ARE STAPLE FOODS BECOMING MORE EXPENSIVE FOR URBAN CONSUMERS IN EASTERN AND SOUTHERN AFRICA? TRENDS IN FOOD PRICES, MARKETING MARGINS, AND WAGE RATES IN KENYA, MALAWI, MOZAMBIQUE, AND ZAMBIA

Nicole Mason, T.S. Jayne, Cynthia Donovan and Antony Chapoto

Department of Agricultural, Food, and Resource Economics
Michigan State University

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ABSTRACT

The world food and financial crises threaten to undermine the real incomes of urban consumers in eastern and southern Africa. This study investigates patterns in staple food prices, wage rates, and marketing margins for urban consumers in Kenya, Malawi, Mozambique, and Zambia between 1993 and 2009. There is high correlation among wage rate series for various government and private sector categories. We find that average formal sector wages rose at a faster rate than retail maize meal and bread prices in urban Kenya and Zambia between the mid-1990s and 2007. Although the 2007/8 food price crisis partially reversed this trend, the quantities of staple foods affordable per daily wage in urban Kenya and Zambia during the 2008/9 marketing season were still roughly double their levels of the mid-1990s. The national minimum wage in Mozambique also grew more rapidly than rice and wheat flour prices in Maputo from the mid-1990s through the 2004/5 and 2006/7 marketing seasons, respectively. During the 2008/9 marketing season, Maputo minimum wage earners' rice and wheat flour purchasing power was still higher than in the mid-1990s and roughly similar to levels at the millennium. These findings obtain for formal sector wage earners in Kenya and Zambia and minimum wage earners in Mozambique only. The majority of the urban labor force in these countries is employed in the informal sector; therefore, the general conclusion of improved food purchasing power over the past 15 years may not hold for a significant portion of urban workers. Maize marketing margins trended downward between 1994 and 2004 in urban Kenya, Malawi, and Zambia, while wheat marketing margins declined only in Zambia. For the public sector, important strategies for keeping food prices at tolerable levels include strengthening and improving crop forecasting and the food balance sheet approach for estimating need for imports, facilitating imports in a timely manner when needed, and ensuring the continued availability of low-cost staple food options for urban consumers through small-scale processing and marketing channels.

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1. Introduction

The food price crisis of 2007/8 and the current global financial crisis are straining economies around the world including those in eastern and southern Africa (ESA). Although world commodity prices began to decline in mid-2008, domestic staple food prices in several ESA countries have remained high well into 2009. ESA countries are urbanizing rapidly and the urban poor are particularly vulnerable to both the food and financial/economic crises: high food prices decrease their purchasing power, as most urban consumers rely on markets to access food, and reductions in employment and wages as a result of the financial and economic crises could further undermine their real incomes (Baker, 2008).

Social unrest in more than 30 countries during the 2007/8 food crisis underscores the importance of effective government, donor, and civil society responses to mitigate the impacts of such shocks on urban populations (von Braun et al., 2008). This paper investigates historical patterns in staple food prices, wage rates, and marketing margins for urban consumers in Kenya, Malawi, Mozambique, and Zambia, with a special focus on the 2007/8 food crisis, and discusses the implications of the empirical findings for policy options to shield the urban poor from the potential adverse effects of future staple food price increases.

An important determinant of how food price increases affect urban consumers in ESA is the extent to which formal and informal sector wages adjust to compensate for higher food prices. Therefore, the first objective of this paper is to determine, for urban centers in Kenya, Mozambique and Zambia, if key staple foods are becoming more or less expensive for urban wage earners by tracking movements in the retail prices of maize, wheat and cassava products, and rice relative to wage rates. A key limitation of this part of our analysis is that, due to data constraints, we are only able to track staple food prices relative to national minimum wage rates in Mozambique and relative to formal sector wages in Zambia and Kenya. No wage rate time series is available for Malawi and informal sector wage data are not available for any of the four countries. Our analysis, therefore, does not capture the subset of the labor force that earns wages in the informal sector, nor workers whose livelihoods depend on informal business activities.[1]

Our second objective in this paper is to determine if vertical marketing margins for maize and wheat products have declined in the various urban centers. Reducing vertical marketing margins through increased competition and efficiency can be a major means of improving the affordability of food for urban consumers. While this was a major objective of market reform and liberalization, there has been very little empirical investigation of this issue across countries in the region.

[1] Labor force surveys indicate that the informal sector accounts for approximately two thirds to three quarters of the employed workforce in urban Kenya, Mozambique and Zambia (CTA, 2004; Kenya Central Bureau of Statistics, 2003; Zambia Central Statistical Office, 2007). In sub-Saharan Africa and developing countries in general, the majority of the poor rely on informal sector wage employment or business activities to earn a living (Guha-Khasnobis and Kanbur, 2006).

The third and final objective of the paper is to use the empirical findings to identify policy tools to protect urban consumers from future dramatic surges in food prices. The specific urban centers on which we focus are the capital cities of Kenya, Malawi, Mozambique and Zambia (Nairobi, Lilongwe, Maputo, and Lusaka), as well as Nampula in Northern Mozambique, Kitwe on the Zambian Copperbelt, and Mansa, a northern town in Zambia. These urban centers account for a significant proportion of the total urban populations in the respective countries (see Table A1 in the Appendix).

The paper is organized as follows: in Section 2, we provide background information on urban staple food consumption patterns and sources of urban staple food supplies in the four case study countries. Section 3 details the methods and data used in the analysis. Sections 4 through 6 present the results and Section 7 discusses the conclusions and policy recommendations that emerge from the empirical findings.

2. Background

2.1. Staple food consumption patterns

The four staple food commodities for which prices are analyzed in this paper are maize, wheat, rice and cassava. These items were selected because they account for a large proportion of households' overall food and staple food budgets in key urban centers in Kenya, Malawi, Mozambique and Zambia. The share of maize, wheat, rice and cassava in urban households' total value of food consumption ranges from 19.5% in Lusaka to 47.5% in urban Northern Mozambique (Table 1). The most recently available urban consumption survey data indicate that budget shares for wheat exceed those for maize in Nairobi, Lusaka, and Kitwe. In Maputo, wheat is also the dominant staple food item in value of consumption terms, followed by rice. Wheat has become a more important staple food budget item in both Maputo and Nairobi since the mid-1990s. In Mansa, maize has the largest staple food budget share, but wheat and cassava are also important. And among urban consumers in Northern Mozambique including Nampula city, cassava and potatoes are the largest staple food expenditure category. Information on staple food budget shares for urban consumers in Malawi is not available, but among all consumers (urban and rural) in that country, maize is by far the dominant staple food budget item.

Table 1. Staple food budget shares, urban centers in Kenya, Malawi, Mozambique and Zambia

Urban center/country	Year	% share of food group in total value of consumption of main staples[a]				% share of main staples in total value of food consumption
		Maize	Wheat	Rice	Cassava	
Nairobi, Kenya	1995	42.4	35.3	22.4	0.0	--
	2003	36.3	39.0	24.7	0.0	28.4
Malawi (urban & rural)	2004/5	83.1	5.0	5.5	6.4	42.1
Urban Maputo Province	1996	2.6	50.7	35.0	11.7	42.8
	2002	8.9	57.4	28.9	4.8	27.0
Urban Northern Mozambique (includes Nampula city)[b]	2002	32.6	8.2	14.7	44.4	47.5
Lusaka, Zambia[c]	2007/8	39.0	49.4	10.7	0.9	19.5
Kitwe, Zambia[c]	2007/8	42.5	45.3	10.3	2.0	23.2
Mansa, Zambia[c]	2007/8	45.8	28.2	10.0	16.0	23.8

Sources: Tschirley et al. (2006), Muyanga et al. (2005), CSO/FSRP 2007/8 Urban Consumption Survey, Zanias and Gunjal (2007), Barslund (2007), Ayieko et al. (2005). *Notes:* [a]Main staples refers to maize, wheat, rice and cassava. Budget shares of these four staple foods sum to 100% +/- 0.1%. Shares for Nairobi and Northern Mozambique are % of total food purchases. [b]Cassava and potatoes (separate figures for cassava only not available). [c]Excludes foods purchased and consumed away from home. -- Information not available.

2.2. Sources of urban staple food supplies

Supplies of maize, wheat, and rice products to urban consumers in Kenya, Malawi, Mozambique and Zambia come from both domestic production and imports. Domestic cassava production is sufficient to satisfy local demand in Malawi, Mozambique, and Zambia. Of all the marketed maize in Kenya, evidence suggests that approximately one half is from domestic production, while the other half is from Tanzania and Uganda. In years of large production shortfalls, the international market becomes more important, and may account for up to 25% of total marketed supplies. Wheat is produced in Kenya on large farms and meets about 50% of the country's wheat consumption needs; wheat is imported to fulfill the remaining needs, and most rice consumed in Kenya is imported.

In Malawi, about 50% and 10% of marketed maize supplies come from domestic smallholder and estate farms, respectively; the remaining 40% is imported mainly from Mozambique but also from Tanzania and Zambia. In drought years, maize is also imported from South Africa but informal regional trade is almost always the largest source of imported maize. Almost all wheat and rice consumed in Malawi is imported.

For Mozambique, almost all wheat is imported, although a wheat production promotion program is currently underway. There is substantial rice production in Mozambique, but most is consumed by producing households, leaving very little marketed surplus. For urban markets, the major source of rice is imports. Maize is mainly produced in the North and Center of the country. Production from the North supplies Nampula city and is also exported to Malawi. Maize supplies in Maputo come from domestic production in the Center region of the country and also from imports from South Africa.

In Zambia, marketed maize from domestic production is from both smallholder and large scale/commercial farms (approximately 50% each) (Jayne et al., 2006). Maize is both imported and exported in most years, and in good production years, exports exceed imports. In drought years, large quantities of imported maize are necessary to meet domestic consumption requirements. South Africa is the main source of imports, but imports from Tanzania and, historically, Zimbabwe, are also important (ibid). Most rice in Zambia comes from domestic production, although small quantities are imported in most years. Wheat is grown on commercial farms in Zambia and production levels increased dramatically over the last decade. Wheat imports were substantial from the mid-1990s to early 2000s, but the country is now nearing wheat self-sufficiency.

3. Methods and data

3.1. Methods

3.1.1. Quantities of staple foods affordable per daily wage

To address our first objective, which is to determine if key staple foods are becoming more or less expensive in the various ESA urban centers, we divide the average daily wage of workers in a given country by the nominal retail prices of maize grain, maize meal, bread or wheat flour, cassava flour and rice in each month from January 1993 through January 2009[2]. This gives us the physical quantity of each staple food affordable per daily wage. (Details on the specific wage and price data used in each country/urban center are provided in the Data section below.) To determine if there have been trends over time in the quantity of each staple affordable per daily wage, we graph these variables over time and look for patterns, and also use econometric analysis to test for statistically significant trends.

[2] Some data series begin later than January 1993. See Table A4 in the Appendix for details.

In the econometric analysis, we first test each quantity per daily wage time series ($kgwage_{ijt}$, where i indexes the staple food, j indexes the urban center, and t indexes time) for unit roots using various specifications of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests.[3] It is important to test for unit roots in this context because non-stationarity of the $kgwage_{ijt}$ time series could lead to incorrect statistical inferences about trends in the data. We find some evidence of unit roots in all of the $kgwage_{ijt}$ time series except for the quantity of cassava meal affordable per daily wage in Mansa (see Table A2 in the Appendix for results of the ADF and PP tests). For $kgwage_{ijt}$ time series with unit roots:

$$\Delta kgwage_{ijt} = kgwage_{ijt} - kgwage_{ijt-1} = \omega_{ij} + u_{ijt} \quad [1]$$

where ω_{ij} is the drift parameter (constant), which drives positive or negative trends over time, and u_{ijt} is the stochastic error term. In such cases, $kgwage_{ijt}$ is non-stationary but $\Delta kgwage_{ijt}$ is stationary (as confirmed by ADF and PP tests). Therefore, we estimate Eq. 1 with monthly data using Ordinary Least Squares and obtain estimates, $\hat{\omega}_{ij}$, which are interpreted as the expected month-to-month change (trend) in the quantity affordable per daily wage.[4] To allow for seasonal differences in the drift parameter, we also estimate

$$\Delta kgwage_{ijt} = \omega_{ij} + \sum_{m=1}^{11} \theta_{ijm} M_{mt} + u_{ijt} \quad [2]$$

where the M_m are monthly dummy variables. Now $\tilde{\omega}_{ij}$ is the drift parameter in the base month, and the drift parameter in month m is $\tilde{\omega}_{ij} + \tilde{\theta}_{ijm}$; we also compute the average monthly drift parameter, $\overline{\omega}_{ij}$. For $kgwage_{ijt}$ for which we find no evidence of unit roots, we use Feasible Generalized Least Squares to estimate

$$kgwage_{ijt} = \alpha_{ij} + \beta_{ij} time_t + \sum_{m=1}^{11} \gamma_{ijm} M_{mt} + \varepsilon_{ijt} \quad [3]$$

where *time* is a time trend and ε_{ijt} is the error term. The parameter estimate of interest is $\hat{\beta}_{ij}$, the linear trend (expected month-to-month change) in the quantity of a given staple food affordable per daily wage.

Conventional tests for unit roots have notoriously low power and so failure to reject the null hypothesis in the various ADF and PP tests may be due to this low power rather than to unit roots in $kgwage_{ijt}$ per se. Furthermore, as indicated by Perron (1989) and others, standard tests will fail to reject the null hypothesis of a unit root if the data generating process is characterized by stationary fluctuations around a trend function with one or more structural breaks. We do not allow for structural breaks in our ADF or PP tests and this may be another reason why we fail to reject the null hypothesis of unit roots for most of the $kgwage_{ijt}$ time series.[5] Therefore, for $kgwage_{ijt}$ for which standard ADF and PP tests suggest unit root behavior, we also estimate Eq. 3 and look for consistency in the inferences drawn about changes over time in the quantity affordable per daily wage. Due to space constraints, we report only one set of estimates for each $kgwage_{ijt}$ (those based on Eq. 3 for cassava flour in Mansa, and those based on Eq. 2 for all others) but briefly discuss the other sets of estimates.

[3] Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) tests were also conducted for time series containing no gaps, and inferences drawn from the ADF, KPSS, and PP tests were largely consistent. KPSS tests could not be performed for time series with gaps.

[4] In these regressions, we add sufficient lags of $\Delta kgwage_{ijt}$ to eliminate autocorrelation in the u_{ijt}

[5] The frequent policy changes and weather shocks during the period of analysis make it difficult to adequately model all structural changes and shocks.

Time series data on wages are not available for Malawi so we analyze trends in real retail maize product and bread prices instead of trends in the quantities affordable per daily wage. No evidence of unit roots is found in these variables (Table A2 in the Appendix), so trends are estimated based on Eq. 3, with the real staple food prices as the dependent variables.

3.1.2. Marketing margins

To address our second objective, which is to determine if vertical marketing margins for maize and wheat products have declined over time, we first compute the nominal price spread, MM_{kjt}^{maize}, between maize meal and maize grain:

$$MM_{kjt}^{maize} = p_{kjt}^{meal} - p_{jt}^{grain*} \;,\; p_{jt}^{grain*} = z_k \, X \, p_{jt}^{grain} - [(z_k - 1) \, X \, p_{jt}^{byproduct}] \qquad [4]$$

where *j* indexes the urban center; *t* indexes time; p_{kjt}^{meal} is the retail maize meal price per kilogram; and p_{jt}^{grain*} is the wholesale or retail[6] maize grain price (p_{jt}^{grain}) after adjusting for z_k, the average number of kilograms of maize grain required to produce one kilogram of type *k* maize meal (*k*=breakfast meal, roller meal, or maize meal in general), and the value of the milling by-product (with $p_{jt}^{byproduct}$ denoting the per kilogram price of the milling by-product). Eq. 4 is per Traub and Jayne (2008) and following Jayne and Argwings-Kodhek (1997) (and due to the lack of by-product price data) we estimate $p_{jt}^{byproduct}$ as 40% of p_{jt}^{grain}.[7] For Zambia and Mozambique, where we have separate price series for different types of maize meal, *z* is set equal to 1.54 for breakfast meal/high quality maize meal and 1.18 for roller meal per Mwiinga et al. (2002). For Lilongwe and Nairobi, maize meal prices are average prices across all types of maize meal. We set *z* equal to 1.33 and 1.25 for maize meal in Lilongwe and Nairobi, respectively, because, on average, maize meal is more refined in Lilongwe than Nairobi.

Because of general inflation over time, nominal maize marketing margins also increase over time. To control for this, we use two different approaches. In one approach, we calculate the nominal maize meal-maize grain price spread (MM_{kjt}^{maize}) as a percentage of the retail maize meal price (and refer to this as the "percentage marketing margin"). In the second approach, we deflate MM_{kjt}^{maize} by the Consumer Price Index (CPI) (and refer to this as the "real marketing margin"). We compute the marketing margins in both real and percentage terms to test the robustness of trends in the marketing margins to alternative definitions of the margin. However, the CPIs used to calculate the real marketing margins are based on both food and non-food prices. (Non-food CPIs were not available for all countries.) Given that staple foods are important items in the basket of goods used to calculate the CPI, marketing margins deflated by the total CPI may be over- or underestimated in some periods. Therefore, we focus our discussion of the results mainly on the percentage marketing margins, which do not require adjustment for inflation, but briefly mention the findings based on the real marketing margins.

[6] For Lilongwe, Kitwe and Kasama, only retail (and no wholesale) maize grain price data are available. For these cities, the margin is computed between retail maize meal and retail maize grain prices; for Nairobi, Maputo, Nampula and Lusaka, the margin is computed between retail maize meal and wholesale maize grain prices.

[7] Traub and Jayne (2008) conducted sensitivity analyses and found that their results on trends in marketing margins were not sensitive to differing assumptions about extraction rates and the value of the milling by-product. We varied the value of by-product from 40% (per Jayne and Argwings-Kodhek, 1997) to 70% (per Traub and Jayne, 2008) of the maize grain price and inferences about trends in marketing margins are not sensitive to such changes.

For wheat products (bread in Zambia, Kenya and Malawi, and wheat flour in Mozambique), we first compute the nominal spread, MM_{ljt}^{wheat}, between the retail wheat product price and the world wheat price:

$$MM_{ljt}^{wheat} = p_{ljt}^{rwheat} - (v_l \, X \, p_t^{wwheat}) \quad [5]$$

where l indexes the wheat product (l=bread or wheat flour); p_{ljt}^{rwheat} is the retail price per loaf of bread or per kilogram of wheat flour; p_t^{wwheat} is the price in local currency units per kilogram of No.1 hard red winter wheat, ordinary protein, FOB Gulf of Mexico (the "world wheat price"); and v_l is the average number of kilograms of wheat required to produce one loaf of bread (v_1=0.649) or one kilogram of wheat flour (v_2=1.351). The v_l figures were obtained via interviews with millers and bakers in Lusaka. We focus on the margin between retail wheat products and the world wheat price due to the unavailability of domestic wholesale or producer level wheat price data and to the importance of wheat imports during the period of analysis in all four countries as discussed above. We adjust MM_{ljt}^{wheat} by the retail wheat product price to obtain the percentage wheat marketing margin, and by the CPI to obtain the real wheat marketing margin.

To determine if there have been trends over time in the various marketing margins, we use graphical and econometric analyses analogous to those described above for the quantity affordable per daily wage time series. The weight of the evidence from unit root tests suggests that the marketing margin time series are general mean or trend stationary (see Table A3 in the Appendix for the unit root test results). Therefore, we estimate equations similar to Eq. 3, with the various marketing margins as the dependent variables.

3.1.3. Summary

Table 2 summarizes the staple food price series and marketing margins studied in each urban center for the two different objectives and associated sets of methods described above. Data limitations prevent us from doing some aspects of the analysis for certain commodity/city pairs.

Table 2. Summary of staple foods price series and marketing margins analyzed in each urban center

	Quantities affordable per daily wage						Marketing margins		
Urban center	Maize grain	Maize meal	Bread	Wheat flour	Cassava flour	Rice	Retail maize meal/ maize grain	Retail bread/ world wheat	Retail wheat flour/ world wheat
Nairobi	X[a]	X					X		
Urban Kenya			X					X	
Lilongwe	X[b]	X[b]					X[c]		
Urban Malawi			X[b]					X	
Maputo	X	X		X		X	X		X
Nampula	X	X		X	X	X	X		X
Lusaka	X	X	X				X	X	
Kitwe	X	X					X[c]		
Mansa	X	X			X		X[c]		

Notes: X indicates that the analysis was done for the particular urban center/country. [a]No retail maize grain prices available; wholesale maize grain prices used in the analysis. [b]Wage data not available; trends in real retail prices analyzed instead of trends in quantities affordable per daily wage. [c]Margin is between retail maize grain and retail maize meal prices (no wholesale maize grain prices available); maize marketing margins in other urban centers are between wholesale maize grain and retail maize meal prices.

3.2. Data

Data sources and the price series used in the analysis for the various urban centers are summarized in Table A4 in the Appendix. All price series for Mozambique were converted to Metical Novo (MTN) equivalents prior to analysis. We analyze trends in wheat flour prices in Maputo and Nampula instead of bread prices.[8] Market wage rates for Mozambique are not available and the official minimum wage rates for formal industrial and agricultural sector employment are usually adjusted once per year, loosely based on the consumer price index and cost of a basic consumption basket. The industrial sector minimum wage is used in the analysis of the quantities of staple foods affordable per daily wage in Maputo and Nampula.

Formal sector wages for a number of groupings are available for both Kenya (public and private sector, which are further subdivided into 12 total categories) and Zambia (central government, local government, parastatals, and private sector). The various wage series in Kenya and Zambia are highly correlated within each country in levels ($0.627 \leq \rho \leq 0.999$) and all are statistically significant at $p \leq 0.05$. The correlation coefficients of first differences range from -0.336 to 0.997 (Tables A5-A8 in the Appendix). In our analysis of the quantities of various commodities affordable per daily wage, we use a weighted average daily wage across all (formal) sectors in each country, where the weights correspond to the share of total employment attributed to a given sector.[9] However, as a robustness check, we examine trends in the kilograms of maize grain affordable per daily wage for each of the four wage series in Zambia and for the average public sector and average private sector wage series in Kenya.

A final note on the data used in the analysis concerns the bread prices for Lusaka, Kenya and Malawi. These price data are per loaf of bread but the weight per loaf was not collected; we also do not have information on the ingredients used and how relative proportions of those ingredients may have changed over time. Therefore, results for the loaves of bread affordable per daily wage and for retail bread-to-world wheat marketing margins must be interpreted with caution.

4. Results: Trends in the quantities of staple foods affordable per daily wage

We begin this section with a brief description of the econometric results. The remainder of the section discusses the graphical analysis.

4.1. Regression results

Table 3 (columns A-C) summarizes the regression results for trends in the quantities of maize grain, maize meal, bread/wheat flour, rice and cassava flour affordable per daily wage in the various urban centers (under the maintained hypothesis that the time series contain unit roots, Eq. 2). The signs of all of the estimated average monthly drift parameters ($\overline{\omega}_{ij}$) are positive, but only three of 23 (bread in Kenya and Lusaka, and roller meal in Mansa) are statistically significant at the 10% level or lower

[8] Bread prices are controlled in Mozambique (but not in the other case study countries), and bakeries change the size of the loaf rather than the price in order to reflect higher or lower costs. Data are not available on monthly changes in flour used per loaf of bread.

[9] Formal sector wage data for Zambia were missing in some quarters; fitted values from a regression of the available wage data on a cubic function of time trends were used to approximate the missing wage data points. Daily wage rates for formal sector workers in Kenya were only available for June of each year. Estimates of these wages in other months were calculated by regressing the wages on a polynomial function of time trends, and using the fitted values from the regression as the approximate daily wage rate for each month in the period of analysis.

(Table 3, columns A and B). Trend estimates from models assuming stationarity (Eq. 3) are all positive as well and are statistically significant for 17 of the 23 quantity affordable per daily wage time series (the exceptions being maize meal and bread in Kenya, breakfast meal and rice in Maputo, and maize grain and roller meal in Nampula). None of the estimated coefficients in either the stationary or non-stationary estimations are negative and statistically significant, which would indicate a declining trend in affordability.

The estimated average monthly drift parameters ($\overline{\omega}_{ij}$ from Eq. 2) and the trend coefficients ($\hat{\beta}_{ij}$ from Eq. 3) are of roughly the same order of magnitude, and are larger for urban centers in Kenya and Zambia (where average formal sector wages are used) than for those in Mozambique (where the minimum wage is used). If we limit the regression analysis to observations through May 2007 only (i.e., to the period just before the food price crisis), the econometric evidence of positive trends in staple food purchasing power is even stronger: under the maintained hypothesis of unit roots, the drift parameters are positive and statistically significant for nine of the 23 quantity per daily wage time series; and under the maintained hypothesis of stationarity, 22 of 23 time series have statistically significant positive trends (the exception being breakfast meal in Maputo). As expected, the improvement in purchasing power over time is greater during this period than when including observations from June 2007 through January 2009, which coincided with dramatic food price spikes.

4.2. Comparisons of maize grain and wheat product affordability in Nairobi, Maputo and Lusaka

Figure 1 depicts the kilograms of maize grain affordable per daily wage in Nairobi, Lusaka, and Maputo. Note that wholesale maize grain prices were used for Nairobi and retail maize grain prices were used for Lusaka and Maputo. Formal sector workers in Nairobi and Lusaka can afford significantly more maize grain per daily wage (11-90 kg/day) than minimum wage earners in Maputo (1-9 kg/day). Although maize purchasing power among Maputo minimum wage earners appears relatively flat in Figure 1, in percentage terms, the increase in the average kilograms affordable per daily wage between the 1995/6 and 2006/7 marketing seasons is higher in Maputo (259%) than in Nairobi (183%) or Lusaka (150%) (Table 3, columns D and F). The quantity of maize grain affordable per daily wage in Nairobi and Lusaka is similar between 1994 and mid-2001 but Lusaka wage earners' purchasing power was significantly lower than that of their counterparts in Nairobi from mid-2001 to mid-2003 (a drought period for Zambia). Steep declines in purchasing power as a result of the food price crisis are evident in both Nairobi and Lusaka in 2007/8. Despite these declines, maize grain purchasing power in 2008/9 is still higher in all three capital cities than it was in mid-1990s and early 2000s (Table 3, columns D, E, and H).

Table 3. Summary of results: quantities of staple foods affordable per daily wage

Urban center	Quantity affordable per daily wage variable (units)	--------Based on regression results------ Estimated change in quantity affordable per daily wage from month-to-month		Estimated change in quantity affordable per daily wage after 12 months (Coef. x 12)	----------Based on observed data---------- Average quantity affordable per daily wage during each marketing season[c]					Obs.	Minimum quantity affordable per daily wage		Maximum quantity affordable per daily wage	
		Coef.[a]	p-value[b]		1995/6	2000/1	2006/7	2007/8	2008/9[d]		Quantity	Date	Quantity	Date
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
Nairobi	Maize grain (kg)	0.210	0.486	2.520	25.2	32.3	71.3	75.8	48.6	181	11.1	2/94	94.9	12/07
	Maize meal (kg)	0.062[e]	0.679	0.744	14.1	18.8	43.2	41.4	23.1	180	5.5	1/94	59.5	7/07
Kenya	Bread (loaves)	0.145*[e]	0.017	1.740*	15.9	28.2	41.1	37.4	36.6	164	14.2	1/95	42.0	10/06
Maputo	Maize grain (kg)	0.024	0.625	0.288	2.2	6.9	7.9	7.6	5.9	192	1.1	1/93	9.4	5/06
	Breakfast meal (kg)	0.011	0.602	0.132	1.4	4.0	3.3	3.2	3.2	153	1.2	1/94	4.6	4/01
	Wheat flour (kg)	0.014	0.290	0.168	1.2	2.7	3.9	3.2	2.7	190	0.9	3/96	4.4	4/07
	Rice (kg)	0.013	0.389	0.156	1.2	3.7	4.1	4.2	3.3	192	1.0	9/95	5.7	4/03
Nampula	Maize grain (kg)	0.002	0.986	0.024	4.3	13.5	12.2	10.4	7.4	190	2.3	2/96	16.3	6/01
	Roller meal (kg)	0.003	0.961	0.036	--	5.4	4.6	4.8	4.2	97	1.6	8/98	7.1	6/05
	Wheat flour (kg)	0.026	0.249	0.312	1.1	3.1	4.2	3.7	3.6	174	0.8	5/94	4.9	4/07
	Rice (kg)	0.016	0.424	0.192	1.1	3.1	4.4	3.9	2.7	192	0.7	1/95	5.1	5/03
	Cassava flour (kg)	0.059	0.222	0.708	2.4	4.8	7.0	8.1	7.9	193	1.1	2/95	10.6	5/05
Lusaka	Maize grain (kg)	0.162	0.633	1.944	20.0	33.3	50.0	67.7	61.4	173	12.5	3/98	78.0	7/08
	Breakfast meal (kg)	0.109	0.374	1.308	10.0	17.2	32.7	43.3	36.5	181	7.1	3/96	45.9	11/07
	Roller meal (kg)	0.236	0.292	2.832	11.9	23.0	48.7	58.7	48.2	181	8.1	3/96	67.1	8/07
	Bread (loaves)	0.128*	0.030	1.536*	6.8	9.2	17.3	22.5	22.0	181	4.4	3/94	23.8	1/08
Kitwe	Maize grain (kg)	0.311	0.445	3.732	23.1	33.0	64.9	74.3	64.0	174	11.9	3/95	96.6	7/07
	Breakfast meal (kg)	0.110	0.353	1.320	9.7	17.4	34.3	42.8	35.5	189	6.7	3/96	46.2	8/07
	Roller meal (kg)	0.181	0.369	2.172	11.2	21.2	49.3	60.2	48.5	185	8.3	3/96	74.2	8/07
Mansa	Maize grain (kg)	0.685[e]	0.219	8.220	26.2	37.4	64.1	67.6	69.6	178	11.9	2/95	97.7	8/06
	Breakfast meal (kg)	0.131	0.285	1.572	9.7	17.2	29.9	39.4	34.4	187	7.0	3/96	42.3	10/07
	Roller meal (kg)	0.263+	0.098	3.156+	11.8	19.4	40.7	53.9	47.8	186	7.5	4/96	60.4	9/07
	Cassava flour (kg)	0.233*[f]	0.043	2.796*	--	11.3	42.4	37.2	45.6	82	7.8	9/00	80.9	7/08

Source: Authors' calculations.

Notes: [a]Reported estimate is the average monthly drift parameter based on Eq. 2 unless otherwise noted. [b]p-value based on robust standard error. [c]July-June for Kenya; May-April for Mozambique and Zambia. [d]Through November/December 2008 or January 2009. [e]Monthly dummies not jointly significant at the 10% level; reported estimate is the drift parameter based on Eq. 1. [f]No evidence of non-stationarity. Reported estimate is the coefficient on the time trend from Eq. 3. **significant at the 1% level, *significant at the 5% level, +significant at the 10% level. --No observations

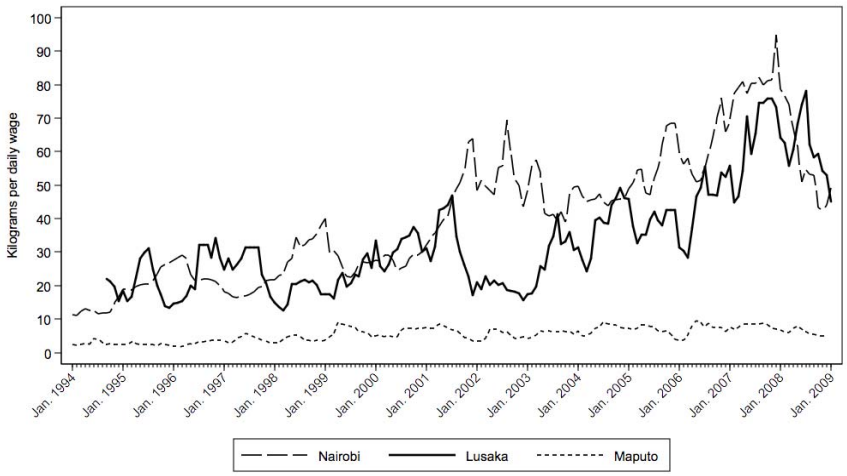

Figure 1. Kilograms of maize grain affordable per daily wage in Nairobi, Lusaka, and Maputo: January 1994-January 2009. *Sources:* MIC, KNBS, CSO, SIMA, GRM. *Notes:* Retail maize grain for Maputo and Lusaka; wholesale maize grain for Nairobi. Average formal sector daily wage used for Nairobi and Lusaka; industrial worker daily minimum wage used for Maputo.

Turning to wheat products, Figure 2 depicts the loaves of bread affordable per daily wage in Kenya and Lusaka, and the kilograms of wheat flour affordable per daily wage in Maputo. (Note that the y-axis for Maputo wheat flour is on the right.) Wheat product purchasing power increased in all three locations between the mid-1990s and 2006/7. Some of this increase can be attributed to increases in the quantity of world wheat affordable per daily wage (i.e., wages divided by the world price of wheat). While bread and wheat flour purchasing power declined sharply in 2007 in Kenya and Maputo, respectively, bread purchasing power in Lusaka between mid-2007 and January 2009 was relatively flat.

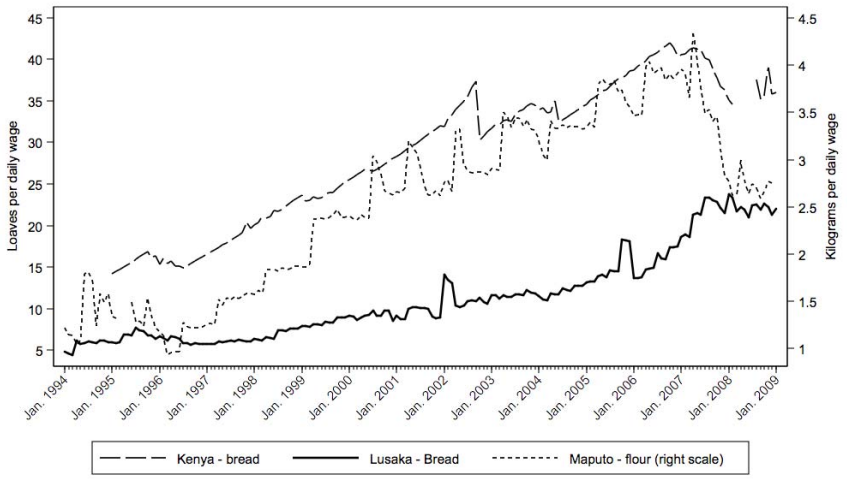

Figure 2. Loaves of bread affordable per daily wage in urban Kenya and Lusaka, and kilograms of wheat flour affordable per daily wage in Maputo: January 1994-January 2009. *Sources:* MTI, KNBS, CSO, SIMA, GRM. *Notes:* Average formal sector daily wage used for urban Kenya and Lusaka; industrial worker daily minimum wage used for Maputo.

4.3. Trends in staple foods affordable per daily wage in urban Kenya, Zambia and Mozambique

Formal sector wages rose more rapidly than wholesale maize grain and retail maize meal prices in Nairobi and bread prices in urban Kenya from 1994 until the 2007/2008 food crisis, as evidenced by the upward trajectory in the quantities of these commodities affordable per daily wage (Figure 3). Urban

consumer purchasing power for maize grain, maize meal and bread dropped off steeply in 2007/2008 but as of late 2008 was still significantly higher than purchasing power in the 1990s.

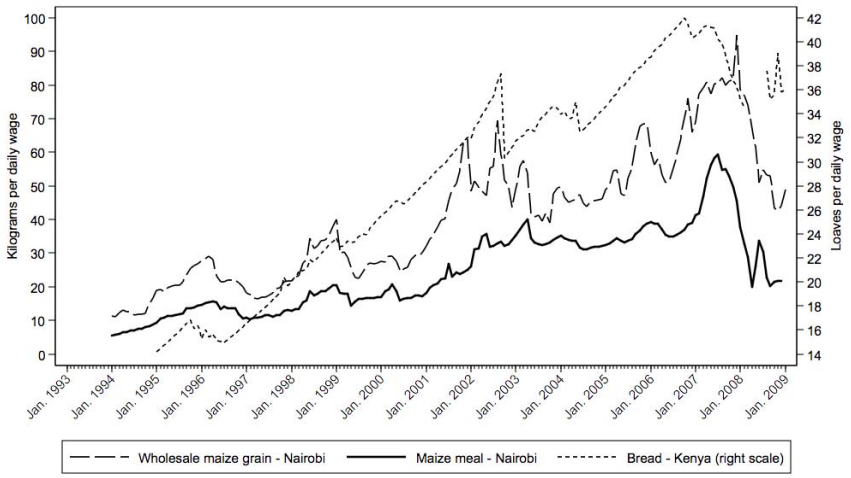

Figure 3. Kilograms of maize meal and maize grain affordable per daily wage in Nairobi, and loaves of bread affordable per daily wage in urban Kenya: January 1994-January 2009. *Sources:* MIC, MTI, KNBS.

Table 3 columns D through H show the average quantity of food affordable per daily wage at 5 different points in time over the sample period. In general, and as indicated in the figures, food affordability rose gradually but steadily in Zambia, Kenya, and Mozambique from the mid-1990s to the 2006/07 season, and then fell back partially in the 2007/08 and 2008/09 seasons. For example, the quantities of maize grain and maize meal affordable per daily wage by formal sector workers in the Zambian cities of Lusaka, Kitwe and Mansa increased between 1994 and mid-2007 (Figure 4 and Table 3, columns D through H). The average quantity affordable per daily wage of these maize products was higher in the 2007/8 marketing season than in the 1995/6, 2000/1, and 2006/7 marketing seasons. Average maize grain and meal affordability was slightly lower in the 2008/9 marketing season relative to 2007/8 but in many cases was still higher than in 2006/7.

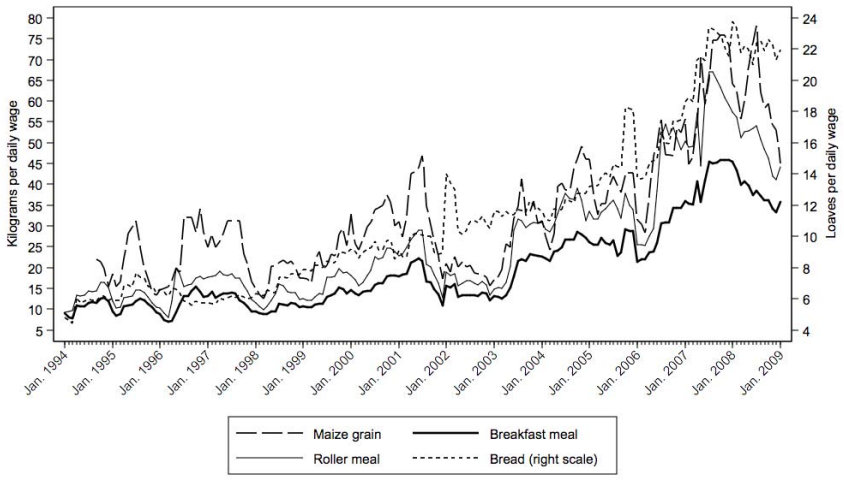

Figure 4. Kilograms of maize grain and maize meal and loaves of bread affordable per daily wage: Lusaka, Zambia, January 1994-January 2009. *Source:* CSO.

The preceding discussions of trends in staple food affordability in Kenya and Zambia are based on a weighted average daily wage across all (formal) sectors in each country, where the weights correspond

to the share of total employment attributed to a given sector. As a robustness check, we examine trends in the kilograms of maize grain affordable per daily wage for each of the four wage series in Zambia (central government, local government, parastatals, and private sector) and for the average public sector and average private sector wage series in Kenya. For Kenya, the quantity of maize grain affordable per daily wage for the average public sector worker and the average private sector worker tracked very closely between January 1994 and January 2004 (Figure A1 in the Appendix). Since then, private sector workers' purchasing power has been somewhat greater than that of public sector workers. In Zambia, trends in maize purchasing power are similar for workers in central government, local government and the private sector, but have risen much more rapidly for parastatal employees; however, parastatal employees accounted for only 5-8% of total formal sector employees in Zambia in 2007 (Zambia Central Statistical Office, 2007) (Figure A2 in the Appendix).

Minimum wage earners in Maputo and Nampula saw some gains in their maize meal, wheat flour, rice and cassava flour purchasing power during the period of analysis. With the exception of roller meal in Nampula, the average quantities of these staple foods affordable per daily wage in the 2008/9 marketing season was 1.7 to 3.3 times higher than in the 1995/6 marketing season (Table 3, columns D and H). Breakfast meal purchasing power in Maputo peaked in 2001 and was relatively flat between 2002 and 2008 (Figure 5). Rice was most affordable for minimum wage earners in Maputo in 2003-2005, declining somewhat thereafter. Wheat flour purchasing power grew gradually between the mid-1990s and 2007 but decreased between 2007 and 2009. The kilograms of maize grain affordable per daily minimum wage fluctuates substantially with seasonality in maize grain prices but in general maize grain was more affordable in 2008 than in the 1990s (Figure 5). The sharp drop in maize and maize meal purchasing power in Maputo around January 2006 was due to spikes in both commodity prices at that time. National maize production for 2005 was substantially overestimated and there was a shortage of maize instead of the predicted surplus, resulting in high maize grain and maize meal prices.

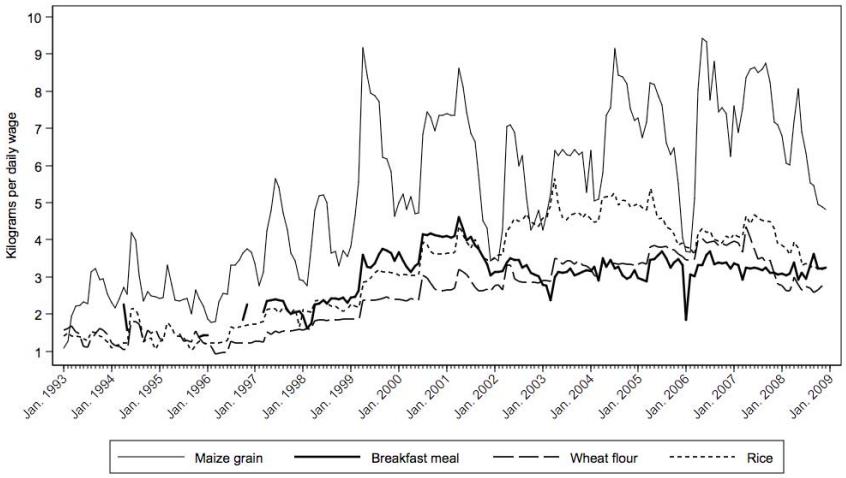

Figure 5. Kilograms of maize meal, maize grain, wheat flour, and rice affordable per daily wage: Maputo, Mozambique, January 1993-December 2008. *Sources:* SIMA, GRM.

It is important to bear in mind that these findings on trends in the quantities of staple foods affordable per daily wage hold only for formal sector workers with average earnings in Kenya and Zambia and for minimum wage earners in Mozambique. The aggregate, average wage rate data available for Kenya and Zambia may mask more nuanced trends in purchasing power among different types of formal sector workers. Furthermore, we do not have time series data on informal wages, returns to formal/informal business activities, nor on the percentage of the workforce employed in the informal sector versus the

formal sector.[10] Such information would help to clarify the implications of rising purchasing power among those employed in the formal sector (Chapoto et al., 2008).

Records of the number of persons employed in the formal sectors in Kenya and Zambia can shed some light on the finding of increased purchasing power among formal sector workers in those countries. The number of formal sector employees in Kenya grew each year between 1993 and 2007, the most recent year for which data are available (Kenya Central Bureau of Statistics, various). In Zambia, there were fewer formal sector employees in 1997/8 compared to 1992-1995 (Zambia Central Statistical Office, various). Employment level information is not available for 1999 through 2005, but the number of persons employed in the formal sector in 2006 was similar to 1997/8, and employment levels began to increase in 2007 (ibid). The number of formal sector employees did not grow as rapidly as the total or urban populations in either Kenya or Zambia between 1993 and 2007 (Kenya Central Bureau of Statistics, various; United Nations Population Division, 2007; Zambia Central Statistical Office, various).[11]

5. Results: Trends in real staple food prices in urban Malawi

Wage data are not available for Malawi so we instead analyze trends in real retail staple food prices. The CPI used to deflate the retail staple food prices is based on both food and non-food prices. Staple foods are important items in the basket of goods used to calculate the CPI, so if staple food prices are rising more (less) rapidly than other goods in the CPI basket, deflating by the CPI will underestimate (overestimate) real food price increases (Jayne et al., 2008). Although there was some seasonal variation, real retail maize grain prices in Lilongwe were relatively flat between 1994 and early 2007 (Figure 6). These prices have increased since mid-2007 and as of late 2008 were at near historic highs; similarly high prices in real terms were seen in the lean seasons of 2002 and 2006. Regression results indicate a positive trend in real retail maize grain prices (Table 4, columns A and B). Real retail maize meal prices in Lilongwe fluctuated dramatically over the period of analysis (Figure 6) and there was no statistically significant positive or negative trend in the time series (Table 4). Figure 6 suggests that after much volatility between 1994 and 2002, real bread prices in urban Malawi trended upward between 2002 and 2008. This result is supported by the finding of a statistically significant positive trend in real bread prices in the regression analysis (Table 4).

[10] The contribution of the informal sector to official gross domestic product in Africa is estimated at 43%, nearly equivalent to the formal sector (Lesser and Moise-Leeman, 2009).

[11] Between the early 1990s and 2007 in both Kenya and Zambia, private sector employees made up an increasing share of total formal sector employees (Kenya Central Bureau of Statistics, various; Zambia Central Statistical Office, various).

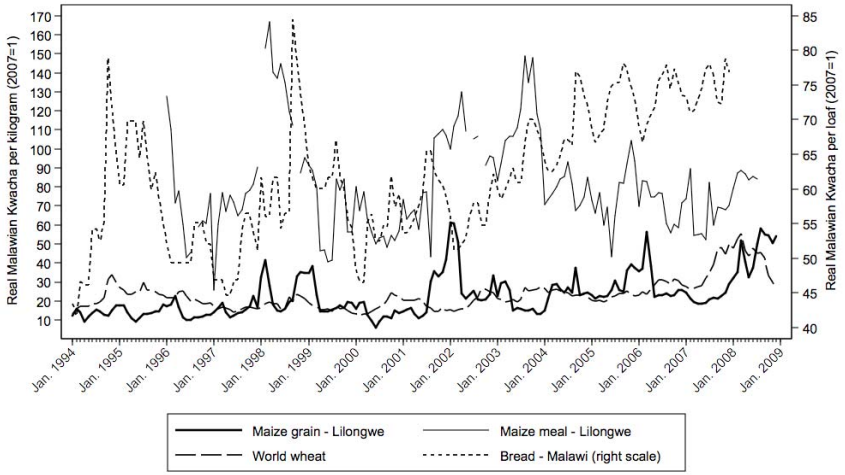

Figure 6. Real retail prices of maize grain and maize meal in Lilongwe and real bread and world wheat prices in Malawi, January 1994-December 2008. *Sources:* MAFS, NSO.

Table 4. Summary of results: real staple food prices, Lilongwe, Malawi

Urban center	Real Malawian Kwacha retail price (2007=1)	-----Based on regression results-----			----------Based on observed data----------									
		Estimated change in real price from month-to-month		Estimated change in real price after 12 months (Coef. x 12)	Average real price during each marketing season (May-April)					Obs.	Minimum real price		Maximum real price	
		Coef.[a]	p-value[b]		1995/6	2000/1	2006/7	2007/8	2008/9[c]		Price	Date	Price	Date
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
Lilongwe	Maize grain (MWK/kg)	0.139**	0.001	1.668	15.2	12.3	22.8	28.1	49.0	180	6.1	6/00	61.3	1/02
	Maize meal (MWK/kg)	0.101[d]	0.473	1.212	96.9	57.9	67.4	72.3	84.4	146	25.7	1/97	166.6	3/98
Malawi	Bread (MWK/loaf)	0.122**	0.002	1.464	58.7	55.6	74.3	75.8	--	168	41.7	2/94	84.5	9/98

Source: Authors' calculations.

Notes: [a]Reported estimate is the coefficient on the time trend from Eq. 3 unless otherwise noted. [b]p-value based on robust standard error. [c]Through December 2008 for maize grain, July 2008 for maize meal. [d]Monthly dummies not jointly significant at the 10% level; reported estimate is the coefficient on the time trend from Eq. 3 excluding monthly dummies. ** significant at the 1% level, * significant at the 5% level, + significant at the 10% level. --No observations.

6. Results: Trends in marketing margins for maize and wheat products

6.1. Kenya

Figure 7 indicates that the retail maize meal-to-wholesale maize grain percentage marketing margin in Nairobi generally declined between 1994 and late 2003 but trended upward between 2004 and late 2008. A significant downward trend is evident even between 1994 and 2006, but is broken by events in 2007 and 2008. Muyanga et al. (2005) attribute the declines in maize marketing margins in Kenya to intense competition in the milling sector following market liberalization and related milling efficiency gains associated with competitive pressures to cut costs. The reasons for the dramatic rise in maize meal-to-maize grain marketing margins in 2008 are not entirely clear, but it is possible that post election violence, poor weather, delayed imports, and attempts to subsidize selected milling firms' maize buying price in return for discounting the price of maize meal may have been factors. Over the entire 1994-2009 sample period, there is no statistically significant linear trend in maize grain-maize meal marketing margins in Nairobi in percentage or real terms (Table 5, columns A and B).

The percentage marketing margin between retail bread prices in Kenya and world wheat prices was lower in 1995/6 compared to the later years of the 1990s and most of the 2000s (Figure 7 and Table 5, columns D-H). On average, the marketing margin is 62% of the retail bread price (Table 5, column I). There is no statistically significant linear trend in this marketing margin in real or percentage terms (Table 5, columns A and B).

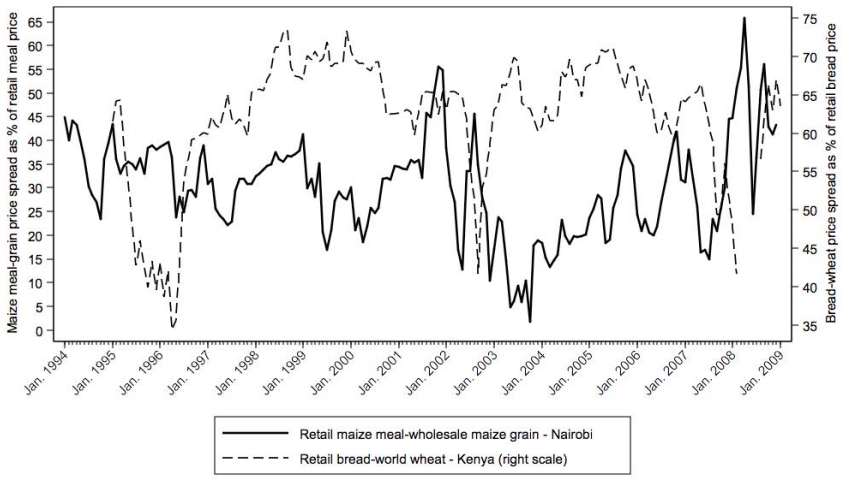

Figure 7. Nairobi retail maize meal-wholesale maize grain price spread as a percentage of the retail maize meal price and urban Kenya retail bread-world wheat price spread as a percentage of the retail bread price: January 1994-December 2008. *Sources:* MIC, MTI, IMF, KNBS.

Table 5. Summary of results: marketing margins for maize and wheat products

Urban center	Products	Marketing margin definition	-----Based on regressions results-----			----------Based on observed data----------								
			Estimated change in margin from month-to-month		Estimated change in margin after 12 months (Coef. x 12)	Average margin during each marketing season [c]						Range of margin		Obs.
			Coef.[a]	p-value[b]		1995/6	2000/1	2006/7	2007/8	2008/9[d]	All	Min.	Max.	
			(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Nairobi	Retail maize meal-wholesale maize grain	Price spread as % of meal price	-0.003	0.956	-0.036	35.3	32.5	30.6	37.6	45.1	30.2	1.7	65.8	180
		Real price spread (Ksh/kg, 2007=1)	-0.029[e]	0.288	-0.348	12.8	14.7	8.2	11.4	19.1	12.1	0.5	31.8	180
Kenya	Retail bread-world wheat	Price spread as % of bread price	-0.006[e]	0.953	-0.072	41.0	63.8	63.1	52.0	63.1	62.2	34.4	73.3	164
		Real price spread (Ksh/loaf, 2007=1)	-0.034[e]	0.307	-0.408	13.2	19.2	16.7	14.9	16.2	19.2	11.3	24.8	164
Lilongwe	Retail maize meal-retail maize grain	Price spread as % of meal price	-0.173**	0.000	-2.076**	75.2	74.5	58.6	54.3	43.2	64.8	15.8	88.1	146
		Real price spread (MWK/kg, 2007=1)	-0.109[e]	0.376	-1.308	74.6	43.2	40.0	38.7	36.4	54.2	6.8	132.9	146
Malawi	Retail bread-world wheat	Price spread as % of bread price	-0.058[e]	0.331	-0.696	72.9	77.0	74.6	65.2	--	77.0	56.7	85.0	168
		Real price spread (MWK/loaf, 2007=1)	0.074*	0.014	0.888*	42.9	42.8	55.4	49.5	--	47.5	31.3	71.8	168
Maputo	Retail breakfast meal-wholesale maize grain	Price spread as % of meal price	0.061	0.652	0.732	--	22.7	50.2	46.5	25.0	34.4	-4.7	58.5	123
		Real price spread (MTN/kg, 2004=1)	0.032**	0.003	0.384**	--	1.7	6.1	6.2	3.6	4.0	-0.4	10.9	123
	Retail flour-world wheat	Price spread as % of flour price	-0.007[e]	0.933	-0.084	42.8	58.8	44.4	38.9	59.8	52.9	21.7	72.5	190
		Real price spread (MTN/kg, 2004=1)	0.002[e]	0.919	0.024	6.4	6.6	4.6	5.2	9.9	6.5	2.2	11.3	190
Nampula	Retail roller meal-wholesale maize grain	Price spread as % of meal price	-0.019	0.892	-0.228	--	65.2	62.8	52.6	41.1	49.6	8.2	77.6	94
		Real price spread (MTN/kg, 2004=1)	-0.009	0.613	-0.108	--	3.7	5.7	4.7	4.4	4.6	0.8	9.5	94
	Retail flour-world wheat	Price spread as % of flour price	-0.049[e]	0.631	-0.588	47.5	53.1	40.8	30.8	45.6	52.5	14.7	75.5	174
		Real price spread (MTN/kg, 2004=1)	-0.013[e]	0.435	-0.156	8.1	5.2	4.0	3.7	5.7	6.5	1.8	12.7	174
Lusaka	Retail breakfast meal-wholesale maize grain	Price spread as % of meal price	-0.110+	0.073	-1.320+	43.4	61.2	44.6	38.2	27.8	40.3	-12.9	74.4	176
		Real price spread (ZMK/kg, 2007=1)	-7.047**	0.000	-84.564**	1596.4	1260.9	692.0	554.0	474.5	984.0	-237.7	2858.9	176
	Retail roller meal-wholesale maize grain	Price spread as % of meal price	-0.158**[e]	0.003	-1.896**	43.8	57.1	31.3	29.9	21.2	35.8	-24.0	70.5	176
		Real price spread (ZMK/kg, 2007=1)	-6.082**[e]	0.000	-72.984**	1326.9	882.5	337.5	328.8	275.5	707.7	-333.7	1882.2	176
	Retail bread-world wheat	Price spread as % of bread price	-0.026[e]	0.409	-0.312	76.8	80.0	81.1	72.2	78.8	80.4	63.3	86.9	181
		Real price spread (ZMK/loaf, 2007=1)	-14.194**[e]	0.000	-170.328**	4042.8	3001.7	2330.3	1998.7	2268.4	3253.1	1637.9	4926.7	181
Kitwe	Retail breakfast meal-retail maize grain	Price spread as % of meal price	-0.022	0.544	-0.264	39.2	28.5	30.0	22.8	25.7	24.8	-25.3	61.7	173
		Real price spread (ZMK/kg, 2007=1)	-3.150**	0.002	-37.800**	1425.4	577.6	445.9	329.8	453.5	595.8	-778.4	2781.7	173
	Retail roller meal-retail maize grain	Price spread as % of meal price	-0.087**	0.008	-1.044**	42.4	28.1	15.9	10.4	15.8	21.6	-19.8	60.5	173
		Real price spread (ZMK/kg, 2007=1)	-3.561**	0.000	-42.732**	1337.4	459.4	176.7	110.7	204.0	446.5	-533.4	2157.3	173
Mansa	Retail breakfast meal-retail maize grain	Price spread as % of meal price	-0.032	0.405	-0.384	43.2	36.2	31.7	18.0	32.4	30.7	-34.3	70.7	175
		Real price spread (ZMK/kg, 2007=1)	-4.249**	0.000	-50.988**	1568.9	773.7	559.6	282.5	585.2	768.9	-988.1	3317.9	175
	Retail roller meal-retail maize grain	Price spread as % of meal price	-0.113*	0.017	-1.356*	42.1	39.9	22.4	6.8	21.6	29.6	-44.4	74.6	175
		Real price spread (ZMK/kg, 2007=1)	-5.736**	0.000	-68.832**	1354.2	744.3	299.2	74.8	276.5	665.8	-588.7	3387.4	175

Source: Authors' calculations.

Notes: [a]Reported estimate is the coefficient on the time trend from Eq. 3 unless otherwise noted. [b]p-value based on robust standard error. [c]July-June for Kenya; May-April for Mozambique and Zambia. [d]Through November/December 2008 or January 2009. [e]Monthly dummies not jointly significant at the 10% level; reported estimate is the coefficient on the time trend from Eq. 3 excluding the monthly dummies. ** significant at the 1% level; * significant at the 5% level; + significant at the 10% level. --No observations.

6.2. Malawi

Retail maize meal-retail maize grain percentage marketing margins are highly volatile in Lilongwe; this percentage marketing margin ranges from 16% to 88% and appears to have declined somewhat between 2004 and 2008 (Figure 8). Comparing the average percentage maize marketing margin during several marketing seasons, the margin was lower in 2008/9 than it was in 1995/6, 2000/1, 2006/7, and 2007/8 (Table 5, columns D-H). Regression results indicate a statistically significant ($p \leq 0.01$) negative trend in the maize meal-maize grain percentage marketing margin in Lilongwe (Table 5, columns A and B). The parameter estimate indicates a 0.17 percentage point decrease in the marketing margin from month-to-month; this corresponds to a yearly decrease in the margin of approximately 2.0 percentage points.

The percentage marketing margin between retail bread prices in urban Malawi and world wheat prices was slightly lower in the 2007/8 marketing season (65.2%) than it was in 1995/6, 2000/1, and 2006/7, when it ranged from 72.9% to 77.0% (Table 5, columns D-H). The most recent bread prices available are for December 2007. The bread-wheat percentage marketing margin during the last months of 2007 is substantially lower than it was during any other month in the period of analysis (Figure 8). More recent data is needed to determine whether these lower marketing margins persisted and why. There is no statistically significant linear trend in the bread-wheat margin in percentage terms, but in real terms, there is a statistically significant monthly increase of 0.07 real MWK (2007=100) in the margin.

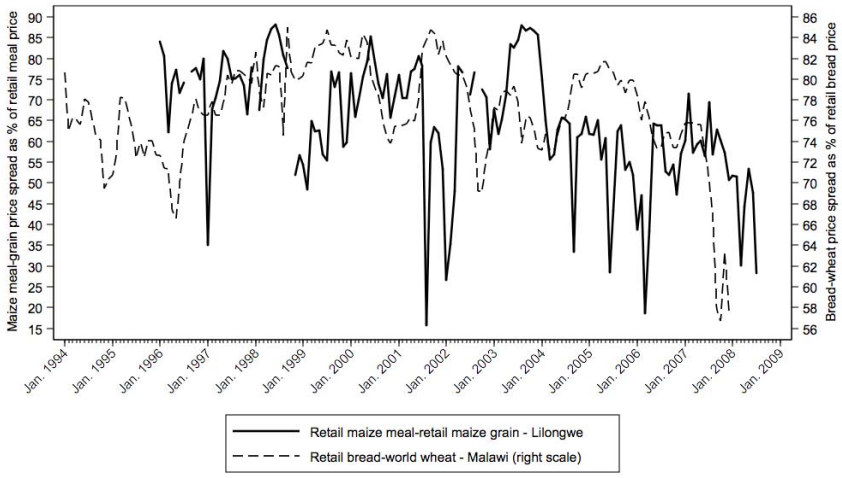

Figure 8. Lilongwe retail maize meal-retail maize grain price spread as a percentage of retail maize meal price and urban Malawi retail bread-world wheat price spread as a percentage of the retail bread price: January 1996-July 2008. *Sources:* MAFS, NSO, IMF

6.3. Mozambique

Retail maize meal-wholesale maize grain percentage marketing margins were quite volatile during the period of analysis in Maputo, showing dramatic seasonal movements (Figure 9). There was no statistically significant linear trend in the maize grain-maize meal marketing margin in percentage terms in Maputo or Nampula but the real marketing margin in Maputo has a statistically significant, positive trend (Table 5, columns A and B). This finding is consistent with earlier work on marketing margins in Mozambique, which also indicated a positive trend in maize marketing margins in Maputo (Abdula, 2005).

Percentage retail wheat flour-world wheat marketing margins increased from 1996 and peaked in 1998/1999 in both Maputo and Nampula (Figure 9). Between 2003 and 2007, monetized food aid wheat

delivered to millers represented about 20% of total supplies (Emerging Markets Group, 2008) and may have contributed to the relatively lower wheat flour-world wheat margins during the period. There were no statistically significant linear trends in the wheat flour-world wheat margins for either Mozambican city during the period of analysis (Table 5, columns A and B).

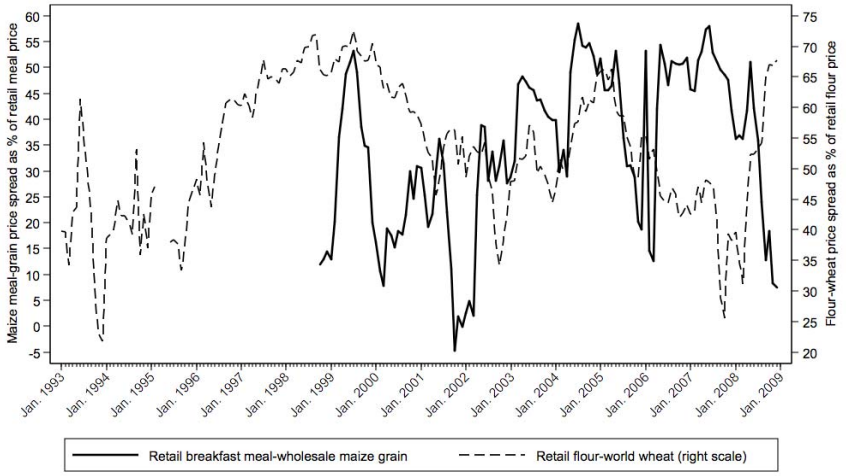

Figure 9. Maputo retail maize meal-wholesale maize grain price spread as a percentage of retail maize meal price and retail wheat flour-world wheat price spread as a percentage of the retail wheat flour price: January 1993-December 2008. *Source:* SIMA, IMF, BDM.

6.4. Zambia

The clearest pattern of trends in maize marketing margins emerges for urban centers in Zambia. The regression analysis indicates statistically significant negative trends in roller meal-maize grain marketing margins in both percentage and real terms in Lusaka, Kitwe and Mansa (Table 5, columns A and B). There were also statistically significant negative trends in breakfast meal-maize grain margins in all three cities in real terms, but in percentage terms, the negative trend was only statistically significant in Lusaka. Graphical analysis of the maize marketing margins in Lusaka reveals that these margins declined between 1994 and 2003 and were relatively flat between 2004 and 2008 (Figure 10). The average breakfast meal-maize grain percentage margin in the 2008/9 marketing season in Lusaka was 27.8% compared to 43.4% in 1995/6; for roller meal, the percentage margin averaged 21.2% in 2008/9 and 43.8% in 1995/6 (Table 5, columns D-H). Similar patterns hold in Kitwe and Mansa.

The finding of declines in maize meal-maize grain marketing margins in Zambia is consistent with previous evidence from Zambia (Chapoto and Jayne, 2006). Following liberalization of the maize processing industry in Zambia, the number of small- to medium-scale millers and retailers expanded rapidly. Large-scale millers that had a de facto oligopoly on maize milling prior to market reforms were forced to lower their prices to maintain market share. At the same time, the increasing availability of hammer mills in urban areas gave urban consumers the (cheaper) option of buying (or producing) grain and having it custom-milled (Chapoto and Jayne, 2006). It is less likely that milling efficiency gains contributed to the declining marketing margins, as established large-scale millers have made few investments in improved milling technology over the last decade.

Retail bread-world wheat percentage marketing margins in Lusaka range from 63.3% to 86.9%. There is not much variation in the average bread-wheat percentage marketing margin across the five marketing seasons analyzed (Table 5, columns D-H). Regression analysis indicates that there was no statistically

significant linear trend in the bread-wheat marketing margin in percentage terms but that the real marketing margin had a significant, negative trend (Table 5, columns A and B).

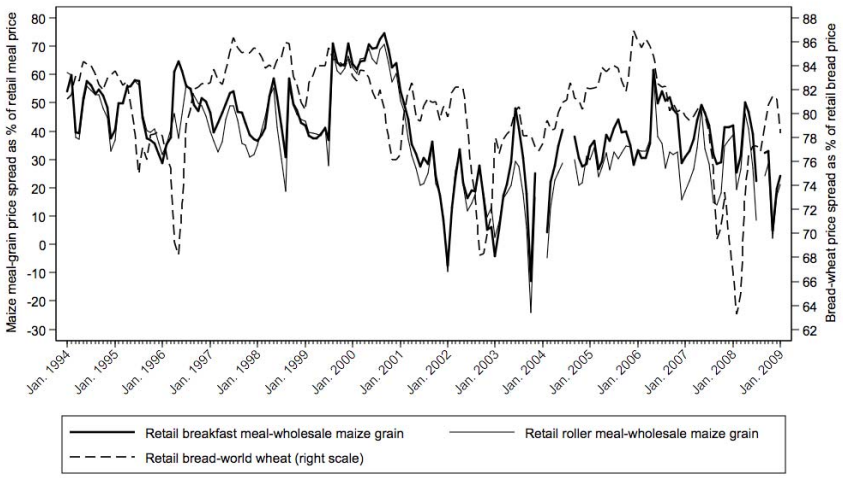

Figure 10. Lusaka retail maize meal-wholesale maize grain price spread as a percentage of the retail maize meal price and retail bread-world wheat price spread as a percentage of the retail bread price: January 1994-January 2009. *Sources:* AMIC, CSO, IMF, BOZ.

7. Conclusions and policy recommendations

In this paper, we examined trends since the 1990s in wage earners' staple food purchasing power and maize and wheat marketing margins in key urban centers in Kenya, Malawi, Mozambique and Zambia. The paper highlights four key findings. First, there is high correlation among wage rate series for various government and private sector categories. We find that these wage rates rose at a faster rate than retail maize meal and bread prices in urban Kenya and Zambia between the mid-1990s and 2007. Although the 2007/8 food price crisis partially reversed this trend, the quantities of staple foods affordable per daily wage in urban Kenya and Zambia during the 2008/9 marketing season were still roughly double their levels of the mid-1990s.

Second, the industrial worker national minimum wage in Mozambique increased more rapidly than staple food prices in Maputo and Nampula city from the mid-1990s into the 2000s. In Maputo, the quantities of rice and wheat affordable per daily minimum wage approximately tripled between the mid-1990s and the 2006/7 marketing season. During the 2008/9 marketing season, Maputo minimum wage earners' rice and wheat flour purchasing power was still higher than in the mid-1990s and roughly similar to levels at the millennium.

These findings obtain for formal sector wage earners in Kenya and Zambia and minimum wage earners in Mozambique only. The majority of the urban labor force in these countries is employed in the informal sector; therefore, the general conclusion of improved food purchasing power over the past 15 years may not hold for a significant portion of urban workers. Unfortunately consistent time series information on informal wage rates is not available, hence our findings must be interpreted with caution. Moreover, cuts in formal sector employment as a result of the global economic crisis may also be adversely affecting a large number of urban consumers.

Third, maize meal-to-maize grain marketing margins trended downward during most of the period of analysis in Lilongwe, Lusaka, Kitwe and Mansa, and between 1994 and 2005 in Nairobi. Retail maize meal-wholesale maize grain marketing margins in Maputo actually increased between 2000 and the

2006/7 marketing season. Declining maize marketing margins in Kenya and Zambia are due, at least in part, to increased competition and efficiency gains in the milling industries of both countries following market liberalization in the early 1990s; improvements in milling technology may have also contributed to the lower margins (Chapoto and Jayne, 2006; Muyanga, et al., 2005).

One factor that puts downward pressure on marketing margins is urban consumers having the option to buy or produce maize grain and bring it to hammermills to have it milled into maize meal, rather than relying on commercially manufactured mealie meal. When grain is in public markets, consumers have a variety of options for acquiring maize meal, including the relatively inexpensive one of buying grain in the market and milling it for a fee at a local miller. However, when grain supplies in public markets dwindle due to poor harvests combined with selective issuing of import licenses to large millers, the entire milling and retail market structure changes. Commercially manufactured meal becomes the only source of maize meal and the large millers enjoy much lower levels of competition, which may lead to higher vertical marketing margins. Thus, an important strategy for keeping maize meal prices at tolerable levels is to increase the availability of maize grain and other food stuffs in public markets during the lean season.

The importance of ensuring a broad range of food products in public markets is reinforced by the finding that more than half of the pairwise correlations of first differenced retail prices in the various urban centers examined are statistically significant and positive (see Table 6), indicating that consumer substitution among staple foods may help to mitigate the effects of retail price increases. Expanding the staple food options available to urban consumers (e.g., by keeping maize grain available in public markets, and by promoting urban agriculture and the marketing of staple substitutes such as cassava and sweet potatoes) could help facilitate such substitution.

Table 6. Pairwise correlation coefficients for first-differenced nominal retail staple prices: key urban centers in Kenya, Malawi, Mozambique and Zambia

Price series	Nairobi[a]	Lilongwe[b]	Maputo[c]	Nampula	Lusaka	Kitwe	Mansa
Maize grain, breakfast meal	--	--	0.022	--	0.276**	0.442**	0.342**
Maize grain, roller meal	--	--	--	0.252*	0.277**	0.409**	0.240**
Maize grain, maize meal	0.100	0.113	--	--	--	--	--
Maize grain, bread	0.100	0.188*	--	--	0.057	--	--
Maize grain, wheat flour	--	--	0.091	0.208**	--	--	--
Maize grain, cassava flour	--	--	--	0.277**	--	--	0.106
Maize grain, rice	--	--	0.171*	0.108	--	--	--
Breakfast meal, roller meal	--	--	--	--	0.790**	0.791**	0.613**
Breakfast meal, bread	--	--	--	--	0.124+	--	--
Breakfast meal, wheat flour	--	--	0.028	--	--	--	--
Breakfast meal, cassava flour	--	--	--	--	--	--	0.031
Breakfast meal, rice	--	--	0.002	--	--	--	--
Roller meal, bread	--	--	--	--	0.107	--	--
Roller meal, wheat flour	--	--	--	0.177+	--	--	--
Roller meal, cassava flour	--	--	--	0.160	--	--	0.051
Roller meal, rice	--	--	--	-0.015	--	--	--
Maize meal, bread	0.317**	0.050	--	--	--	--	--
Wheat flour, rice	--	--	0.285**	0.182*	--	--	--
Wheat flour, cassava flour	--	--	--	0.121	--	--	--
Rice, cassava flour	--	-	--	-0.047	--	--	--

Source: Authors' calculations.

Notes: + significant at 10% level; * significant at 5% level; ** significant at 1% level. -- Not applicable or data not available.

[a]Wholesale maize grain prices used as proxy for retail maize grain prices in Nairobi; bread price is average for urban Kenya .

[b]Bread price is average for urban Malawi. [c]Breakfast meal refers to high quality maize flour (e.g., Top Score brand).

Fourth, real retail bread-to-world wheat marketing margins trended negatively in Lusaka and positively in urban Malawi. Further research is necessary to determine what is driving these trends; however, anecdotal evidence from Zambia suggests that wheat is more profitable than maize for millers, and that bakers and millers may be trying to induce a consumption shift to bread by keeping bread prices low relative to maize meal prices.

As events in 2007 and 2008 have shown, timely and accurate crop production and market information systems are needed to identify well in advance whether imports and needed, and if so how much, to stabilize food prices during tight market situations. It is becoming increasingly clear that national crop estimates in some countries in the region are unreliable. An example of how inaccurate crop production estimates can exacerbate food insecurity is the case of Malawi in 2007/08. On the basis of the Government's forecast of a record maize harvest in 2007 and a projected maize surplus of 1.2 million tons over national consumption requirements, the government contracted with other states in the region to export over 400,000 tons of maize. However, the government was only able to source some 300,000 tons and this sent the price of maize rocketing to levels seen only in the most severe drought years. In hindsight, it is widely believed that the 2007 Malawi harvest was overestimated by roughly 25% (Dorward et al., 2008). If the government had been able to produce a more accurate estimate of crop production, it might not have arranged to export maize, which in turn might have avoided the huge price surge in late 2007/early 2008, which caused great hardship for maize buying households. Problems of overestimated crop forecasts have been noted elsewhere in the region, especially where improved food self-sufficiency has become a key litmus test of politicians' effectiveness and governments' popularity.

Another high-priority step for ensuring tolerable food prices during years of tight market conditions like 2008/09 is to make early arrangements for importation if it is deemed that imports are required. In 2008, relatively timely early warning analysis reported that maize imports would be required in several countries of the region to keep food prices from spiking above import parity in early 2009. However, imports were both late and insufficient to prevent maize prices from rising over US$400 per ton in Kenya and Zambia, and over US$500 per ton in parts of Malawi in late 2008 and early 2009, despite the fact that world market prices declined back to the range of US$150 to US$180 per ton by November 2008. In these cases, late realization of the need to import and/or barriers to private sector importation during the 2008/09 season has exacerbated low-income consumers' access to food. Opportunities to relieve maize deficits in the region could be substantially improved by reducing barriers to regional trade (Haggblade et al., 2008).

In the longer run, there are many elements to a comprehensive strategy to keep food prices at tolerable levels for consumers, many of which derive from promoting on-farm productivity gains and cost-reduction in the marketing system. Some of the more important long-term measures include: (1) investing in agricultural public goods such as research and extension, market information systems, and infrastructure, to stimulate supply response and productivity growth in agriculture (Baker, 2008; Jayne, et al., 2008; von Braun, et al., 2008; World Bank, 2008); (2) facilitating regional trade of staple commodities by keeping borders open and lowering taxes and tariffs (FAO, 2008; International Monetary Fund, 2008; von Braun, et al., 2008; World Bank, 2008); (3) improving incentives for staple food imports by the private sector, including engendering mutual trust between the public and private sectors (Chapoto, et al., 2008; Dorosh et al., 2007; Mwanaumo et al., 2005; Nijhoff et al., 2002; Tschirley and Jayne, 2008); and (4) expanding, strengthening, and improving the targeting of safety net programs, and social protection more broadly (e.g., conditional cash transfers, food vouchers, school feeding programs, etc.) (Baker, 2008; FAO, 2008; International Monetary Fund, 2008; von Braun, et al., 2008; World Bank, 2009).

APPENDIX

Table A1. Urbanization and percentage of total urban population residing in each of the urban centers analyzed in Kenya, Malawi, Mozambique and Zambia, 1960s-2000s

Country/ urban center	1960s		1970s		1980s		1990s		2000s	
	Urbanization (%)	Urban center % of total urban population	Urbanization (%)	Urban center % of total urban population	Urbanization (%)	Urban center % of total urban population	Urbanization (%)	Urban center % of total urban population	Urbanization (%)	Urban center % of total urban population
Kenya	**9.6**		**14.2**		**17.3**		**-**[a]		**-**	
Nairobi		48.3		36.0		35.8		-[a]		-
Census year	*1969*		*1979*		*1989*		*1999*		-	
Malawi	**4.8**		**8.5**		**10.6**		**14.1**		**-**	
Lilongwe		9.8		21.0		26.2		31.1		-
Census year	*1966*		*1977*		*1987*		*1998*		-	
Mozambique	**-**		**-**		**12.7**		**28.6**		**-**	
Maputo		-		-		34.9		21.5		-
Nampula		-		-		10.1		6.9		-
Census year	*1960*		*1970*		*1980*		*1997*		-	
Zambia	**20.5**		**29.4**		**39.9**		**39.3**		**35.8**	
Lusaka		16.9		22.0		23.7		33.8		32.4
Kitwe		17.2		16.8		11.8		11.6		10.9
Mansa[b]		-		-		1.5		1.3		1.2
Census year	*1963*		*1969*		*1980*		*1990*		*2000*	

Sources: Potts (2006); [b]Brinkhoff (City Population)

Notes: Urbanization indicates the percentage of the total population that resides in urban areas. - Not available. [a]Potts (2006) does not report these figures for Kenya in the 1990s, arguing that methodological changes in the 1999 Kenyan census render the resulting urbanization rates highly misleading.

Table A2. Augmented Dickey-Fuller and Phillips-Perron unit root test results – quantities of staple foods affordable per daily wage time series for Kenya, Mozambique, and Zambia, and real staple food price time series for Malawi

Urban center	Per daily wage time series	H_0: Unit root H_1: General mean stationary Approximate p-value for Z(t)		H_0: Unit root with drift H_1: General mean stationary p-value for Z(t)	H_0: Unit root H_1: Trend stationary Approx. p-value for Z(t)		Inference
		Dickey-Fuller	Phillips-Perron	Dickey-Fuller	Dickey-Fuller	Phillips-Perron	
Nairobi	Kg maize grain	0.393	0.393	0.039	0.284	0.284	Ambig.
	Kg maize meal	0.330	0.413	0.029	0.563	0.880	Ambig.
Kenya	Loaves bread	0.490	0.389	0.057	0.972	0.987	Ambig.
Lilongwe	Real maize grain price	0.064	0.019	0.003	0.013	0.003	I(0)
	Real maize meal price	0.001	0.001	0.000	0.005	0.005	I(0)
Malawi	Real bread price	0.023	0.023	0.001	0.007	0.007	I(0)
Maputo	Kg maize grain	0.426	0.087	0.045	0.526	0.062	Ambig.
	Kg breakfast meal	0.114	0.067	0.007	0.352	0.169	Ambig.
	Kg wheat flour	0.150	0.691	0.010	0.821	0.474	Ambig.
	Kg rice	0.470	0.579	0.053	0.989	0.921	Ambig.
Nampula	Kg maize grain	0.121	0.082	0.007	0.164	0.202	Ambig.
	Kg roller meal	0.228	0.046	0.018	0.446	0.111	Ambig.
	Kg wheat flour	0.366	0.572	0.035	0.946	0.262	Ambig.
	Kg rice	0.642	0.567	0.103	0.997	0.800	I(1)
	Kg cassava flour	0.786	0.583	0.183	0.521	0.001	Ambig.
Lusaka	Kg maize grain	0.804	0.363	0.198	0.504	0.103	I(1)
	Kg breakfast meal	0.830	0.825	0.224	0.207	0.349	I(1)
	Kg roller meal	0.869	0.641	0.272	0.538	0.233	I(1)
	Loaves bread	0.983	0.973	0.668	0.647	0.416	I(1)
Kitwe	Kg maize grain	0.862	0.405	0.262	0.592	0.082	Ambig.
	Kg breakfast meal	0.837	0.767	0.231	0.486	0.338	I(1)
	Kg roller meal	0.805	0.648	0.199	0.641	0.328	I(1)
Mansa	Kg maize grain	0.946	0.260	0.449	0.606	0.114	I(1)
	Kg breakfast meal	0.881	0.752	0.290	0.421	0.266	I(1)
	Kg roller meal	0.884	0.807	0.295	0.480	0.538	I(1)
	Kg cassava flour	0.005	0.005	0.003	0.006	0.006	I(0)

Source: Authors' calculations.

Notes: p-values reported for the ADF regression with the minimum number of lagged differenced variables required to eliminate autocorrelation in the residuals. I(1) = integrated of order one (time series has a unit root); I(0) = integrated of order zero (time series is a stationary process). Ambig. = ambiguous results. Z(t) is the Dickey-Fuller test statistic.

Table A3. Augmented Dickey-Fuller and Phillips-Perron unit root test results – marketing margin variables

Urban center	Products	Marketing margin definition	H_0: Unit root H_1: General mean stationary Approximate p-value for Z(t)		H_0: Unit root with drift H_1: General mean stationary p-value for Z(t)	H_0: Unit root H_1: Trend stationary Approximate p-value for Z(t)		Inference
			Dickey-Fuller	Phillips-Perron	Dickey-Fuller	Dickey-Fuller	Phillips-Perron	
Nairobi	Retail maize meal-wholesale maize grain	Price spread as % of meal price	0.001	0.001	0.000	0.008	0.008	I(0)
		Real price spread	0.001	0.000	0.000	0.003	0.001	I(0)
Kenya	Retail bread-world wheat	Price spread as % of bread price	0.362	0.362	0.034	0.732	0.732	Ambig.
		Real price spread	0.261	0.261	0.021	0.453	0.453	Ambig.
Lilongwe	Retail maize meal-retail maize grain	Price spread as % of meal price	0.001	0.000	0.000	0.000	0.000	I(0)
		Real price spread	0.004	0.004	0.000	0.002	0.002	I(0)
Malawi	Retail bread-world wheat	Price spread as % of bread price	0.403	0.403	0.041	0.682	0.682	Ambig.
		Real price spread	0.002	0.002	0.001	0.002	0.002	I(0)
Maputo	Retail breakfast meal-wholesale maize grain	Price spread as % of meal price	0.034	0.034	0.002	0.173	0.173	Ambig.
		Real price spread	0.179	0.011	0.012	0.503	0.007	Ambig.
	Retail flour-world wheat	Price spread as % of flour price	0.036	0.036	0.002	0.139	0.139	Ambig.
		Real price spread	0.134	0.075	0.008	0.376	0.246	Ambig.
Nampula	Retail roller meal-wholesale maize grain	Price spread as % of meal price	0.000	0.006	0.000	0.001	0.033	I(0)
		Real price spread	0.003	0.005	0.000	0.015	0.028	I(0)
	Retail flour-world wheat	Price spread as % of flour price	0.171	0.106	0.006	0.430	0.364	Ambig.
		Real price spread	0.012	0.037	0.005	0.216	0.229	Ambig.
Lusaka	Retail breakfast meal-wholesale maize grain	Price spread as % of meal price	0.001	0.001	0.000	0.002	0.001	I(0)
		Real price spread	0.011	0.011	0.000	0.000	0.000	I(0)
	Retail roller meal-wholesale maize grain	Price spread as % of meal price	0.000	0.000	0.000	0.000	0.000	I(0)
		Real price spread	0.007	0.002	0.003	0.000	0.000	I(0)
	Retail bread-world wheat	Price spread as % of bread price	0.001	0.019	0.000	0.029	0.054	I(0)
		Real price spread	0.593	0.468	0.085	0.220	0.081	Ambig.
Kitwe	Retail breakfast meal-retail maize grain	Price spread as % of meal price	0.000	0.000	0.000	0.000	0.000	I(0)
		Real price spread	0.000	0.000	0.000	0.000	0.000	I(0)
	Retail roller meal-retail maize grain	Price spread as % of meal price	0.000	0.000	0.000	0.000	0.000	I(0)
		Real price spread	0.000	0.000	0.000	0.000	0.000	I(0)
Mansa	Retail breakfast meal-retail maize grain	Price spread as % of meal price	0.015	0.000	0.001	0.071	0.002	I(0)
		Real price spread	0.082	0.000	0.005	0.072	0.000	I(0)
	Retail roller meal-retail maize grain	Price spread as % of meal price	0.028	0.011	0.001	0.010	0.074	I(0)
		Real price spread	0.031	0.000	0.001	0.000	0.000	I(0)

Source: Authors' calculations.

Notes: p-values reported for the ADF regression with the minimum number of lagged differenced variables required to eliminate autocorrelation in the residuals. I(1) = integrated of order one (time series has a unit root); I(0) = integrated of order zero (time series is a stationary process). Ambig. = ambiguous results. Z(t) is the Dickey-Fuller test statistic.

Table A4. Data series analyzed and data sources

Country/ urban center	Data series description (units)	Frequency	Period	Data source	Obs.	Note
Nairobi	Wholesale maize grain prices (Ksh/kg)	Monthly	1/94-12/08	MIC	181	
	Retail maize meal prices (Ksh/kg)	Monthly	1/94-12/08	MTI	180	Average across all maize meal types
Kenya	Retail bread prices (Ksh/loaf)	Monthly	1/95-1/09	MTI	164	Some data also from FEWS
	Formal sector ave. daily wage (Ksh)	Annual	1993-2007	KNBS	15	See Data section for details
	Consumer price index (2007=1)	Monthly	1/94-12/08	KNBS	181	
	Exchange rate (Ksh/US$)	Monthly	1/94-12/08	KNBS	181	
Lilongwe	Retail maize grain prices (MWK/kg)	Monthly	1/94-12/08	MAFS	180	
	Retail maize meal prices (MWK/kg)	Monthly	1/96-7/08	NSO	146	Average across all maize meal types
Malawi	Retail bread prices (MWK/loaf)	Monthly	1/94-12/07	NSO	168	
	Consumer price index (2007=1)	Monthly	1/94-12/08	NSO	180	
	Exchange rate (MWK/US$)	Monthly	1/94-12/08	NSO	180	
Maputo	Wholesale maize grain prices (MTN/kg)	Weekly*	10/98-1/09	SIMA	124	
	Retail maize grain prices (MTN/kg)	Weekly*	1/93-12/08	SIMA	192	
	Retail maize meal prices (MTN/kg)	Weekly*	1/94-12/08	SIMA	153	High quality (e.g., Top Score brand)
	Retail wheat flour prices (MTN/kg)	Weekly*	1/93-12/08	SIMA	190	
	Retail rice prices (MTN/kg)	Weekly*	1/93-12/08	SIMA	192	Low quality rice, ≥ 25% brokens
Nampula	Wholesale maize grain prices (MTN/kg)	Weekly*	10/98-1/09	SIMA	122	
	Retail maize grain prices (MTN/kg)	Weekly*	1/93-12/08	SIMA	190	
	Retail maize meal prices (MTN/kg)	Weekly*	4/01-12/08	SIMA	97	Low quality/roller meal
	Retail wheat flour prices (MTN/kg)	Weekly*	1/93-12/08	SIMA	174	
	Retail rice prices (MTN/kg)	Weekly*	1/93-12/08	SIMA	192	Low quality rice, ≥ 25% brokens
	Retail cassava flour prices (MTN/kg)	Weekly*	4/91-1/09	SIMA	214	
Mozambique	Minimum monthly wages (MTN)	Annual**	10/92-12/08	GRM	26	Min. wage for industrial sector laborers
	Consumer price index (2004=100)	Monthly	1/93-12/08	INE	192	
	Exchange rate (MTN/US$)	Monthly	1/93-12/08	BDM	192	
Lusaka	Wholesale maize grain prices (ZMK/kg)	Monthly	1/94-1/09	AMIC	176	
	Retail maize grain prices (ZMK/kg)	Monthly	9/94-1/09	CSO	173	
	Retail breakfast meal prices (ZMK/kg)	Monthly	1/94-1/09	CSO	181	
	Retail roller meal prices (ZMK/kg)	Monthly	1/94-1/09	CSO	181	
	Retail bread prices (ZMK/loaf)	Monthly	1/94-1/09	CSO	181	
Kitwe	Retail maize grain prices (ZMK/kg)	Monthly	2/94-11/08	CSO	174	
	Retail breakfast meal prices (ZMK/kg)	Monthly	1/93-11/08	CSO	189	
	Retail roller meal prices (ZMK/kg)	Monthly	1/93-11/08	CSO	185	
Mansa	Retail maize grain prices (ZMK/kg)	Monthly	11/93-1/09	CSO	178	
	Retail breakfast meal prices (ZMK/kg)	Monthly	2/93-1/09	CSO	187	
	Retail roller meal prices (ZMK/kg)	Monthly	2/93-1/09	CSO	186	
	Retail cassava flour prices (ZMK/kg)	Monthly	9/00-1/09	CSO	82	
Zambia	Formal sector ave. monthly wages (ZMK)	Quarterly	Q1/93-Q4/07	CSO	42	
	Consumer price index (total CPI)	Monthly	1/94-1/09	CSO	181	
	Exchange rate (ZMK/US$)	Monthly	1/94-1/09	BOZ	181	
World wheat	No.1 hard red winter wheat prices (US$/kg)	Monthly	1/93-1/09	IMF	193	Ordinary protein, FOB Gulf of Mexico

Notes: *Weekly data aggregated to month level. ** Minimum wage raised approximately once per year. kg (kilogram). KSH (Kenyan Shillings), MWK (Malawian Kwacha), MTN (Mozambican Metical Novo), ZMK (Zambian Kwacha), US$ (US dollar). MIC (Kenya Market Information Center, Ministry of Agriculture), MTI (Kenya Ministry of Trade & Industry), FEWS (Famine Early Warning Systems Network), KNBS (Kenya National Bureau of Statistics), MAFS (Malawi Ministry of Agriculture & Food Security), NSO (Malawi National Statistical Office), SIMA (Mozambique Agricultural Market Information System), GRM (Government of Mozambique Monthly Bulletins), INE (Mozambique Instituto Nacional de Estatistica), BDM (Banco de Mocambique), AMIC (Zambia Agricultural Marketing Information Centre), CSO (Zambia Central Statistical Office), BOZ (Bank of Zambia), IMF (International Monetary Fund Primary Commodity Prices database).

Table A5. Pairwise correlations of wage series in levels, Kenya, 1993-2007 (annual data)

	PRIVATE SECTOR								PUBLIC SECTOR						BOTH
	Majority Shares Held By Private Sector	Local Public	Local Private	Foreign Public	Foreign Private	Cooper-atives	Other Private	Average Private Sector	Central Govt.	Local Govt.	TSC	Para-statals	Majority Shares Held By Public Sector	Average Public Sector	Average Public & Private Sectors
Maj. Share. By Priv. Sector	1														
Local Public	1.000**	1													
Local Private	0.999**	1.000**	1												
Foreign Public	1.000**	0.999**	0.999**	1											
Foreign Private	0.999**	1.000**	1.000**	0.999**	1										
Cooperatives	0.999**	1.000**	0.999**	0.999**	1.000**	1									
Other Private	0.999**	1.000**	0.999**	0.998**	1.000**	1.000***	1								
Average Private Sector	0.999**	1.000**	1.000**	0.999***	1.000**	1.000**	1.000**	1							
Central Government	0.986**	0.988**	0.990**	0.986**	0.990**	0.989**	0.989**	0.989**	1						
Local Government	0.631*	0.642**	0.640*	0.627*	0.650**	0.652**	0.652**	0.644**	0.641*	1					
TSC	0.967**	0.972**	0.971**	0.965**	0.975**	0.975**	0.975**	0.972**	0.983**	0.723**	1				
Parastatals	0.977**	0.979**	0.977**	0.976**	0.979**	0.980**	0.980**	0.979**	0.958**	0.754**	0.962**	1			
Maj. Share. by Pub. Sector	0.976**	0.978**	0.977**	0.975**	0.978**	0.979**	0.979**	0.978**	0.958**	0.757**	0.962**	1.000**	1		
Average Public Sector	0.971**	0.975**	0.974**	0.969**	0.977**	0.978**	0.978**	0.975**	0.972**	0.784**	0.986**	0.990**	0.990**	1	
Average Private & Public Sector	0.996**	0.998**	0.998**	0.996**	0.998**	0.999**	0.999**	0.998**	0.989**	0.688**	0.981**	0.987**	0.986**	0.987**	1

Source: Authors' calculations.

Notes: ** statistically significant at the 1% level; * statistically significant at the 5% level; + statistically significant at the 10% level. Averages are weighted averages of wages across all sub-sectors with the weights corresponding to the share of total employment in that sub-sector. TSC = Teachers Service Commission.

Table A6. Pairwise correlations of first differenced wage series, Kenya, 1993-2007 (annual data)

	PRIVATE SECTOR								PUBLIC SECTOR						BOTH
	Majority Shares Held By Private Sector	Local Public	Local Private	Foreign Public	Foreign Private	Cooper-atives	Other Private	Average Private Sector	Central Govt.	Local Govt.	TSC	Para-statals	Majority Shares Held By Public Sector	Average Public Sector	Average Public & Private Sectors
Maj. Share. By Priv. Sector	1														
Local Public	0.948**	1													
Local Private	0.899**	0.962**	1												
Foreign Public	0.993**	0.964**	0.936**	1											
Foreign Private	0.884**	0.984**	0.965**	0.910**	1										
Cooperatives	0.917**	0.969**	0.880**	0.911**	0.957**	1									
Other Private	0.938**	0.960**	0.867**	0.924**	0.936**	0.994**	1								
Average Private Sector	0.954**	0.997**	0.972**	0.969**	0.983**	0.963**	0.958**	1							
Central Government	0.501+	0.523+	0.568*	0.534*	0.514+	0.444	0.452	0.531+	1						
Local Government	-0.336	-0.320	-0.325	-0.309	-0.308	-0.305	-0.328	-0.330	-0.254	1					
TSC	0.286	0.303	0.216	0.282	0.279	0.297	0.308	0.278	0.423	-0.178	1				
Parastatals	0.233	0.247	0.198	0.257	0.212	0.230	0.209	0.225	-0.198	0.390	-0.121	1			
Maj. Share. by Pub. Sector	0.192	0.214	0.160	0.211	0.185	0.214	0.188	0.192	-0.221	0.373	-0.136	0.959**	1		
Average Public Sector	0.078	0.108	0.054	0.116	0.083	0.084	0.061	0.078	0.175	0.765**	0.278	0.582*	0.561*	1	
Average Private & Public Sector	0.869**	0.917**	0.872**	0.897**	0.894**	0.879**	0.867**	0.908**	0.529+	0.038	0.377	0.444	0.406	0.484+	1

Source: Authors' calculations.

Notes: ** statistically significant at the 1% level; * statistically significant at the 5% level; + statistically significant at the 10% level. Averages are weighted averages of wages across all sub-sectors with the weights corresponding to the share of total employment in that sub-sector. TSC = Teachers Service Commission.

Table A7. Pairwise correlations of wage series in levels, Zambia, 1991-2007 (quarterly data)

	Central Government	Local Government	Parastatal	Private	Average
Central Government	1				
Local Government	0.926	1			
Parastatal	0.964	0.932	1		
Private	0.936	0.893	0.936	1	
Average	0.975	0.940	0.946	0.956	1

Source: Authors' calculations.
Notes: All correlation coefficients are statistically significant at the 1% level. Average is a weighted average of wages across all sectors with the weights corresponding to the share of total (formal) employment in that sector.

Table A8. Pairwise correlations of first differenced wage series, Zambia, 1991-2007 (quarterly data)

	Central Government	Local Government	Parastatal	Private	Average
Central Government	1				
Local Government	0.006	1			
Parastatal	0.568**	0.125	1		
Private	0.038	-0.366+	0.352+	1	
Average	0.187	0.481**	-0.121	0.026	1

Source: Authors' calculations.
Notes: + significant at 10% level; * significant at 5% level; ** significant at 1% level. Average is a weighted average of wages across all sectors with the weights corresponding to the share of total (formal) employment in that sector.

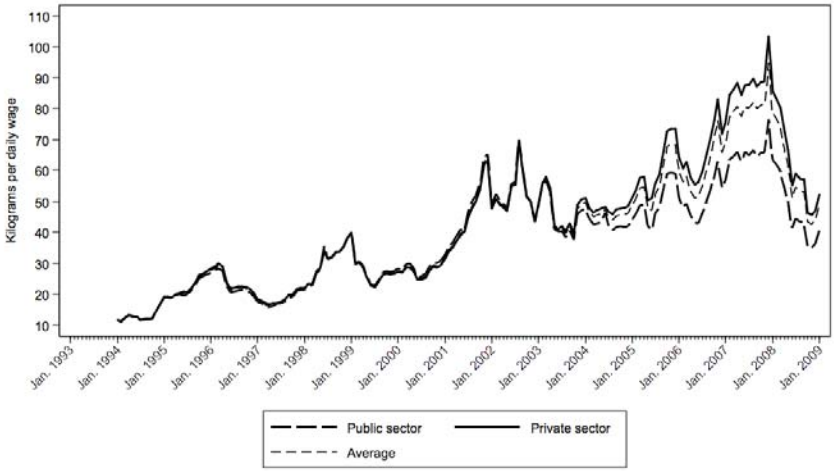

Figure A1. Kilograms of wholesale maize grain affordable per daily wage for workers in the public sector and private sector: Nairobi, Kenya, January 1994-December 2008. *Sources:* KNBS, MIC.

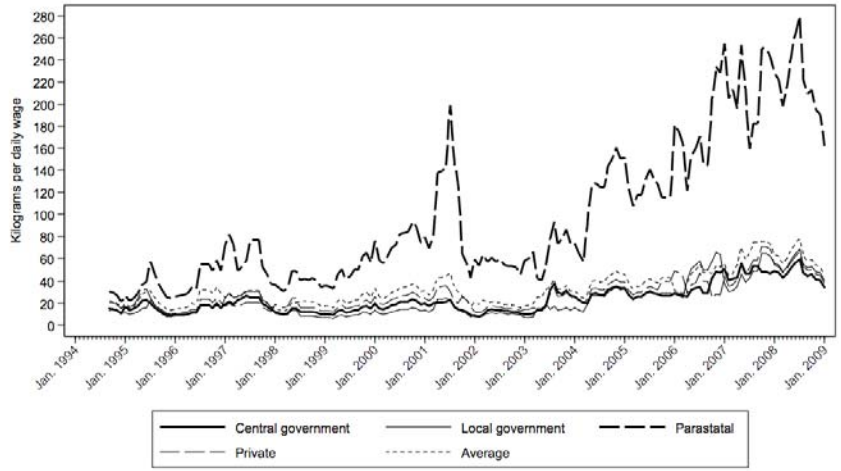

Figure A2. Kilograms of retail maize grain affordable per daily wage for workers in the central government, local government, parastatals and private sectors: Lusaka, Zambia, September 1994-January 2009. *Source:* CSO.

REFERENCES

Abdula, D., 2005. Improving maize marketing and trade policies to promote household food security in southern Mozambique. M.S. Thesis, Michigan State University, East Lansing, MI.

Ayieko, M., Tschirley, D., Mathenge, M., 2005. Fresh fruit and vegetable consumption patterns and supply chain systems in urban Kenya: implications for policy and investment priorities. Working Paper No. 19, Tegemeo Institute of Agricultural Policy and Development.

Baker, J.L., 2008. Impact of financial, food, and fuel crisis on urban poor. Directions in Urban Development, The World Bank, Urban Development Unit, December 2008.

Barslund, M., 2007. Regional differences in food consumption in urban Mozambique: a censored demand system approach. Discussion Papers No. 07-15, Department of Economics, University of Copenhagen, August 2007.

Brinkhoff, T. City Population. <http://www.citypopulation.de/index.html> (accessed 03.30.09).

Chapoto, A., Jayne, T.S., 2006. Trends in breakfast meal and maize marketing margins in Zambia. Policy Synthesis No. 14, Food Security Research Project, August 2006.

Chapoto, A., Haggblade, S., Shawa, J., Jayne, T.S., Weber, M.T., 2008. Marketing policy options for consumer price mitigation actions in the 2008/09 maize marketing season in Zambia. Policy Synthesis No. 31, Food Security Research Project, September 2008.

CTA, 2004. Reflexão sobre o salário mínimo para 2004 na República de Moçambique. Confederação das Associações Económicas de Moçambique, March 2004.

Dorosh, P.A., Dradri, S., Haggblade, S., 2007. Alternative instruments for ensuring food security and price stability in Zambia. Working Paper No. 29, Food Security Research Project, November 2007.

Dorward, A., Chirwa, C., Kelly, V., Jayne, T.S., Slater, R., Boughton, D., 2008. Evaluation of the 2006/7 Agricultural Input Subsidy Programme, Malawi. Final Report, March 2008.

Emerging Markets Group, 2008. Mozambique: FY08-12 Bellmon monetization and distribution analysis. Maputo: Emerging Markets Group.

FAO, 2008. FAO's Initiative on Soaring Food Prices: guide for immediate country level action. FAO, May 2008.

Guha-Khasnobis, B., Kanbur, R., 2006. Introduction. In: Guha-Khasnobis, B., Kanbur, R. (Ed.), Informal labour markets and development. Palgrave MacMillan, New York.

Haggblade, S., Nielson, H., Govereh, J., Dorosh, P., 2008. Potential consequences of intra-regional trade in short-term food security crises in southeastern Africa. Report, Michigan State University, June 2008.

International Monetary Fund, 2008. Food and fuel prices: recent developments, macroeconomic impact, and policy responses. International Monetary Fund, June 2008.

Jayne, T.S., Argwings-Kodhek, G., 1997. Consumer response to maize market liberalization in urban Kenya. Food Policy 22 (5), 447-458.

Jayne, T.S., Chapoto, A., Zulu, B., Haggblade, S., Shaffer, J., Shawa, J., Haantuba, H., 2006. Zambia's maize value chain: toward national and regional food security. Draft Working Paper, Food Security Research Project, October 2006.

Jayne, T.S., Chapoto, A., Minde, I., Donovan, C., 2008. The 2008/09 food price and food security situation in Eastern and Southern Africa: implications for immediate and longer run responses. International Development Working Paper, Michigan State University, November 2008.

Kenya Central Bureau of Statistics, 2003. Report of the 1998/99 Labour Force Survey.

Kenya Central Bureau of Statistics, various. Statistical Abstract.

Lesser, C., Moise-Leeman, E., 2009. Informal cross-border trade and trade facilitation reform in sub-Saharan Africa. OECD Trade Policy Working Papers No. 86, OECD, February 2009.

Muyanga, M., Jayne, T.S., Argwings-Kodhek, G., Ariga, J., 2005. Staple food consumption patterns in urban Kenya: trends and policy implications. Working paper No. 16, Tegemeo Institute for Agricultural Policy and Development.

Mwanaumo, A., Jayne, T.S., Zulu, B., Shawa, J., Mbozi, G., Haggblade, S., Nyembe, M., 2005. Zambia's 2005 maize import and marketing experiences: lessons and implications. Policy Synthesis No. 11, Food Security Research Project, December 2005.

Mwiinga, B., Nijhoff, J.J., Jayne, T.S., Tembo, G., Shaffer, J., 2002. The role of mugaiwa in promoting household food security: why it matters and who gets access to government maize imports. Policy Synthesis No. 5, Food Security Research Project, October 2002.

Nijhoff, J.J., Jayne, T.S., Mwiinga, B., Shaffer, J., 2002. Markets need predictable government actions to function effectively: the case of importing maize in times of deficit. Policy Synthesis No. 6, Food Security Research Project, November 2002.

Perron, P., 1989. The great crash, the oil price shock, and the unit root hypothesis. Econometrica 57 (6), 1361-1401.

Potts, D., 2006. Urban growth and urban economies in Eastern and Southern Africa: trends and prospects. In: Bryceson, D.F., Potts, D. (Ed.), African urban economies: viability, vitality or vitiation? Palgrave MacMillan, New York.

Traub, L.N., Jayne, T.S., 2008. The effects of price deregulation on maize marketing margins in South Africa. Food Policy 33 (3), 224-236.

Tschirley, D., Abdula, D., Weber, M.T., 2006. Toward improved maize marketing and trade policies to promote household food security in Central and Southern Mozambique. Research Paper Series No. 60E, Republic of Mozambique, Ministry of Agriculture, Directorate of Economics, June 2006.

Tschirley, D., Jayne, T.S., 2008. Food crises and food markets: implications for emergency response in southern Africa. Policy Synthesis for Cooperating USAID Offices and Country Missions No. 82, US Agency for International Development, Office of Sustainable Development, July 2008.

United Nations Population Division, 2007. World urbanization prospects: the 2007 revision population database. <http://esa.un.org/unup/index.asp?panel=1> (accessed 03.20.09).

von Braun, J., Ahmed, A., Asenso-Okyere, K., Fan, S., Gulati, A., Hoddinott, J., Pandya-Lorch, R., Rosegrant, M.W., Ruel, M., Torero, M., van Rheenen, T., von Grebmer, K., 2008. High food prices: the what, who, and how of proposed policy actions. Policy Brief, International Food Policy Research Institute, May 2008.

World Bank, 2008. Rising food prices: policy options and World Bank response. Background Note, The World Bank.

World Bank, 2009. Swimming against the tide: how developing countries are coping with the global crisis. Background Paper prepared by World Bank Staff for the G20 Finance Ministers and Central Bank Governors Meeting, Horsham, UK, March 13-14, 2009.

Zambia Central Statistical Office, 2007. Labour Force Survey 2005 Report.

Zambia Central Statistical Office, 2007. Quarterly employment and earnings inquiry report, 2007. May 2007.

Zambia Central Statistical Office, various. Quarterly employment and earnings summary report.

Zanias, G.P., Gunjal, K., 2007. Food demand analysis and food aid requirements. Food and Agriculture Organization of the United Nations.