may not be adequately correlated with index prices, and that in immature markets price information may be poor, complicate the design of crop insurance for developing country farmers, as well. Design of insurance contracts that avoid moral hazard and adverse selection issues have also been problematic for insurance approaches in developed countries (Anton, 2009). Farmers in the US complain, for example that pay-outs based on state-wide yields do not result in pay-outs when their own output is low. Scale and transactions costs to serve small farmers are also issues for crop insurance.

103. That bad weather is not an isolated local event, harming harvests nationally, may mean losses of many farmers occur in the same year and so insurers face large simultaneous pay-outs. Crop insurance alternatives better protect against random domestic sources of volatility than against systematic events, like world price changes that affect all farmers, as well as national droughts. In systematic events, pooling of risk across farmers is not an option. Reinsurance of those local contracts on international insurance markets

is essential and may be costly. In the event of an international food crisis, demands on the reinsurance pool would coincide, as well.

104. Experience with crop insurance in developed countries should not be seen as encouraging. Like parastatal price stabilisation, crop insurance programs have often incorporated implicit subsidies. They have either raised mean prices, or benefited some types of farmers at the expense of others. When there are not subsidies, demand for insurance by farmers has been low. Crop insurance schemes have also been part of government programs, and have not existed to any significant extent as an entirely private enterprise (Anton, 2009).

105. Both forward pricing and crop insurance are risk management tools that develop as agriculture develops and becomes commercialised. Benefits will arise to farmers, and markets will become more stable as these institutions evolve. The primary beneficiaries will be traders and commercial storage operators, with benefits to farmers following. Until markets mature and commercialisation advances, it is unlikely that local traders will utilise existing futures markets to help stabilise farm gate prices or incomes. In most developing countries forward pricing options are still a premature alternative to substitute for the stabilisation policies that existed before reforms. Crop insurance may be a better option in the shorter term, but designing affordable contracts remains quite difficult, and when markets work well insurance protects farmers against domestic events, not world price spikes. While development of these institutions should be encouraged, they are not tools that substitute for market stabilisation policies in poor countries, nor do they protect against infrequent world price spikes as experienced during the 2007-08 food crisis.

Governance

106. The key to effective private sector participation in any stabilisation strategy, as in any successful agricultural development strategy, is effective governance. A lesson from the aftermath of the privatisation era is that some role for government remains, including provision of public goods and fostering institutional development, including fostering development of new private market institutions.

Parastatal reform and coexistence

107. Following structural adjustment reforms, parastatal marketing boards were eliminated in many developing countries. Reform conditionality had a much bigger effect on policy than did trade liberalisation initiatives, such as the URAA agreement (Abbott, Andersen and Tarp, 2010). It was driven in part by the financial losses of those entities. Problems arose out of stabilisation efforts, but were exacerbated by policies that subsidised as well as stabilised. Stabilisation objectives persisted after reforms, and contributed to lack of country “ownership” of privatisation reforms. Countries under less pressure from the IMF and World Bank, principally in Asia, did not undertake these reforms, and one still finds parastatal grain boards functioning there. Those boards effectively stabilised during the 2007-08 food crisis, at a cost. Somewhat surprisingly, parastatals have also persisted in eastern Africa (Jayne and Jones, 1997).

108. While parastatal grain marketing institutions may continue to exist outside Asia, external pressures have led to changes in the way they operate in many cases. In Morocco, for example, the marketing board ONICL no longer physically handles international grain trade, but still manages international tenders for its wheat imports. While private traders conduct trade, ONICL retains some control on the magnitude and timing of imports. Trade policy clearly and consistently delineates stabilisation goals there. In eastern Africa, and elsewhere, it is not uncommon for parastatals and private traders to coexist in various ways. This compromise has been pushed in both structural adjustment and WTO reform agendas, even in China. Jayne and Tschirley (2009) illustrate some problems that can arise. If incentives and signals to private traders are inconsistent or opaque, they may not act in a timely manner to achieve food security. Rules can be stacked against the private sector, so they may not take up functions

expected after the reforms. Response to a crisis is likely to elicit both the need for government intervention, and conflicts between public and private trade interests, as Jayne and Tschirley's examples illustrate. For coexistence of public and private trade to work, there must be clear delineation of regulations and assignment of functions. If trade liberalisation is the norm, to dictate institutions and behaviour in normal years, but governments must intervene in crises, then clear and transparent rules must characterise that intervention, and when it will occur.

Developing new private market institutions

109. Countries that eliminated parastatal marketing boards often also saw problems in the provision of credit, affecting marketing and distribution as well as input provision. In addition, private sector trade requires different legal frameworks that were seldom implemented upon reform. If the private sector is to play an increasing role, but infrequent intervention by governments will continue to avoid catastrophes, institutions that facilitate private storage and marketing need to be reformed, as well. These are critical to both long run agricultural development and short run adjustments to changing market conditions.

110. Governance problems can arise from inconsistencies and corruption. They may simply reflect national objective functions that put low weight on agriculture, however. The disconnect between international donor and developing country government responses to the 2007-08 food crisis is mostly due to differing objectives, hence different priorities. This can spill over to international solutions, as well. Gilbert (1996) argued that the fundamental reason behind the failure of international commodity agreements was the failure of participating governments to agree on common objectives. The risk with regional trade solutions also lies in potentially differing objectives of trade agreement partners. If a country within a free trade area wants to stabilise, its actions will spill over onto its trade partners, who may not want the same degree of stabilisation, or at the same price level.

111. The cases described by Jayne and Tshirley (2009) and by Poulton *et al.* (2006) illustrate the importance of overcoming political failures if stabilisation and broader food security objectives are to be achieved. In the cases where grain market stabilisation succeeded in the face of food crisis, credible and transparent policy prevailed. The problem cited by economists with these cases is always high cost. Government commitment, another key to success, means that government was willing to pay those costs. It is not necessary, however, to return to public institutions managing grain markets, if the governance problems with coexistence and commitment are solved.

Conclusions

112. During the 2007-08 food crisis dramatic world grain price increases brought stabilising policy responses by many developing country governments. The isolationist policies pursued by governments contradicted existing "best practices" risk management strategies that focus on long run agricultural development, trade liberalisation, safety nets and private market solutions to risk (Byerlee, Jayne and Myers, 2005). Domestic market outcomes were conditioned to varying degrees by lagged, imperfect price transmission, transactions costs and weak market integration in addition to policy. Stabilisation of domestic markets also spilled over into greater international market instability. Countries that had opened their borders were vulnerable to high import costs and pass-through to high consumer prices, which was estimated to have brought hunger, malnutrition and poverty to an additional 100 million people (FAO, 2008b; Rosen *et al.*, 2008; World Bank, 2008a).

113. Trade policy responses to future world price spikes are likely to look much like the responses to the just past food crisis. National priorities reflect persistent stabilisation objectives and broad concern with consumer welfare. Governments alter tariffs or quantitative controls as the infrequent price spikes are realised, acting like a price bands regime. While these responses spill over into greater international market

instability, unless the very large exporters and large, now self-sufficient markets (e.g. China and India) leave their borders open, it is unlikely that liberal trade will result in sufficient stability in world prices to allow most developing country importers to leave their borders open. Combined actions by small importers may also make world markets less elastic, even if individual country policies have very small influence on world prices. Asian parastatals maintained quite stable domestic markets during the 2007-08 food crisis using this regime, and experts doubt they would behave otherwise in the future.

114. Galtier (2009a&b) and others have argued that policy recommendations on risk management, and the de-emphasis on domestic price stabilising regimes, are no longer appropriate in light of the food crisis. Moreover, recommended private risk management institutions, including forward pricing and crop insurance, had seldom materialised following structural adjustment reforms. A new perspective on policy must rethink “best practices” for both risk management and stabilisation in light of the infrequent but real world price spikes that require combating international as well as domestic sources of volatility in those years.

Policy recommendations

115. Policy recommendations follow from objective functions of policy makers, which need to be clear on the priorities given to agriculture, food security, stability and poverty. In spite of estimates by economists of small benefits to stability (Byerlee, Jayne and Myers, 2005), developing country governments have shown a preference for stability both in their reluctance to adopt reforms following structural adjustment and in their responses to the food crisis. The international donor community had emphasised the use of safety nets to protect the extreme poor and promotion of long run agricultural development, reflecting an objective function putting heavier political weight on prevention of extreme rural poverty and on longer run outcomes. The short run focus of developing countries reflects concern for short run stability and broader consumer protection. National policy responses may also reflect a desire to avoid catastrophes and extremes, by pursuing policy regimes that try to avoid consequences of being in the tails of price distributions.

116. Policy responses should be conditioned by future expectations on world price distributions versus domestic sources of variability. Existing recommendations were based on a presumption of stable world markets and the dominance of production variability as a contributor to domestic instability. Policy makers and analysts now need to recognise that there will be episodes of high, volatile world prices and of low, stable world prices, driven by external factors. The level, variability and even predictability of agricultural commodity prices are now conditional on circumstances both internal and external to those markets. Policy makers must pay attention to related markets that have caused world price increases in the past, aware that new mechanisms arise. They should expect infrequent but large spikes when relying on international markets to smooth domestic markets. It is likely that we may return to a period of stability like 1998 to 2005, where domestic factors dominate, but that spikes in world grain prices can reoccur. Macroeconomic, financial market and energy market factors will influence this future world price distribution.

117. Since domestic sources of instability do dominate in most years, policy must first address that domestic volatility. Liberal trade policy works well toward that end in those years when world prices are low and stable. The “best practices” recommendation combines trade liberalisation with self-sufficiency, to use trade as a stabilising mechanism, but not letting the share of imports become excessive due to the neglect of domestic agriculture. Early warning of both domestic shortfalls and world price trends is needed if there is to be greater reliance on trade, however, necessitating improved market information systems. The biggest risks from relying on trade, however, are that world markets fail during crises, as the rice market did in 2008, and supplies are unavailable at any price.

118. Public stocks management as an alternative to trade policy has been seen as a costly option, since large stocks must be carried for long periods if crises are infrequent. The use of trade alternatives requires that financial resources allow imports when needed. It also requires that world markets are reliable suppliers.

119. Imperfect integration into world markets and seasonal price dynamics along with delays in import delivery mean that short-run, inter-seasonal stockholding policy will complement trade policy to implement a stabilising regime. Contrary to theory that looks only at annual carry-overs, stocks management is used along with trade adjustments in most developing countries to adjust to both production shortfalls and world price spikes. Seasonality and short run price dynamics also mean stocks will always exist, and carry-out stocks will smooth both current and future consumption. Trade and stocks adjustments must also prepare a country for repeated shortfalls, as imports replace depleted stocks. Stocks management can also prevent domestic price spikes in critical pre-harvest periods, before imports arrive.

120. Improved private domestic risk management institutions will facilitate better stocks management as well as greater reliance on trade. In the least developed countries imperfect legal frameworks, market information systems, and financial institutions impede development of commercial stocks as well as the ability of trade or stocks strategies to broadly protect domestic consumers. Stocks need not be publicly held if consistent and transparent rules govern stocks management. Better private institutions mean smaller stocks and more effective interventions.

121. The aftermath of structural adjustment reforms has demonstrated that a role for government remains in assuring food security and developing agricultural markets. While private markets may more efficiently provide most marketing services, public goods require government provision and the government must foster institutional development, public and private. While the cost of maintaining parastatal marketing boards is likely to be high, they were effective in stabilising and avoiding increased poverty in many Asian markets. Elsewhere stabilisation policy is pursued by a new mix of public and private trade. Consistency, transparency and predictability of interventions is key if the private sector is to play a role in stabilisation, and especially if public and private trade are to coexist. Governance failures can exacerbate food security crises, whether of domestic or international origin.

122. While the agricultural trade policy regime should rely on liberal trade in most years, it should be recognised that short run dynamics mean short-run stocks policy remains a viable concern, due to delays in import arrival and inter-seasonal price dynamics. Moreover, trade policy adjustments are likely to be necessary when infrequent world price spikes reoccur. The challenge to implementing such a regime is that consistent, predictable and transparent governance is needed so that interventions make outcomes better, not worse.

Future research agenda

123. World grain price spikes have been short run phenomena eliciting short run policy responses. Many of the anecdotes about market failures and governance failures were more about poorly timed reactions or short term information inadequacy than about incorrect eventual levels of intervention. The extent of problems becomes masked in annual average data, as well. The dynamics of storage and of price transmission require that trade and stocks policy be considered under that shorter term time frame. Most of the work on stabilisation policy has utilised annual models to examine stocks and trade options, however. Data requirements and availability mean that seasonal price dynamics would be difficult to model, but stylised assumptions based on cost of storage theory and presumptions of inelastic demand would enable examination of these issues under shorter time frames. One element of that work should be to understand better how private trading evolves in developing countries, and how marketing institutions develop to change the roles of private commercial storage versus public storage. Another would be to better

understand why the lags in price transmission occur as they do, and how that is affected by policy in place. The benefits of developing better market information, including better early warning systems, could be compared to the alternatives of building better port and distribution infrastructure to deliver imported food more quickly to needy populations. Benefits to forward pricing options could also be better estimated under the appropriate (short run) time frame for those options. Rules on stockholding and on trade flows could be explored in that framework to compare how costly these alternatives actually are in light of dynamic market adjustments. A short run model would also provide better insight into the extent to which world price spikes actually are passed to consumers, and the effects that might have on short run nutritional status and poverty. It is likely that better insight into stabilisation policy would emerge if research looks more closely at the time frame under which it operates.

124. A related issue critical to the analysis of this paper is our understanding of the distribution of world grain prices. The assertion here is that this price distribution, and its uncertainty, is conditional on external factors and exhibits infrequent but large spikes. Policy recommendations are conditional on the shape of those world price distributions. Much of the work subsequent to the 2007-08 food crisis has utilised time series methods that assume no structural changes in this distribution, and don't capture any irregularities in the shape of that distribution, however. Better understanding of the historical distribution of world grain prices, and the factors driving those prices, will better inform assumptions on future price distributions and so implications of those distributions for policy design. This will require that simple assumptions on symmetric normal distributions be abandoned, and that policies be considered in light of the likely world price distribution that may occur in the future. Risk management and stabilisation policy strategies should be evaluated under more realistic assumptions on these world price distributions.

125. The effectiveness of stabilisation policy is likely dependent on the state of marketing institutional development. One of the "best practices" recommendations that stands is that improvement in these private market institutions will help farmers, consumers and governments manage risk. The state of these institutions is immature in most developing countries. Moreover, while it was eventually recognised that market liberalisation reforms should be phased in, how to implement that slowly, and even what that meant for policy evolution, were unknown. In addition, recommendations often resulted in coexistence of both public and private trade, but with unclear divisions of labour between the public and private sectors. Research should develop a better understanding of how marketing institutions can and should develop, and what their development may mean for development of risk management strategies. It should lead to a better understanding of the conditions under which public marketing boards and private trade can coexist, and what regulations lead to better functioning markets. It should inform policy makers on what market conditions and what stage of development is needed for some of the more advanced marketing institutions to work. More realistic assumptions on when more sophisticated risk management institutions might work are needed by both policy makers and researchers.

126. The focus of this paper has been on domestic stabilisation options. But domestic policy choices both depend on and create problems for international stabilisation strategies. A well know issue is that domestic stabilisation spills over into greater international market instability, and the extensive stabilisation by countries in 2007-08 contributed to the height of the price peaks realised. The extent to which world markets would have been stable, and how high prices might have risen had countries left their borders open, however, is quite uncertain. Methods to model this have utilised very simple assumptions on price transmission or imperfect domestic-foreign good substitutability, typically assuming any blockage of international price transmission is the consequence of policy not weak market integration. The extent of world market stability should be explored using better estimates of price transmission behaviour, and better models than simple price transmission and the law of one price to capture border interventions (such as average cost pricing by local traders or models that assume parastatals react to quantity and not price signals). This is also another case where shorter term models might better inform the extent of world price instability, taking into account the observed lags in price transmission. Price transmission and the stability

of world prices, as well as options to use trade to stabilise domestic markets, depend on whether any of the proposed international mechanisms, such as a virtual reserve or clearinghouse, are adopted. Such research should look at the worldwide consequences of alternative assumptions on domestic stabilising regimes by a country, its trade partners and other important world market actors, including regimes that only protect against being in the tails of price distributions.

127. In general the interaction between domestic and international markets needs to be better understood and better modelled, so that evaluation of domestic policy options is better informed by realistic assumptions on world market behaviour and on international stabilisation mechanisms adopted or proposed, as well as better assumptions on how domestic markets behave.

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