Variation in Staple Food Prices in Eastern and Southern Africa: A Synthesis

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1 Introduction

The global food crisis of 2007-08 has focused attention on food prices, pushing the topic to the top of the agenda of international organizations. For policymakers in sub-Saharan Africa, however, food prices have been an issue of economic importance and political sensitivity for decades. Of particular importance are the prices of staple foods, defined as grains and starchy root crops that are inexpensive sources of calories. In eastern and southern Africa, maize is the most important staple food, followed by cassava, sorghum, teff, wheat, plantains, and sweet potatoes, with the importance of each varying by country. The importance of these staple foods cannot be underestimated, as they contribute 50-75% of the caloric intake of the population. Furthermore, staple foods represent a large share of food spending, which is itself 40-70% of the budgets of households in sub-Saharan Africa.

The impact of changes in staple food prices varies across types of households within countries. The urban poor are particularly vulnerable to price increases because staples make up a larger share of their budgets. Less obvious but equally important, a large number of rural households, a majority in some countries, are also net buyers of staple foods. Earning their income from cash crops, agricultural labor, small business income, or remittances, they are also adversely affected by higher staple food prices. On the other hand, net sellers of staple food prices gain from higher food prices. Although they represent a minority of the rural population, perhaps 10-40%, they are a vocal minority, often playing a key role in farmer organizations and local politics.

Given the impact of staple food prices on well-being and food security, particularly among the poor, it is not surprising that food prices are such a politically sensitive topic in developing countries and in sub-Saharan Africa in particular. Price instability and food shortages have serious food security implications and can erode the political support for the government. The global food crisis of 2007-08 provoked food riots in more than a dozen countries, including Burkina Faso, Cameroon, Senegal, Mauritania, Cote d'Ivoire, Mozambique, and South Africa. Policymakers have a strong motivation to use any and all tools at their disposal to manage staple food prices, regardless of whether their goal is poverty reduction or political survival.

Many of the agricultural policies and programs implemented by governments in developing countries are designed to support agricultural prices for farmers, hold down food prices for consumers, and reduce volatility in both. In order to achieve these objectives, governments in sub-Saharan Africa and elsewhere have implemented price controls, interventions by state-owned grain marketing boards, import tariffs and restrictions, export taxes and bans, restrictions on movement of food within the country, state-owned farms, crop production campaigns, input subsidies, and agricultural credit programs, among others. Longer-term investments such as roads, market places, agricultural research, and extension systems may be implemented in part to improve staple crop marketing.

Food policies will have the best chance of achieving their objectives if they are based on a solid understanding of the functioning of food markets in the country and a familiarity with the experience of different policies in other countries. This is the premise behind the African Agricultural Marketing Project (AAMP), managed by the Common Market for Eastern and Southern Africa (COMESA). The objective of the AAMP is to “provide policy-relevant

analysis, promote empirically based policy dialogue among public and private sector stakeholders, and build capacity to analyze, formulate and implement growth-oriented agricultural trade policies." The AAMP is carrying out six policy seminars and short-training courses of selected topics related to food security and agricultural markets. This report is a synthesis of papers prepared for the third policy seminar, which is organized around the topic "Price variability: Causes, consequences, and policy implications." In particular, it summarizes the findings of three thematic papers and seven country background papers. The titles are listed below, while the full citations are available in the reference section at the end of this synthesis.

- "Maize price instability in eastern and southern Africa: The impact of trade barriers and market intervention"
- "Are staple food markets efficient in Africa? Spatial price analysis and beyond"
- "Transmission of world food price changes to African markets and its effect on household welfare"
- "Staple food prices in Ethiopia"
- "Staple food prices in Uganda"
- "Staple food prices in Kenya"
- "Staple food prices in Tanzania"
- "Staple food prices in Zambia"
- "Staple food prices in Malawi"
- "Staple food prices in Mozambique"

Following this introduction, Section 2 provides a framework for understanding price variation, both between different locations and over time. Sections 3-5 summarize the findings of the three thematic papers. Section 3 reviews the patterns of spatial variation in staple food prices within sub-Saharan African countries. Section 4 analyzes the effect of global food markets on domestic food prices in Africa. Section 5 analyzes maize price volatility in eastern and southern Africa, focusing on the effect of government stabilization efforts. Section 6 provides an overview of the seven country papers. And Section 7 identifies some of the implications of these findings for staple food policy in the region.

2 Framework for understanding variation in food prices

In a well-functioning market, prices reflect the relative scarcity of the commodity, so, variations in prices reflect differences in scarcity. Price differences create opportunities for arbitrage, in which traders buy from low-price markets to sell in higher-price markets. In doing so, they reduce the scarcity in the high-price markets and increase scarcity in low-price markets, which has the effect of reducing the price in the former and raising the price in the latter. In the process of attempting to profit from the price difference, traders paradoxically tend to reduce the price difference below what it would have been without trade.

It is useful to distinguish between price variation across different locations (spatial variation) and price variation over time (temporal variation). Although the process of arbitrage is similar in both cases, the causes of price variation differ. Each is discussed below.

2.1 Spatial variation in staple food prices

As discussed in Rashid and Minot (2009), the patterns of spatial variation in food prices in a country depend partly on whether or not the commodity is internationally traded:

- For non-tradable food commodities, areas producing large surpluses of the commodity (those with good agricultural potential relative to the size of the population) tend to have the lowest prices.[1] Examples of surplus maize areas include Jimma in Ethiopia, the western highlands in Kenya, the southern highlands in Tanzania, and northern Mozambique. In contrast, cities and other deficit areas have higher food prices in order to cover the cost of shipping food from surplus zones.
- For tradable commodities, prices will generally depend on distance from the port of entry or exit. Imported food will be least expensive near the port of entry or along the main transport routes. For example, in sub-Saharan Africa, rice and wheat are generally least expensive at the port city or in places with good market access.

Spatial arbitrage refers to the process in which traders buy in low-price locations and sell in higher-priced locations. In competitive markets, spatial arbitrage has three implications:

- First, spatial arbitrage ensures that the price difference between two markets will be, in the long run, no greater than the transfer cost, defined as the full cost of shipping the commodity from one market to another including profit and compensation for risk. If the price difference were temporarily greater than the transfer cost, traders would buy from the low-price market and sell to the high-price market, thus reducing the price difference.
- Second, spatial arbitrage implies that, if there is a flow between two markets, the price difference will be approximately equal to the transfer cost. To keep the flow going, the price difference must be large enough to cover the cost of trading.
- And finally, spatial arbitrage implies that, if the price difference between two markets is less than transfer costs, there will be no private trade of the commodity between the two markets. In this situation, trade between the two markets is not profitable. For example, if the government sets pan-territorial prices or subsidizes the shipment of food from surplus to deficit regions, the private sector will withdraw from trade.

Thus, although food traders carry out spatial arbitrage for their own profit, it has socially beneficial effects in moving food from surplus to deficit areas and reducing the gap between food prices in different locations.

Where there are trade flows between markets, the difference between the prices is more or less constant, so the prices will move up and down together. In economic terms, this is called market integration or spatial co-integration of prices. When there is no trade flow

[1] Spatial differences in demand also matter, but usually there is less variation in per capita consumption of staple foods than in per capita production of staple foods.

between markets, the prices in each market will not move together, unless they are linked by another factor such as similar rainfall patterns or trade with a third market.

Spatial arbitrage applies to different markets within a country as well as to markets in different countries, although there are some differences. One important difference is that the barriers to trade between countries is generally greater than the barriers to trade within a country. International trade is subject to tariffs, quantitative restrictions, occasional bans, sanitary and phytosanitary requirements, foreign exchange controls, and other regulations. Internal barriers to trade, common in the 1970s and 1980s, have been largely eliminated, though local taxes and police checkpoints continue in some countries. Regional organizations such as Comesa and the East African Community are attempting to reduce international barriers between members, but this is a continuing challenge.

Another difference between domestic and international arbitrage is that internal shipments take no more than a few days to accomplish, while an international transaction may take more than a month to complete. Thus, we expect food prices to respond more quickly to changes in nearby domestic food markets than to changes in world food markets.

2.2 Temporal variation in staple food prices

As described in Minot (2009c), the variation in food prices over time (temporal variation) also depends on whether or not the commodity is internationally traded:

- For tradable food commodities, the variation in prices over time is largely determined by world prices, trade policy, and the exchange rate. If trade policy and the exchange rate remain unchanged, the domestic price of a tradable commodity will generally track the international price of the commodity. However, import quotas, high tariffs, exchange rate volatility, or difficulty in accessing foreign exchange can break the link between domestic and international commodity prices.
- For non-tradable food commodities, the variation in prices over time is primarily caused by the seasonal harvest calendar and by weather-related differences in production from year to year.[2] Seasonal prices are lowest during the harvest and rise throughout the post-harvest period in order to cover the cost of storage. Similarly, year-to-year variation in staple food prices is inversely related to the harvest. Because farmers and consumers can switch between staple foods in response to prices, the prices of different staple foods often move together over time.

Temporal arbitrage refers to the process of storing a commodity when the price is low in order to sell it when the price is higher. The implications of temporal arbitrage are quite similar to those of spatial arbitrage:

- First, temporal arbitrage ensures that the expected price increase between two time period will be, in general, no greater than the full cost of storage, including profit and compensation for risk. If the expected price increase were temporarily greater than the storage cost, traders would have an incentive to buy and store more of the commodity, thus raising the current price (when the commodity is less scarce) and

[2] Again, changes in demand can affect food prices, particularly for some specialty foods linked to holidays, but changes in demand are usually not an important cause of variation in staple food prices.

lowering the expected later price (when it is more scarce). This reduces food price variability over time.

- Second, temporal arbitrage implies that, if there is a storage between two time periods, the expected price increase will be approximately equal to the storage cost. To maintain the incentive to store, the monthly price increase must be enough to cover the monthly cost of storage.
- And finally, temporal arbitrage implies that, if the expected price increase from one time period to another is less than storage costs, there will be no storage undertaken by private traders because storage would not be profitable. For example, if the government sets pan-seasonal prices or subsidizes the inter-seasonal storage of grains, the private sector will withdraw from seasonal storage.

Traders who undertake this type of operation are often accused of "hoarding" and profiting from a food crisis. Indeed, traders do undertake storage with the goal of making a profit, but the outcome is often socially beneficial. If food is plentiful and cheap at harvest but expensive and scarce in the off-season, it is desirable for someone to store food now and sell it onto the market later. Likewise, if the next harvest is expected to be poor, it is useful to hold some stocks for the off-season after the poor harvest. In either case, the effect is to redistribute food from a low-scarcity period to a higher-scarcity period and to reduce the variability in food prices below what it would have been without storage.

There are two important differences between spatial and temporal arbitrage. First, spatial arbitrage can take place in either direction between two locations, while storage can transfer goods from the present to the future, but not the reverse. Second, spatial arbitrage is motivated by the *actual* difference in prices between two locations, while temporal arbitrage is based on the *expected* increase in prices between two time periods[3]. For this reason, temporal arbitrage is much riskier, so we would expect the risk premium (the profit necessary to compensate for the risk) to be much higher in the case of temporal arbitrage.

Because storage decisions are based on expected prices, expected future events can influence current prices. For example, if traders learn that the next grain harvest will be a poor one, they will have an incentive to put more grain into storage for resale during the high-price period after the next harvest. By withdrawing grain from the market today, they increase the current price, but by increasing the supply of stored grain available later on, they will partially alleviate the scarcity during that period and reduce food price differences between the two years.

Changes in expectations about the harvest, the size of government stocks, or the volumes being imported can have dramatic effects on current prices. This is because staple food crops have very inelastic supply and demand, meaning that a given price change causes only a small percentage change in the quantities consumed and produced. Inelastic demand is related to the urgent need to maintain a basic level of caloric intake, combined with the lack of other foods that are as cheap on a per-calorie basis. Inelastic supply is the result of seasonal supply (between harvests, the supply is fixed) and the subsistence-orientation of

[3] In fact, the difference is a little more subtle because spatial arbitrage is based on the *expected* price of the commodity at the time it is delivered to its destination. Delivery may take just a day or two for domestic trade but more than a month for international trade.

most staple food production. When supply and demand are inelastic, a small change in actual or expected supply results in a large change in the market price.

In summary, when food markets are characterized by competition and good information, they work well in redistributing food from low-price markets to higher-price markets and from low-price periods to high-price periods. In doing so, they tend to reduce spatial variation in food prices, as well as reducing price variability over time. However, markets will not eliminate all price variation across market or over time. Indeed, the elimination of price variation would cost more than the social benefits, as well destroying the incentives necessary to attract private agents to engage in trade.

However, food markets may be inefficient due to monopolistic behavior, imperfect competition, policy inconsistency, and/or high transportation costs. Furthermore, even when food markets work well, they cannot be expected to address all food security problems, such as delivering food to households whose livelihoods and purchasing power have been destroyed by natural disasters. These have implications for the role of government, which are discuss in below in Section 7.1. The next three sections apply the concepts from this section in the empirical analysis of variation in staple food prices in eastern and southern Africa.

3 Spatial variation in staple food prices

Do staple food prices in nearby markets in sub-Saharan Africa move together and what does this tell us about the efficiency of staple food markets? This section summarizes the findings of Rashid and Minot (2009), including a discussion of the relationship between market integration and market efficiency, a summary of studies of spatial market integration in Africa, and a discussion of factors that affect the cost of transportation and marketing in the region.

3.1 Spatial integration of markets in Africa

As defined in section 2.1, spatial market integration refers to the co-movement of prices different locations. In contrast, market efficiency refers to minimizing cost and not leaving any opportunities for mutually beneficial trade unexploited. Although the concepts are closely linked, it is possible for efficient markets not to be integrated if the price difference between the two markets is less than the marketing cost between them. In other words, segmented markets may well be efficient. At the same time, spatially integrated markets may not be efficient if marketing costs are higher than normal due to imperfect competition, lack of information, or other reasons.

The methods for measuring market integration have improved over time, taking into account exogenous factors, lagged effects, and the problem of non-stationary variables[4]. Cointegration analysis takes non-stationarity into account and allows measurement of the long-run relationship and the speed of adjustment, but it does not distinguish between lack of integration due to market inefficiency and lack of integration due to the price difference being too small to justify trade. Threshold autoregression (TAR) and the parity bound

[4] Non-stationary variables are those that do not have a constant mean and variance, such as those following a "random walk" pattern. This poses a problem because standard regression analysis will give misleading results when applied to stationary variables. Price data are often non-stationary.

method (PBM) address this problem, particularly if outside information on transfer costs can be obtained.

Based on our review of studies of the spatial integration of food markets in sub-Saharan Africa, we can draw four conclusions:

- Food grains prices in most of the markets within each country are co-integrated, though the degree of integration varies with distance and road quality. Markets that are not co-integrated are usually those that are more remote or off the main roads.
- The speed of adjustment varies widely across studies, ranging from just one week to six months. However, recent studies that use weekly price data indicate that half of the full adjustment takes place within 1-4 weeks.
- There is no consensus on the symmetry of price transmission. One study of maize markets in Ghana found asymmetry in Ghana, possibly indicating trader collusion, but another study found symmetric price transmission in maize markets in Malawi, indicating competitive markets.
- Most of the studies that examine the impact of market liberalization find statistically significant evidence of improved market integration after reforms. The exception (Benin) represents a case in which pre-reform food markets were not heavily regulated.

3.2 Factors affecting marketing costs

Marketing costs can be decomposed into transportation costs and trader profits, including compensation for risks. Studies of marketing costs suggest that transportation costs account for more than half of marketing costs.

The cost of transport is significantly higher in sub-Saharan Africa than elsewhere, due to a combination of poor roads, high fuel prices, and administrative procedures which cause delays. The cost is US$ 0.04 - 0.10 per km-ton for long-distance road transport and US$ 0.10 - 0.40 per km-ton for shorter-distance transport. In contrast, the cost of road transport is US$ 0.03 - 0.04 in Pakistan and OECD countries. Transport costs vary widely within Africa as well, being lowest in southern Africa and highest in western and central Africa.

There is fragmentary but widespread evidence that transport costs have declined over the past decade due to market liberalization, infrastructure investments, and better access to information thanks to mobile phones.

The efficiency of food markets is affected by a variety of factors:

- Barriers to trade in agriculture. District-level taxes, check points, tariffs, and non-tariff barriers to trade raise the cost of food to remote deficit areas and landlocked countries.
- Degree of competition in the transport sector. Countries and areas within countries with less dense demand for transport services tend to have lower transport costs, due in part to lower competition.
- Access to information. Although difficult to measure, one study showed that the adoption of mobile phones cut spatial price margins by 6%.
- Effectiveness of the legal system. The difficulty of enforcing contracts in developing countries results in additional marketing costs as traders personally inspect their purchases and carry out face-to-face transactions.

- Quality of transport infrastructure. Studies show that poor-quality roads can double the cost of transportation, reduce trade volumes, and reduce the prices farmers receive.
- Regulation of the transport sector. Marketing costs are generally increased by state transportation monopolies, administratively-set freight rates, regulations favoring domestic transporters, and the proliferation of check points.
- Government interventions in food markets. Pubic stocks are necessary to meet emergency needs, but unpredictable purchases and sales by the government introduce uncertainty into grain markets, raising costs and often increasing price volatility.
- Trade and macroeconomic policy. Grain prices have spiked above import parity due to foreign exchange controls, high tariffs, and uncertainty about public-sector import intentions.

Overall, it appears that grain markets are reasonably efficient given the difficult environment in which they operate, but they are constrained by poor infrastructure, administrative and tariff barriers, a high degree of risk and uncertainty, and limited information. In some cases, price differences may be significantly higher than transfer costs, particularly in remote areas, but the best way to reduce margins is to address the root causes (poor infrastructure, risk, and lack of information) rather than by regulating prices or having state enterprises compete with traders. The policy implications of these findings are discussed in Section 7.2.

4 Transmission of food price shocks from world markets

To what degree are changes in world food prices transmitted to domestic markets in sub-Saharan Africa? This section summarizes the results of Minot (2009c). The study is divided into three parts. The first part is an examination of the trends in staple food prices in sub-Saharan Africa over 2007-08. The second is an econometric analysis of price transmission from international markets to domestic markets in Africa. And the third part is a discussion to reconcile the apparently contradictory results.

4.1 Recent trends in staple food prices in sub-Saharan Africa

Staple food prices in sub-Saharan Africa have risen rapidly since 2006, even in US dollar terms. Across 83 food prices in eleven countries examined in this report, the average increase between June 2007 and June 2008 was 63% in US dollar terms. On average, this represents 71% of the increase in the price on international markets for the corresponding commodities. There is, however, considerable variation across countries and commodities. For example, food price increases were relatively small (25-39%) in South Africa, Ghana, and Cameroon. On the other hand, food prices increases were quite large (over 150%) in Ethiopia and Malawi. Since the price increases in these latter two countries actually exceed the price increase in the world markets for the same commodities, this suggests that domestic factors (such as inflation, crop failure, or manipulation of the exchange rate) must have played an important role in the price hike. The price increases in domestic African markets also varied by commodity. The price increases in African markets were highest for maize (87%), wheat (65%), and rice (62%). Other commodities experienced smaller increases, particularly plantains (9%) and cassava (12%). The degree of price increase appears to be roughly related to the degree of tradability: highly tradable commodities are more closely linked to international markets and so domestic prices of these commodities

tracked the spike in world prices. Commodities that are less widely traded in international markets saw smaller price increases in African markets.

4.2 Econometric analysis of price transmission from international food markets

The above analysis is based on the simple ratio of local to international price increases over June 2007 to June 2008. We also carried out an econometric analysis of the degree to which local prices track world prices using a vector error-correction model. The data consist of 62 price series for maize, rice, and wheat in nine sub-Saharan African countries. Each domestic price series is tested against the world price of the same commodity.

Based on the Johansen test, only 13 of the 62 price series show a long-run relationship in which the domestic price is influenced by the international price of the same commodity. Of the 13 domestic prices that show a long-run relationship with international prices, only six have an long-term elasticity of transmission that is statistically significant. These six elasticities range from 0.16 to 0.97, with a median value of 0.54. The median value implies that 54% of a percentage change in international prices would be transmitted to the domestic price of the same commodity.

Although less than a third of the 62 African prices tested showed a statistically significant link to international prices, there was some variation in the proportion across countries and commodities. Malawi, Mozambique, and Ethiopia have the highest proportion of prices that are linked to world markets, though the share is less than 40% in all three cases. Zambia, Uganda, and Kenya have no prices that show a long-run relationship with world markets.

The differences across commodities are somewhat clearer. Just 10% of the domestic maize prices tested are significantly related to world maize prices, but almost half of the domestic rice prices are related to world rice prices. This implies that rice markets in Africa are generally better connected to world markets than maize markets. This result in not surprising in light of the fact that most sub-Saharan African countries are close to self-sufficient in maize, but rely heavily on imported rice to meet local demand. More specifically, the traded volume of maize is equivalent to less than 5% of the domestic consumption in eight of the nine countries under consideration; the exception is Mozambique, where maize imports are equivalent to 14% of domestic production. Among the three countries whose rice prices were tested, rice imports represent more than 50% of domestic consumption in Ghana and Mozambique and 11% in Tanzania.

4.3 Discussion

A key question is how to reconcile the trend analysis, which shows almost all domestic African prices rising apparently in response to the global food crisis of 2008-09, and the econometric analysis, which suggests that often there is no relationship between world prices and domestic African prices for the same commodities. There are several possible explanations for this.

First, unlike normal fluctuation in world food prices, the food crisis coincided with a sharp increase in oil prices, which rose from US$ 71 per barrel in June 2007 to US$ 133 per barrel a year later (see **Error! Reference source not found.**). This led to much higher costs of fertilizer, sea-freight, and overland transportation, which would raise the cost of domestically produced and imported food. Since fuel costs represent less than half of transportation cost, and transportation costs generally account for up to half of imported food cost, an 87% increase in fuel prices could account for a 20-25% increase in imported

grain costs. Thus, higher fuel costs may be an important contributing factor, but it is not be enough to explain the full increase in African staple food prices.

Second, the food crisis provoked a wave of grain export restrictions in sub-Saharan Africa, as well as elsewhere. As mentioned above, during the global food crisis, Malawi, Zambia, and Tanzania all banned the export of maize, while several western African countries attempted to ban grain exports with varying degrees of success. Although the effect is difficult to quantify, these restrictions probably raised grain prices in landlocked countries.

Third, the higher food and oil prices may have started an inflationary process in some countries, an occurrence that normal fluctuations in food prices does not cause. With market-determined exchange rates, the depreciation would largely offset the inflation, leaving prices as we measured them (in US dollar terms) relatively unchanged. However, domestic inflation combined restrictions on the foreign currency market would drive up domestic African prices, in US dollar terms. This could be part of the explanation in some countries, such as Malawi and Ethiopia, where domestic food price increases actually exceeded world food price increases. But in most countries, the increase in food prices was much greater than the increase in the general price level, as measured by the consumer price indices.

Fourth, there may be threshold effects such that small changes in world food prices are not transmitted to African markets or their effects on African markets are not measurable given the price fluctuations due to variation in domestic supply. Most of the African grain prices do show significant spikes that are not related to world prices and are presumably driven by poor harvests. However, when the shock from international markets is large, as it was in 2007-08, the price changes are transmitted to local markets or at least the transmission to local markets becomes measurable with econometric methods.

In summary, the most likely explanation is that international prices of food grains do have an effect on African markets for rice, wheat, and (to a lesser degree) maize, but the effect is usually swamped by the dominant effect of weather-related domestic supply shocks. The spike in world prices in 2007-08 was more clearly transmitted, partly because it was a large shock, partly because it was accompanied by sharply higher transportation costs, and partly because many African countries attempted to ban grain exports in response to the emerging crisis, thus exacerbating food price increases in landlocked countries. The policy implications of these findings are discussed below in Section 7.3.

5 Maize price instability and government intervention

Staple food price instability remains a major problem in eastern and southern Africa. A number of governments in the region attempt to stabilize food prices through pricing, marketing and trade policy instruments. This section summarizes a study by Chapoto and Jayne (2009), which examines the effect of trade policy and market interventions on maize price stability in eastern and southern Africa. The study argues that trade policies and market interventions tend to be implemented in ad hoc, stop-go, and unpredictable ways that can generate uncertainty for participants in the marketing system and create unintended consequences for the performance of food markets. The result is that policies intended to reduce food price instability can instead be a source of price instability.

5.1 Methods

This study assessed the impacts of various maize marketing and trade policy instruments on maize price unpredictability in eastern and southern Africa. More specifically, the study applied an econometric model that estimates both the level and variability of monthly food prices for eight countries over the period from January 1994 to December 2008[5]. The countries were divided into two categories. Category A countries have fully embraced the maize-without-borders policy with a stable trade policy regime and a relatively predictable role for government operations in domestic markets. Mozambique, Uganda, and South Africa fall into this group. In contrast, category B countries use a variety of *ad hoc* domestic marketing and external trade policy tools to stabilize prices. Zambia, Malawi, Ethiopia and Tanzania are in this group. Kenya is a borderline case, falling in Category B until January 2005 when the customs union of the East African Community came into operation, including its maize-without-borders policy.

5.2 Results

The results of the study can be summarized as follows. First, with the exception of Malawi, all of the other countries pursuing food price stabilization and food security objectives through direct state operations over the past decade have not been able to match production growth for the sub-Saharan Africa as a whole. By contrast, Mozambique and Uganda, countries that have stable and open maize marketing and trade policies have experienced more than 100 percent increase in maize production over the past two decades.

Second, Malawi and Zambia, countries pursuing interventionist and ad-hoc trade policies have highest price volatility and price uncertainty of all eight countries. This finding implies that ad hoc and discretionary the government policies in these two countries have had a destabilizing effect on prices and market predictability.

Third, Mozambique, a country with the most liberalized markets in southern Africa has the lowest price variability in the capital city of Maputo, but the other markets, Nampula and Beira, have price volatility and market uncertainty closer to that of Malawi. This is likely because markets in the northern part of Mozambique are integrated with markets in Malawi; hence, policy instability in Malawi is likely to be transmitted into these markets.

Fourth, maize price volatility has declined greatly in Kenya since its adoption of the maize-without-border policy of the East African Community in January 2005. At this time, Kenya eliminated the variable tariffs on maize imported from Uganda and Tanzania (except for a 2.75% inspection fee). The more stable trade policy may have resulted in the decline of both price volatility and market uncertainty.

Fifth, there is no apparent relationship between being on a coastal port versus being landlocked in terms of the magnitude of maize price volatility.

Sixth, in well functioning markets, there is a regular seasonal price pattern in which prices are lowest directly after the harvest and rise gradually over the season reflecting the costs of storage until they reach their peak in the months prior to the next harvest. This pattern is seen in all eight countries studied, most clearly in Randfontein, South Africa.

[5] The analysis used the Autoregressive Conditional Heteroskedasticity (ARCH) model.

In summary, these findings indicate that many governments' well-meaning attempts to stabilize prices actually destabilize them because marketing boards operations and sporadic border closings put a cloud of uncertainty over the maize market, depressing the long-term development of commercial markets. In such an unpredictable environment, private trade develops more slowly and more tentatively in countries. While private trading systems will always result in some variation in food prices over time, as discussed in Section 2.2, they tend not to cause the frequent food crises due to policy mistakes and inaction that are commonly seen in the region. The policy implications of these findings are discussed below in Section 7.4.

6 Country case studies

Sections 3-5 described the results of three studies of variability in staple food prices in sub-Saharan Africa. This section focuses on the patterns and trends in staple food prices in seven countries of eastern and southern Africa, as well as the evolution of policies and programs designed to influence food prices. Describing the seven countries illustrates the diversity of conditions and experiences, as well as highlighting some common characteristics and challenges.

6.1 Ethiopia[6]

Ethiopia has a relatively diversified set of staple foods. Maize and wheat are the most important staples, accounting for 20% of caloric intake each, followed by teff and sorghum. Teff and wheat are "luxury" grains, consumed disproportionately in urban areas, while maize and sorghum are more common in rural areas.

Cereals play a significant role in the national economy: cereals account for roughly 60 percent of rural employment, 80 percent of total cultivated land, more than 40 percent of a typical household's food expenditure, and more than 60 percent of the caloric intake. In terms of contribution to national income, our calculations suggest that the cereal sub-sector accounts for roughly 30 percent of gross domestic product (GDP). This explains why both economic growth and poverty alleviation strategies of the government have placed so much emphasis on cereals.

Continued policy emphasis on cereal has brought about significant changes in the structure and performance of the subsector. Production of wheat and maize has grown significantly since 2000—so much so that crop mix in the country has changed. Production of all four major cereals has increased significantly since the 1990s, with particularly strong growth in wheat and maize output. Wheat has moved from being ranked last among the four major cereals in the 1990s to second in recent years, with its production exceeding teff and sorghum.

Despite this impressive growth, all cereals except wheat remain non-tradable. That is, given the infrastructure and other market fundamentals, large-scale imports and exports of cereals are not profitable in Ethiopia, though small volumes are involved in cross-border trade. On the other hand, almost one-third of the wheat consumed in Ethiopia is imported, though this is mostly in the form of food aid rather than commercial imports.

[6] This section is based on Rashid (2009).

Domestic marketing remain very important in the country due to concentration of production in two regions—Amhara and Oromia—which account for 87 percent of the nation's teff and wheat production and 82 percent of maize production. Therefore, inter-regional trade of cereal remain critically important, and public policies focusing on improving arbitrage efficiency can have a high pay off.

Cereal markets in Ethiopia have gone through dramatic shifts over the past three decades, with each shift bringing about significant changes in agricultural price polices. The major thrust of the current government's policy has been on (a) enhanced investments in market infrastructure, (b) gradual withdrawal of government controls, and (c) enhancing the scope and coverage of social safety net programs. This is line with government's strategy to make transition from relief to development. The largest safety net program in Ethiopia is now conditional transfer programs, which not only feed the poor but also contribute towards growth through infrastructural and human capital development (nutrition supplement and school feeding).

However, policy makers do not seem to be convinced that staple foods can yet be left to the market forces yet. The EGTE has continued *ad hoc* market interventions in recent years. The interventions, however, have been designed largely to address emergencies. For example, although it officially withdrew from market, government instructed EGTE to make local purchases in 2003 when maize prices collapsed. Similarly, in the wake of very high domestic prices, EGTE imported more than half a million tons of wheat in 2008, which were distributed through the urban food rationing program, open market sales, and sales to flour mills. The objective was to stabilize prices.

During the 2007-09 global food crisis, staple food prices increased in Ethiopia, but it seems that the increase was not related to world price rise. It began with rapid growth in the money supply relative to overall economic growth. This was later aggravated a modest harvest in 2007. Although official statistics suggested a bumper harvest, an IFPRI-EDRI gathers several indicators which suggest that official figures were overestimated. Grain imports would have been able to stabilize food prices, but rising fuel prices and a fixed exchange rate resulted in government rationing of foreign exchange. This prevented traders from importing grain and caused domestic grain prices to rise above import parity prices. Food prices have remained high in spite of the decline in world food prices.

Taking all the factors together, it appears that that rising food prices in Ethiopia has been the outcome of monetary policy misalignment, the balance of payment problems resulting from sharp increases in fuel prices, as well as a supply shortfall that was disguised by overestimated cereal production. However, although the sources of price rise have been different from the other countries, the policy reactions have been similar—increased intervention in cereal markets.

6.2 Uganda[7]

Uganda is a densely populated, landlocked country with a population of about 32 million. The diet of Ugandan consumers is unusual, both because of the diversity of staples and the relatively small importance of grains. The most important staple is plantains (also called *matooke* or cooking bananas), but it represents just 18% of caloric intake. Cassava, maize, sweet potatoes, and beans each contribute another 6-13%. Rice and wheat are relatively

[7] This section is based on Haggblade and Dewina, 2009.

unimportant at the national level, but they are more popular among high-income, urban households.

Most of the staple crops in Uganda are non-tradable. There is very little trade in plantains, cassava, and sweet potatoes, although there are reports of cross-border exports of plantains to southern Sudan. There is significant cross-border exports of maize and beans to Kenya, Rwanda, and Sudan. In addition to the small but growing exports of maize, Uganda, the World Food Programme has been buying maize for distribution as food aid in northern Uganda, Sudan, and Ethiopia.

Maize prices in Uganda are generally higher, more seasonal, and more volatile than the SAFEX price in South Africa and the US yellow maize price. Although maize markets within Uganda are integrated with each other, they are not integrated with international prices. This is to be expected given the lack of international trade in maize, with the exception of cross-border trade. On the other hand, rice prices in Uganda do not show a strong seasonality and seem to be linked to international rice prices. This is not surprising given that 42% of local rice supplies are imported.

Ugandan policy with regard to staple foods is relatively non-interventionist. Perhaps because of the relatively minor importance of maize in Uganda compared to other countries in the region, maize prices are not a politically sensitive issue. Thus, there is little pressure for the government to stabilize maize prices through trade restrictions and operations by a marketing board. Indeed, the government has explicitly stated its interest in becoming a local supplier of food, particularly maize and beans.

During the global food crisis of 2007-2008, food prices rose significantly in Uganda. Rice and wheat prices appear to be driven up by higher prices on international markets. However, the price of maize and beans were probably more influenced by the post-election violence and poor rainfall in Kenya, which affected agricultural production there and increased the demand for food exports from Uganda. In addition, an increase in food demand from Sudan is said to have put upward pressure on Ugandan prices.

6.3 Kenya[8]

Kenya has a somewhat higher income and a relatively large manufacturing and services sector compared to its neighbors in the region. As a result, the share of agriculture in GDP is relatively low, 21%. Achieving productivity growth in staple crops is likely to be necessary but not sufficient for broad-based and pro-poor agricultural growth in Kenya.

Maize is the most important staple food in Kenya, accounting for 36% of caloric intake. Wheat and beans are also important staples, contributing 9% and 5% respectively to the total. These figures indicate a relatively diversified diet compared to other countries in the region, which is partly a reflection of the higher income. Wheat and rice are preferred staples, consumed disproportionately among urban and high-income households.

Food imports are becoming increasingly important in Kenya. The country is largely self-sufficient in maize, though there are cross-border imports from Uganda and Tanzania, as well as imports from South Africa. Impediments to regional maize trade make it easier for large millers and traders to source maize from international markets rather than from smallholder farmers in neighboring countries. Wheat and rice are mainly imported

[8] This section is based on Ariga, Jayne, and Njukia (2009).

commodities, with imports contributing 63% and 87% of domestic requirements in recent years. Domestic wheat production is carried out primarily by large-scale commercial farmers. Because of rising income and urbanization, preferences are slowly shifting toward rice and wheat, suggesting that grain imports are likely to grow over time.

The real price of maize in Kenya has declined markedly since 1995 as the NCPB has partially withdrawn from the maize market. However, real prices of maize, wheat and almost all other crops rose dramatically with the world food crisis of 2007-08 and Kenya's particular food crisis in 2008-09. While food prices in world markets peaked in July 2008 and started declining thereafter, food prices in Kenya started skyrocketing in mid-2008 and exceeded the import parity price for much of 2009. This mainly reflects policy decisions to maintain a 50% tariff on maize imports long after the need for major grain imports was realized in mid-2008.

In the period between 1995 and 2005, the NCPB's activities were found to reduce the standard deviation and coefficient of variation of market prices, consistent with its stated mandate of price stabilization. It has successfully raised market prices in bumper crop years and exerted downward pressure on market prices in drought years (with the notable exception of 2008-09), mainly through its price setting operations. The treasury costs of the NCPB maize trading account in recent years are not immediately available but in the controlled marketing period of the late 1980s, they were estimated at roughly 5% of Kenya's GDP.

Maize productivity growth will remain a crucial objective. If it can be achieved, it will reduce import dependence and remain a source of dynamism and growth for both rural and urban areas in the region. For farms that satisfy the joint conditions of being located in agro-ecologically suitable areas and cultivating enough land to overcome relatively low returns per unit of land, maize will remain a dominant cash crop, as for many of the farms in districts such as Trans Nzoia, Uasin Gishu, Lugari, and Nandi. For farmers in most other areas (the majority of which are purchasers of maize), lower costs of acquiring maize will encourage the commercialization of smallholder agriculture toward higher-valued commodities – a major source of productivity growth.

6.4 Tanzania[9]

The main staple foods in Tanzania are maize (33% of caloric intake) and cassava (13%), with rice, sorghum, and wheat playing smaller roles. Rice and wheat are preferred staples, being disproportionately important in urban areas and among high-income households.

Tanzania is essentially self-sufficient in maize, although there are occasional cross-border exports from the main surplus zone in the southern highlands to northern Zambia and Malawi. There is little or no trade in cassava and sorghum. On the other hand, the country relies on imports for 8% of its rice and 91% of its wheat requirements.

Over the last five years, there does not appear to be a very close connection between world prices and domestic markets for maize, sorghum, and rice. This is not surprising in the case of maize and sorghum, since there is little international trade, but it is somewhat surprising in the case of rice. One hypothesis is that administrative procedures required for rice imports make it difficult for importers to take advantage of arbitrage opportunities.

[9] This section is based on Minot (2009b).

On the other hand, food prices in different markets of Tanzania do appear to move together in response to weather-related supply shocks. Price seasonality is what would be expected given the harvest schedule, though there is considerable variation from year to year. Price differences between markets also follow expectations, with the surplus regions having the lowest prices and deficit regions having the highest prices. There is some evidence that spatial margins declined over the reform period, presumably due to improved competition, though food price volatility may have increased. A more in-depth analysis would be required to test whether the spatial margins and seasonal differences correspond to marketing and storage costs, respectively.

Food policy in Tanzania is largely liberalized, with most of the state enterprises and cooperatives created in the 1960s and 1970s dismantled or reduced in size and mandate. The country does maintain a strategic grain reserve, but the annual transactions are small relative to the volumes of grains marketed. One significant intervention in staple food markets is the frequent bans on maize exports, significantly limiting the ability of maize surpluses in the southern highlands from being exported to deficit zones in northern Malawi and Zambia. Another important intervention is a large voucher scheme recently launched, which will provide subsidized fertilizer and seed to a significant share of Tanzanian farmers.

6.5 Zambia[10]

Maize is by far the most important staple food in the diet of Zambian consumers, accounting for 57% of caloric intake. This percentage is the highest among the seven eastern and southern African countries being examined here. Cassava and wheat are also important staples, contributing 13% and 7% of caloric intake, respectively. Wheat is a preferred staple and is consumed disproportionately by urban and high-income households.

Zambia is mainly self-sufficient in maize, but it imports about 5% of its requirements on average. There is virtually no recorded international trade in cassava, presumably due to the low value-bulk ratio and the perishability of the fresh root. Zambia imports 38% of its wheat requirements, the remainder being produced locally, primarily by large-scale commercial farmers.

Volatility in maize production and in maize prices drives food policy in Zambia. Following an initial liberalization of maize markets in the early 1990's, following the bankruptcy of the government marketing parastatal NAMBOARD, the Zambian government has gradually resumed a larger and larger role in maize markets. Government also routinely controls maize and wheat imports and exports through quantitative restrictions imposed under the Control of Good Act. Cassava, however, remains largely unregulated.

As an intermittent surplus producer and periodic importer of maize, Zambia would seem poised to benefit from regional trade opportunities, as an exporter in some years and an importer in others. Unpredictable policies (in particular, uncertainties over import quotas, tariffs and FRA release prices) have discouraged private maize trade. This, in turn, has reinforced government suspicion that they cannot rely on private traders to supply food markets during crisis years, a sentiment that has fueled the renewed dominance of the FRA and government trade controls. This mutual caution and mistrust, between government and private traders, has resulted in periods (such as 2002 and 2003) when domestic maize prices

[10] This section is based on Chapoto et al (2009).

have exceeded import parity. As a result, Zambian food prices have fluctuated more than necessary in some years.

In the medium run, price moderation through regional trade will require improved efficiency among marketing agents as well as transparent and predictable policy signals. Over the long run, consumption diversification out of maize and into wheat and cassava-based foods, feeds and beverages will tend to reduce Zambia's current vulnerability to its erratic maize harvests, policies and maize prices.

6.6 Malawi[11]

Maize is overwhelming the most important staple food in Malawi. It accounts for 54% of the caloric intake, a close second behind Zambia among the seven countries examined here. Cassava and sweet potatoes each contribute 7-8% of caloric intake.

Malawi is an occasional importer and exporter of maize, though the volumes are less than 6% of production on average. Until recently, Malawi imported maize regularly from northern Mozambique. In recent years, large harvests have allowed government-to-government exports of maize to Zimbabwe and other countries in the region. There is virtually no recorded trade in cassava and sweet potatoes, probably because of the low value-bulk ratio of these crops.

The agricultural economy of Malawi has four characteristics that make managing food prices particularly difficult. First, the diet is heavily dependent on maize, this commodity accounting for over half of the caloric intake. This means that food security is closely tied to the harvest of one crop. Second, Malawi is landlocked, so imports and exports face high costs of transport. This creates a wide band between import and export parity prices within which domestic prices can fluctuate, although cross-border trade with Tanzania and Mozambique lowers the effective import parity price to some degree. Third, the unimodal rainfall pattern means that the seasonal fluctuation in prices is greater than in some other countries in the region such as Kenya and Uganda. And fourth, the high population density, small farms, and low level of income of farmers, even by African standards, mean that many rural households are one bad harvest away from hunger and deprivation. As a result, maize price volatility is higher in Malawi than elsewhere in the region, and the volatility has serious implications for food security.

Studies of market integration in Malawi suggest that 1) market liberalization has improved the degree of integration between major towns in the country, 2) the major towns are integrated with each other with relatively rapid adjustment, suggesting functioning markets, and 3) smaller and more remote town remain disconnected from national markets.

The evolution of food policy in Malawi reveals a somewhat erratic process of market liberalization. ADMARC lost its monopoly over grain trade in 1989 and it role in enforcing a price band in 2000, but the monopoly was temporarily restored in response to the food crisis of 2007-08. Similarly, food price controls were eliminated in the 1980s but reinstated in 2008 (though not fully enforced). Fertilizer policy has also experience numerous changes and reversals.

The fertilizer subsidy program has been credited with four consecutive bumper harvests in maize (2006-09). Critics point out that it has largely displaced the private distribution

[11] This section is based on Minot (2009a).

network, that the costs may be unsustainable, and that the 2007 harvest was probably overestimated, but it is popular in the country and is being adopted by a number of other African countries.

On the other hand, the parallel commercial operations of traders and the government have created problems. In 2001, the sale of subsidized maize and the plans for public-sector maize imports inhibited private imports, creating a serious shortage when ADMARC stocked out and government imports were delayed. In 2004, fertilizer imports were stalled by a when government plans to launch the new subsidy program were delayed and scaled back. Experience suggests that private traders can play a useful role in importing maize during shortages, thus putting a ceiling on maize prices, but only if they can be reassured they will not be competing with subsidized government imports. One the main challenges facing policymakers in Malawi is to design a framework for public sector intervention in food markets which is flexible enough to allow it to respond to emergencies, yet limited, transparent, and predictable enough to provide the private sector with a business environment that will favor trade, storage, and marketing investment.

6.7 Mozambique[12]

Unique among the seven countries under consideration, cassava is the most important staple crop in Mozambique, accounting for 36% of the caloric intake of the average consumer. It is followed closely by maize, which contributes 24% of the total. Wheat and rice account for 7% each, though, being preferred staples, their importance is greater in urban areas and among high-income households.

Mozambique imports about 12% of its maize consumption requirements, while also exporting about 12% of its maize production. This apparent contradiction is explained by regional differences within the country. Northern Mozambique is a surplus maize area, with occasional cross-border exports to Malawi. In contrast, southern Mozambique is a maize deficit zone, relying on local supplies during the local harvest season and relying on imports from South Africa in the off-season.

There is virtually no recorded trade in cassava. It is mainly produced in the north and center of the country. Farmers there consider maize to be a cash crop, while producing cassava for home consumption. Wheat and rice are largely imported commodities. Virtually all (99%) of the country's wheat requirements are imported, while about two thirds of its rice is imported.

Mozambican consumers show a willingness to shift among the basic consumption staples according to relative prices, both in urban and rural areas. That flexibility helps to cushion world price shocks, where locally produced cassava is available, but in the southern provinces, where most staples are imported, high world prices have strong effects on urban consumers.

Mozambique has been committed to open borders, allowing exports to neighboring countries, resulting in maize prices in northern Mozambique that are closely tied to those in southern Malawi. If Malawi or other neighbors close their borders to trade, there may be possible actions from the Mozambican side to limit trade as well, negatively affecting Mozambican producers and traders in the surplus zones of the north. Food price

[12] This section is based on Donovan and Tostao (2009).

movements in southern Mozambique are not closely related to those in northern Mozambique, but they do follow price changes in South Africa.

Overall, staple food price volatility in Mozambique tends to be less than in neighboring countries, but increased price problems can be expected if regional trade policies remain in flux and if agricultural subsidy programs are used for short term gains in production without sufficient investments in agricultural marketing.

Government investments in roads and other infrastructure will need to continue with strong support from donors to enable trading systems to operate efficiently and to encourage the entrance of new agents in trading and processing. Analysis of prices indicates increasing market integration among markets in the country, as well as with markets in the region. Farmers will need to develop more productive crop management systems, and will need to adapt as climate challenges increase to avoid increasing risks and price volatility. This requires also public and private sector support for technology development and diffusion. It remains to be seen if government direct investment in storage facilities and in food reserve stocks will provide a solid basis for food security and have any impact on seasonal price fluctuations.

7 Policy implications

What do the findings described in this paper mean for the design of effective policies and programs to improve food market efficiency and reduce spatial and temporal variation in staple food prices? This section begins with an overview of the criteria for government intervention, based on the discussion in Section 2. Then we consider policies to reduce spatial price variation, based on the results from Section 3. Next, there is an assessment of policies for reducing vulnerability to volatility in world prices, based on the results from Section 4. Finally, we consider the policy implications for reducing temporal variation in staple food prices, that is, food price volatility, based on Section 5.

7.1 Criteria for government intervention

Under what conditions is government intervention justified? Government intervention may be able to improve the performance of markets if there are market failures, defined as distortions in markets which make them work sub-optimally. If farmers and/or traders do not have good information about market conditions, they will be unable to make informed decisions, reducing market performance. Mobile phone technology has probably increased the flow of market information, but farmers still lack access to information they need, particularly in more remote areas of sub-Saharan Africa. Even with perfect information, it is possible for markets to be distorted if traders are able to collude in setting prices. When this happens, trader margins are larger than necessary, which reduces producer prices and raises consumer prices. As discussed below, many studies show that that price differences are largely explained by transportation costs and normal profits. In cases where trader profits appear large, it is difficult to know whether this reflects non-competitive markets or a large risk premium associated with working in an unpredictable environment.

In addition, government intervention may be justified on equity grounds. Even perfectly functioning food markets will not necessary deliver food to households who need it but lack the necessary purchasing power. This problem is particularly acute in cases of natural or manmade disaster.

However, government interventions must be designed taking into account the limitations of public sector institutions. This means focusing food policy efforts on 1) promoting transparent and competitive food markets through market information systems, standardized weights and measures, and grades and standards, 2) investing in public goods infrastructure such as roads, the rail network, market places, the legal system, and agricultural research, and 3) establishing a safety net system that addresses chronic poverty as well an emergency relief system for natural disasters. Below, we discuss policy implications for reducing spatial and temporal variability in staple food prices.

7.2 Implications for policies to reduce spatial variation in staple food prices

Based on the review of spatial variation in staple food prices (Rashid and Minot, 2009), what are the policies and investments that will make agricultural markets more efficient? It should be noted that none of the studies reviewed provide a cost-benefit analysis that would be needed to demonstrate beyond a doubt the value of these measures. However, they do provide information on the types of policies that would reduce marketing costs and further integrate markets. Rashid and Minot (2009) identify the following policy implications:

- Continue the process of agricultural market liberalization. Five of the seven studies examining this issue concluded that agricultural market liberalization had improved spatial market integration or reduced marketing margins.
- Streamline administrative border procedures. One of the most comprehensive studies of the transport sector in sub-Saharan Africa concluded that administrative barriers are at least as important an obstacle as poor roads, particularly in West and Central Africa. One such step would be to explore the feasibility of regional or continent-wide uniform truck registration.
- Promote competition in the transport industries. Marketing costs are lower in countries and regions where the demand for transport services is dense, leading to more competition. Competition can be promoted by reducing administrative and regulatory barriers to entry into the transport industry and eliminating protection for local trucking companies.
- Improve market information, particularly with the use of information and communication technology. Strong evidence from Niger suggests that mobile phones can improve market efficiency, and economic theory supports the government support in the provision of public goods such as market information.
- Strengthen institutions that facilitate contract enforcement. The objective could be pursued by a) establishing small-claims courts, b) establishing a commercial code of conduct and peer-review mechanisms, or c) promoting mediation through trader associations.
- Improve transportation infrastructure. This is less important where there are still high administrative and policy barriers to trade, but becomes more important as these barriers are reduced or eliminated.
- Make government intervention in staple food markets predictable and modest. Any government intervention creates some uncertainty, but this can be minimized by adopting rule-based interventions, such as price-triggers for purchase and sale

operations. Transparency about public stocks and planned interventions would also be useful.

- Reduce barriers to international and cross-border grain imports. Sharp price hikes in Ethiopia, Kenya, and Malawi could have been avoided by reducing barriers to food imports by private traders.
- Seek regional agreements to limit food export bans. Many African countries implemented food export bans during the 2007-08 food crisis. These policies were not successful in keeping food prices down and exacerbated the crisis in landlocked countries. Although it is politically difficult for an individual country to allow food exports when prices are high, African countries have a collective interest in maintaining open borders. For this reason, this policy objective needs to be tackled at a regional level.

These measures will not eliminate spatial variation in prices (nor would this be desirable in any case), but they would reduce transport costs and possibly trader profits, thus shrinking the gap between the price farmers receive for staple food crops and the price consumers pay for them.

7.3 Implications for policies to reduce vulnerability to world food price volatility

The global food crisis of 2007-08 has understandably shaken confidence in the stability and reliability of world food markets. In many countries, it has sparked renewed interest in food self-sufficiency, trade barriers, and strategic grain reserves.

Minot (2009c) concluded that the international prices of food grains do have an impact on African markets for rice, wheat, and (to a lesser degree) maize, but the effect is usually swamped by influence of weather-related domestic supply shocks. The spike in world prices in 2007-08 was more clearly transmitted to African markets, partly because it was a large shock, partly because it was accompanied by sharply higher transportation costs, and partly because many African countries attempted to ban grain exports in response to the emerging crisis, thus exacerbating food price increases in landlocked countries.

In light of these findings, an obvious question is: how can African countries reduce vulnerability to fluctuations in world food prices? The simplest answer is staple food self-sufficiency, but how is this to be achieved. One approach would be to invest in agricultural research, extension, disease control, and methods for reducing post-harvest losses. Based on numerous studies of the returns to agricultural research, this would probably be a good investment regardless of the net trade position of the country in staple foods and regardless of whether it succeeded in achieving self-sufficiency. But it would be a long-term strategy, which limits its appeal in the political arena. The likelihood of success varies by crop: for maize, it would be feasible given that most African countries are 90-95% self-sufficient in maize already. For rice and wheat, the rate of self-sufficiency could be increased, but, for most eastern and southern African countries, yield improvements alone are not likely to be enough to reach self-sufficiency[13].

Another approach, probably more appealing in the short term, is to restrict imports through tariffs, quotas, or a full-scale import ban. If enforceable, these policies will increase the rate

[13] Madagascar and Tanzania import less than 10% of their rice requirements, so rice self-sufficiency is a feasible target there.

of "self-sufficiency" quickly at no cost to the government, but it would raise the price of staple foods significantly, probably above the levels experienced during the global food crisis. Since rice and wheat imports continued during this period, the "self-sufficiency" price must be still higher. This means that avoiding vulnerability to a spike in world grain prices like the one in 2007-08 could require keeping grain prices at or above that level permanently. Clearly, this would have serious adverse effects on food security, particularly among the urban poor.

In addition, staple food self-sufficiency would not eliminate food price volatility; rather it will decrease volatility due to international markets but increase volatility due to domestic supply shocks. The key question is whether price volatility due to domestic supply shocks would be greater or less than volatility due to international grain markets. Although more in-depth analysis would require trade modeling beyond the scope of this study, several pieces of evidence suggest that price volatility[14] due to domestic supply shocks is as large or larger than volatility due to international markets:

- The price of maize in South African commodity markets is more stable than the price of maize in most other sub-Saharan African countries.
- The import parity price of maize in sub-Saharan Africa is more stable than the domestic price of maize in most sub-Saharan African countries.
- In markets of sub-Saharan Africa, the price of rice (a largely tradable grain) is more stable than the price of maize (a largely non-tradable grain).

As discussed above, the global food crisis was exacerbated when several major exporters restricted grain exports in response to the rising prices[15]. As food-importers, the countries of sub-Saharan Africa have a strong interest in limiting this kind of behavior. One way to do this would be to lobby the World Trade Organization and other international bodies to limit food export restrictions as part of multi-lateral trade agreements.

Similarly, the effects of another spike in world food prices could be ameliorated if African countries themselves were able to restrain from banning grain exports whenever prices rise. Although these bans are understandable from the perspective of an individual country, the combined effect of many countries doing this is to exacerbate the price spike, particularly for landlocked and food-importing countries. Given this situation, the implication is that any effort to prevent food export bans would have to be carried out at the regional level rather than at the national level. In addition, an effort by African countries to discipline food export restrictions at the global level would be more persuasive if these countries were undertaking similar measures at the regional level.

The experience of Ethiopia, Malawi, and other countries indicates that grain prices occasionally exceed the import parity price because of 1) the rationing of foreign exchange to prevent depreciation of the currency, 2) the inability of traders to obtain food import permits, and 3) uncertainty regarding the government's intentions regarding food imports. The policy implications are as follows:

[14] Here, price volatility is measured by the coefficient of variation, equal to the standard deviation divided by the mean.

[15] This was the case for Argentina, Russia, and the Ukraine in wheat and India and Vietnam in rice.

- Either allow the currency to depreciate in order to avoid foreign exchange shortages that constrain food importers or (as a second-best solution) give priority to food imports in rationing foreign currency.
- Remove the requirement that importers obtain permits to import food grains, although they should be required to register the order for data collection and transparency purposes.
- Governments need to provide a clear and predictable environment for traders to make decisions. One approach would be for the government to withdraw from the business of trading in food grains. If this is not politically feasible, the government needs to be as transparent as possible in its trading decisions. Subsidized sales of grain by the government should be targeted to poor and vulnerable groups rather than made available to, for example, all urban consumers.

In the longer term, African governments can promote resilience to volatility in international grain prices by diversifying the staple foods diet of consumers. During the global food crisis, the domestic prices of cassava, sweet potatoes, and other non-tradable staple foods rose much less than the prices of rice, wheat, and maize. Having a diversified diet allows households to substitute toward less expensive staples when the price of one of them rises. Staple crop diversification can be promoted on the production side by investing in cassava and other root crops, particularly in the areas of developing disease-resistant varieties and distributing improved planting materials. On the consumption side, efforts to develop and disseminate methods for processing root crops and non-tradable grains to increase shelf-life and make food preparation easier.

7.4 Implications for policies to reduce volatility in staple food prices

The results of Chapoto and Jayne (2009) are summarized above. In this section, the policy implications of that study are presented. The authors argue that a "maize without borders" policy may be an important part of overall maize government policy that has a potential to considerably stabilize maize price for both consumers and producers. Open border policies protect domestic food markets against domestic shocks by allowing more food to be imported in times of shortage and exported in times of plenty. This study shows that more active intervention in maize markets has not helped Malawi, Zambia, Kenya, Malawi and Tanzania because trade barriers and changes in government policy tend to exacerbate price unpredictability. This has an effect of dampening investment in the maize sector. Embracing open border policies and relying on regional trade to stabilize maize prices could be a win-win situation in terms of both efficiency and price instability.

This does not mean that governments have no role to play in maize markets; indeed, they have an important role in providing market information, promoting competition, investing in physical infrastructure and other public goods, encouraging diversification of food consumption patterns, and improving rural financial markets to improve the capacity of traders.

For example, efficient regional trade depends on the long-run development of key infrastructure, especially better road connections. In the short to medium term, however, policy and institutional changes can facilitate regional trade by becoming more rules-based, setting clear criteria for when changes in tariff rates or trade barriers will be instituted, and preferably reducing trade restrictions and cross-border trade barriers, both regulatory (e.g.,

phytosanitary standards) and bureaucratic (e.g., border crossing documentation).

Given that governments in eastern and southern Africa are likely to continue intervening in food markets, promoting more "rules based" approaches to marketing and trade policy may reduce the level of policy uncertainty and the price instability associated with it. Greater policy stability may also contribute to broader grain market development. Predictable and transparent rules governing state involvement in the markets would reduce market risks and enable greater coordination between private and public decisions in the market. For the most part, addressing problems of policy uncertainty involve very little cost per se, but do require greater coordination and more efficient management of government operations. However, policy makers may feel that rules-based and non-discretionary marketing and trade policies entail a loss of control and autonomy – leaders are bound to act according to pre-defined rules and triggers. Successfully addressing these dilemmas may lie at the heart of efforts to move to a new post-liberalization system in which governments retain the ability to influence prices to achieve national food security objectives but within a clear and transparent framework of credible commitment to support long run private investment in the development of markets.

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