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Jotham Momba

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P U B L I S H I N G

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Book Reviews

ESTIMATING THE IMPACT OF THE FOOD, FUEL, AND FINANCIAL CRISES ON ZAMBIAN HOUSEHOLDS

NEIL MCCULLOCH AND AMIT GROVER
INSTITUTE OF DEVELOPMENT STUDIES[*]

This article combines nationally representative household survey data from Zambia in 2006, with detailed, spatially disaggregated, price data, to simulate the likely welfare impacts of the price changes arising from the food, fuel, and financial crises between 2006 and 2009. We find that urban households, particularly the poorest, were very hard hit by both the rises in food prices in 2008 and in non-food prices in 2009. However, agricultural households in rural areas generally benefited from the food-price rises. The key determinant of impact was whether a household is a net producer or a net consumer of food. Our results are robust to a wide range of assumptions about wage changes over the period. However, the poor quality of data on wages and non-farm business income makes it impossible to provide a definitive account of welfare changes.

1. Introduction

The recent financial crisis has led to an outpouring of literature on its impact on developing countries (see Griffith-Jones and Ocampo 2009; IMF 2009; Mendoza 2009; Naude 2009; ODI 2009; World Bank 2009). Much of this work has focused on the macroeconomic impact given the ready availability of such data. Studies have shown large variations in impact, from the relatively mild (much of South and some larger East Asian economies, Latin America, and several African countries) (World Bank 2010) to the quite severe (several Eastern European and Central Asian countries and economies heavily specialised on trade, such as Singapore).

Notwithstanding this variation, the overall conclusion of much of the literature has been that developing countries have generally been less hard

hit than richer nations. In particular, many African countries appear to have been resilient to the shocks that they have faced (AfDB 2010). The conclusion that countries have been less affected is generally drawn from macroeconomic data. The literature on previous crises, including the East Asian crisis in the late 1990s, should lead us to expect that the impacts on different groups within countries will be highly heterogeneous (Frankenberg, Thomas, and Beegle 1999; Lokshin and Ravallion 2000; Mendoza 2009). In particular, they depend on the pathways through which the shock is transmitted, and the sources of income and patterns of expenditure of different groups within society (McCulloch, Baulch, and Robson 2003).

Assessing the welfare impact of the crisis therefore requires microeconomic data. Ideally, such data should be available as a panel of households from both before and after the shock, but inevitably very few countries have such data. Indeed, very few countries even have cross-sectional household data covering the period of the crisis (McCulloch and Grover 2010). For the vast majority of countries, all that is available is a household survey often collected some years prior to the 2008/2009 financial crisis.

There are two ways of responding to this difficulty. First, some authors construct computable general equilibrium (CGE) models to estimate the impact of the shock, disaggregating the household sectors as far as possible using the existing household survey data (Gutierrez, Paci, and Park 2010). Such models have the strong advantages of consistency (by definition) with the macroeconomic data, as well as the ability to specify precisely the nature of the shock. However, the results from such models are critically dependent on the quality of the underlying database and the behavioural assumptions of the model.

An alternative approach, taken here, is to estimate the welfare impact by combining high-frequency, spatially disaggregated price data with the existing household survey data. This micro-simulation approach has the strong advantage that it uses the prices actually faced by households across the country to determine impact. However, prices can change for many reasons, often unrelated to the financial crisis. Moreover, price changes occur continuously from the time when the previous survey was undertaken to the present. Therefore this approach estimates the combined effect of the various shocks that have taken place since the initial survey.

This article attempts to use this direct approach to estimate the impact of the shocks faced by Zambian households between 2006 and 2009. Zambians were subject to several major shocks during this period consisting of the fuel and food crisis shocks of 2008, followed by the financial crisis and associated commodity price collapse at the end of 2008, and the subsequent recovery during 2009. In addition, food prices are influenced significantly by patterns of rainfall and their effect on the harvest.

To preview our results, we find that there has been huge disparity between the impact of price changes on rural and urban households. Whilst rural households have gained slightly overall from rising prices, reflecting their strong net producer status, urban households have been hard hit. The largest impact on welfare has come from the effect of rapidly rising prices on the urban population during 2008, prior to the onset of the global financial crisis, although welfare for the urban population continued to deteriorate in 2009. Conversely, analysis suggests that welfare improved for the rural population until 2009, when rising non-food prices reversed some of the welfare gains. Although this overall pattern of results is robust to a range of sensitivity tests, we find that the absolute value of the impact on the urban population is sensitive to assumptions about the rate of wage increases over the period.

Our article is organised as follows. Section 2 describes the macroeconomic and policy developments between late 2006 and the end of 2009, and discusses the pathways through which these may have affected households. Sections 3 and 4 describe our methodology and the data respectively. Section 5 describes the price shocks experienced by households, and shows the income sources and expenditure patterns of the population. It then lays out our estimates of the welfare impact of the changes observed. Section 6 concludes.

2. Macroeconomic Context

Zambia's economy has been doing well in recent years. Gross domestic product (GDP) growth between 2003 and 2008 was 5.7%, the highest sustained rate of growth for over 30 years. In large part this has been driven by the surge of investment that followed the privatisation of the mines in 2000. Zambia's economy is still strongly dependent upon copper and cobalt, which comprise 74% of export revenue (calculated using CSO Zambia 2010). As a result the macroeconomic performance of the country is heavily influenced by the world price of copper.

Figure 1: The price of copper per tonne (grade A) from December 2000–2009
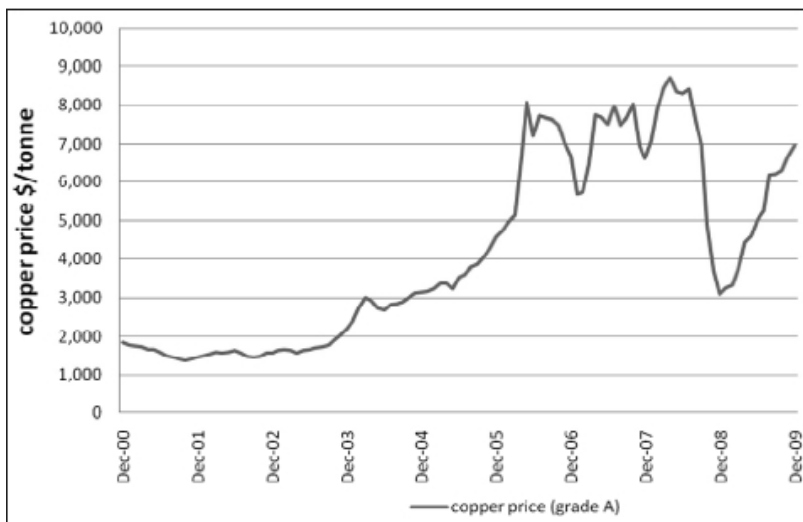
Source: IMF (2009).

Copper production in Zambia was in long-term decline from the mid-1970s until the end of the 1990s, as low world prices and inefficiency in the nationalised mines led to worsening performance. This trend was reversed in 2000 when the mines were privatised, and since 2000 there has been a surge of private investment into the mining sector, which has rapidly increased output. Separately, the world price of copper rose by 190% between 2003 and 2008, as burgeoning demand from newly emerging economies boosted prices. The run up of commodity prices since 2003 came to an end in mid 2008 as the spread of the sub-prime crisis gave rise to a loss of confidence and a dramatic fall in copper prices. The copper price fell from US$8,407 per tonne in July 2008 to a low of U$3,105 in December. As a result one mine closed and others were put into care and maintenance. An estimated 8,100 jobs were lost in the Copperbelt Province (Ndulo et al. 2009). Also the performance of the mines has a spillover effect on other aspects of the economy, since much of the manufacturing sector and many services exist to provide inputs to the mining sector. In addition formal sector mine workers are often indirectly responsible for supporting up to 20 other members of the extended family (Green 2009), so the loss of mine jobs can have a major negative impact on the communities in the mining areas.

It is nonetheless important to put this shock into a broader context. Zambia has two types of mines – new mines resulting from the major investments of recent years, which are low cost but highly capital intensive and which therefore employ relatively few people; and older mines which are higher cost and more labour intensive. As a result of major recent investments coming into operation in 2008 – notably the enormous Lumwana Mine in Solwezi – copper production actually increased even as the price of copper was collapsing in late 2008. It therefore seems likely that the industry used the opportunity of the crisis to close down uneconomical mines and to reduce costs. Moreover, the copper price has steadily risen since the initial shock so that by December 2009 it was back to US$6,977 per tonne. This has allowed the new and more efficient mines to expand employment, but, because they are more capital intensive, only around 1,500 jobs have been created (Government of Zambia 2009).

Aside from the direct impact of job losses on households, the main channel through which copper prices influence households is through its effect on the exchange rate (Figure 2). The large flows of Foreign Direct Investment (FDI) since the early 2000s as well as the foreign exchange earnings from mineral exports led to an appreciation of the exchange rate, particularly in 2005/2006, putting downward pressure on inflation, which fell to single figures (8.9%) at the end of 2007 for the first time in 30 years. The fall in commodity prices from June 2008 until the end of the year, compounded by the sudden withdrawal of portfolio capital from developing economies after the collapse of Lehman Brothers, led to a sharp fall in the exchange rate. Between October 2008 and April 2009, the Kwacha fell from K4,044 per US$ to K5,660, a 40% depreciation (Ndulo et al. 2009). This, combined with increases in maize, fuel, and fertilizer prices, increased inflation sharply to 16.9% by the end of 2008. However, the rebound of copper prices, as well as a fall in maize prices due to good rains, brought inflation down to 12.3% in October 2009.

Figure 2: Exchange rates and inflation from 2006–2009
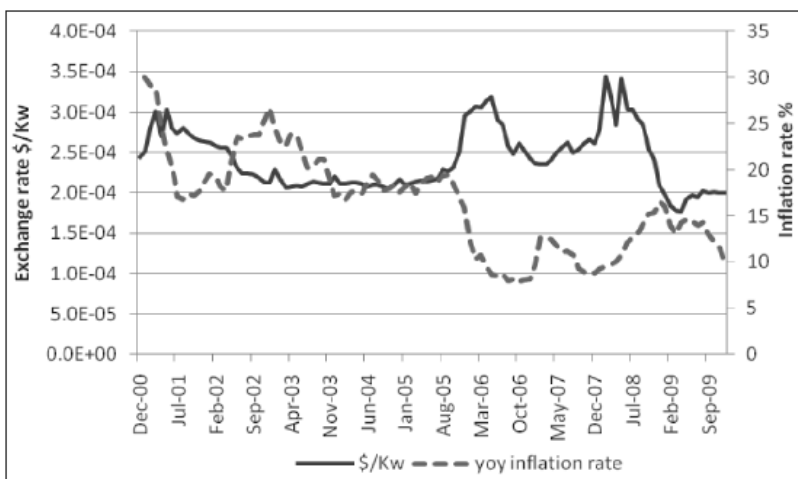
Source: Bank of Zambia and Central Statistics Office (CSO) Zambia (2010).

Fiscal Space

Other developments have also helped to provide macroeconomic stability and growth. In particular, Zambia's efforts to meet the Enhanced Heavily Indebted Countries Initiative (HIPC) completion point through the establishment of fiscal discipline resulted in a one-off cancellation of most of its external debt. Fiscal deficits, which averaged over 10% of GDP in the 1970s and 1980s, and 6% in the 1990s, were brought down to 2.9% in 2004 and have stayed below that level ever since. The resulting reduction in interest rates coupled with the debt reduction and increased revenue from mining led to an increase in fiscal space of 4.1% of GDP between 2004 and 2007 (Whitworth pers. comm., 2010). In addition, Zambia was one of the key beneficiaries of the agreement to issue Special Drawing Rights (SDR) in response to the financial crisis. It received US$630 million worth of SDRs bolstering reserves to 4.3 months of import cover.

Balance of Payments

The investments in the mining sector are now leading to substantial increases in copper production. This combined with the boom in prices up to 2008 lifted exports to US$4.7 billion in 2007, six times more than in 2000 (Economist Intelligence Unit 2008). There have also been strong

increases in exports of cotton, sugar, gemstones, horticulture, and floriculture. Imports have also grown strongly, particularly of machinery and transportation equipment for mining. In addition, repeated disruptions from the Indeni refinery in Ndola have necessitated importing refined petroleum products, adding to the import bill (see below).

Table 1: Key macroeconomic indicators for Zambia 2004–2008

Indicator	2004	2005	2006	2007	2008	2009
Real GDP growth	5.4	5.2	6.2	6.0	6.0	6.3
Inflation	17.5	15.9	8.2	8.9	16.6	9.9
Current account balance (% of GDP)	-11.4	-9.1	1.1	-2.4	-9.3	-5.4
Exchange rate ZK/US$ (av)	4772	4464	3578	4003	3753	5046
Fiscal deficit (% of GDP)	-2.9	-0.9	4.3	-2.1	-2.6	-2.7
Lending interest rate	30.7	28.2	23.2	18.9	19.1	21.0+

+ EIU forecast
Source: IMF (2009), EIU (2008), BoZ (2009), CSO (2007).

3. Methodology

There is a large body of literature on the use of household surveys to measure the impact of major economic shocks (Benjamin and Deaton 1993; Ravallion 1995; Demery and Squire 1996; Dercon 2000; Christiaensen, Demery, and Paternostro 2002; Chen and Ravallion 2004). Moreover, the literature examining the impact of trade liberalisation on households (McCulloch, Winters, and Cirera 2001; Winters, McCulloch, and McKay 2004) offers a variety of methodologies to track the pathways through which exogenous shocks affect households, as well as appropriate methods to estimate the effects.

In choosing a suitable framework, studies typically identify four features: the nature of the exogenous shock or policy change; its impact on the prices of goods and factors; how households respond to these price changes; and the resulting effect on outcomes such as welfare, poverty rates, or child labour. For example, Friedman and Levinsohn (2002) measure the impact of the 1997 Indonesian Financial crisis on household welfare by calculating the compensating variations – i.e. the amount of income required to get the household back to their pre-crisis utility. Given that the East Asian crisis caused the collapse of the Indonesian Rupiah and led to high inflation, the paper concentrates on the welfare impact of

increasing goods prices. The authors account for each household's exposure to price rises by weighting price changes by the composition of the household's consumption basket. Changing goods prices are likely to affect the demand for goods as households reallocate consumption, while changing factor prices may influence labour supply and other factor endowments. They account for such responses by calculating demand elasticities using regional variation in prices (Deaton 1990). Doing so does not change the qualitative story about the impact of the crisis, but does significantly reduce the size of the impact.

If one measures welfare changes through the impact of a shock on prices, it is important to take into account the fact that some households may gain from price increases. Thus Friedman and Levinsohn incorporate income increases due to rising prices by treating production of a good as a negative expenditure in their estimates of consumption. They show that price increases had a large distributional impact in rural areas where income from agricultural production is a large component of total income. However, this approach is not completely satisfactory for a country such as Zambia where 35% of the population live in urban areas and rely predominantly on wage income. If a shock is very sudden, then it may be reasonable to suppose that there is little chance for nominal wages to adjust; but where, as here, we are considering the impact of multiple shocks over a longer period, it is important to take into account wage adjustments. Porto (2005 and 2006) and Nicita (2009) achieve this in their estimations of the welfare changes after trade liberalisation by using a farm household model that includes the impact of tradable goods prices on wages. Although our Zambian data does not permit us to do this as precisely as they do, we also attempt to incorporate the impact of changing goods prices on wages in estimating welfare changes.

We therefore examine three channels through which prices affect welfare: consumption expenditure, household agricultural production, and wage income. In Zambia, including the potential benefits of price rises on agricultural production and wages is necessary given the importance of farm income for rural households and wage income for urban households. The welfare change for a household is derived from the indirect utility function of the standard agricultural household model:

$$U=V[P,x]$$

(1)

where household utility, U, is a function of a vector of prices, P, and total outlay, x. Assuming the usual conditions on labour supply hold (i.e. flexible labour markets and perfect substitution between household and brought-in labour), household production and consumption decisions are separable and so a first-order approximation to the change in welfare for household, h, is:

$$du = -\sum_{g=1}^{G} \theta_g^c \Delta \ln P_{gd} + \sum_{m=1}^{M} \theta_m^w \Delta \ln W_{prov} + \sum_{g=1}^{G} \theta_g^{og} \Delta \ln P_{gd}$$

(2)

=	θ_g^c	share of expenditure spent on good g
=	θ_g^{og}	share of income gained from producing good g
=	θ_m^w	wage share of income for member m in household
=	$\Delta \ln P_{gt}$	change log prices for good g in district d
=	$\Delta \ln W_{prov}$	change in log wage for each province

The first term represents the welfare change from consumption expenditure. Consumption of own-farm produce and food given in-kind make up a sizeable portion of total household consumption so are treated as negative expenditure shares in order to account for the increasing opportunity cost of these resources when prices rise. A further complication is that many rural households own their own dwellings, whereas many urban households have to rent accommodation. Theoretically we should credit homeowners with a welfare gain when rents rise because of the rising opportunity cost of housing services. However, it is debatable whether homeowners in Zambia would have been able to capitalise on the potential gains from rising rental prices. Therefore we also examine welfare changes, which do not include rent as a negative expenditure for homeowners.[1]

The welfare impact of wage growth, the second term, enters into the equation positively, signifying a welfare gain when wages rise. Ideally wage and earnings growth could be calculated empirically by comparing the 2005 and 2008 Labour Force Surveys, but the data for the latter survey was not made available. In principle, earnings data is also available from the quarterly Earnings and Employment Survey conducted amongst

registered firms – but the changes recorded in this dataset over this period are completely implausible.

We therefore adopt a simple sensitivity analysis of the results with respect to two very different assumptions about wages: that they did not rise at all in nominal terms, and that they rose exactly in line with provincial inflation.[2] The former assumption represents a plausible worse case for the change in welfare since it is extremely unlikely that wages did not respond at all to prices over the period.

Conversely, assuming that wages rose in line with inflation is probably optimistic, given the rapid inflation of 2008 and the financial crisis in 2009. Thus these assumptions almost certainly bracket the true effect. The final term in equation 2 represents the welfare change associated with changes in agricultural income resulting from the price changes experienced. Price changes of 22 goods were matched to the 24 farm income sources recorded in the household survey data. By using shares of income (i.e. revenue minus costs) to weigh the price changes, we implicitly assume that inputs experience the same percentage change in prices as outputs. If the price of farm inputs, such as fertiliser, rose faster than the price of agricultural outputs, then our calculations may overestimate the welfare gains from price increases.[3]

Finally, although we have tried to incorporate the largest sources of welfare change into our calculations, we nonetheless recognise that our estimates are incomplete. In particular, they exclude the welfare effects of changes to other income streams, such as non-farm business income, returns to savings, and remittances. Unfortunately, our data provides us with no empirical basis for estimating how these income sources may have been affected at the household level. Nor, unfortunately, can we consider the welfare impact of reduced demand for labour resulting from the financial crisis.   Although we know that there were significant redundancies in the mining sector in certain locations, we have no credible basis for allocating the reduced risk of employment since we have no information on the characteristics of those that were made redundant. Our calculations therefore probably underestimate the welfare losses experienced in some areas, particularly the Copperbelt Province. Nevertheless, we believe that our approach provides, at least, an initial indication of the relative magnitude of the welfare changes experienced by different groups of Zambian households based on the best data available.

4. Data

In order to estimate welfare changes we match household data on consumption and farm income to the price changes of goods at the most detailed possible level of regional and product disaggregation. For the income and consumption data we use the 2006 Living Conditions Monitoring Survey (LCMS V), the most recent nationally representative household survey available for Zambia prior to the onset of the financial crisis.[4] The 2006 LCMS covers all 72 districts in Zambia, sampling over 18,000 households stratified into eight different categories of rural and urban household.

District level price changes for commodities were taken from the Zambian CPI data, which covers just over half of the districts in Zambia. For districts without price data, the commodity prices of the closest district by road with price data were used as a proxy. This is likely to be a suitable approximation if heterogeneity between districts is small (if, for example, households closer by road share suppliers and have similar patterns of consumption). However, it could either exaggerate or underestimate the price changes if there is high regional price variation. For some goods, the coverage of districts is much sparser, perhaps reflecting differences in regional consumption baskets. Where this was the case, province level prices were used, calculated as the population-weighted average of available district prices in a province. In a few cases, the national average price was used where the province price could not be constructed.

Our results present estimated changes in welfare for December 2007, 2008, and 2009 relative to December 2006, the month of the LCMS survey. We use the same month each year to try to minimise the effects of seasonality on our results. Zambian households face seasonality in prices for both food and non-food items resulting from fluctuations in agricultural production and increases in the cost of utilities and rent (Jesuit Centre for Theological Reflection 2006).[5]

5. Results

We present our results in three sections. First we describe the price shocks experienced by Zambian households between 2006 and 2009, and the proximate causes of these changes. Second, we describe the expenditure patterns and income sources of Zambian households that influence the way

in which they have been affected by these price changes. Finally, we present our calculations of welfare changes over the period using the methodology described above.

Price Shocks from 2006–2009

There were substantial increases in the prices of food and non-food goods between the end of 2006 and the end of 2009 (see Figure 3). Annual inflation in Zambia rose to 16.6% in December 2008 compared to 9% and 10% in 2007 and 2009 respectively.

For food prices, a good harvest in 2007 led to relatively stable food prices until towards the end of the year, when seasonal shortages usually give rise to an increase in prices. However the harvest in 2008 was poor, in part due to flooding in some key provinces. As a result the decline in prices usually observed after the main harvest in May/June did not transpire and shortages of stock, combined with large increases in world food prices, resulted in food price inflation of 20% between December 2007 and 2008.

In 2009 the food price index dipped in March, a month before the usual end of the hunger season. This was probably as a result of the government intervening by releasing maize grain into the market at subsidised prices. A better harvest in 2009 kept food inflation lower for the rest of the year, with an annual rate of 8% by the end of 2009.

Non-food inflation climbed steadily between 2006 and 2009 and remained higher than food inflation for most of the period. The annual rate of non-food inflation was around 12% in both December 2007 and December 2009. The dramatic rise in world fuel prices during 2008 gave rise to large increases in fuel prices faced by households in mid-2008. However, the onset of the crisis caused a sharp fall in fuel prices, so that overall non-food inflation by December 2008 was only slightly more than in 2007 (see Figure 3). Rising energy costs and property rents prolonged non-food inflation into 2009 even after fuel prices had dropped.

Price increases for food were not uniformly distributed across the provinces. The range of annual food inflation was between 5% and 14% in 2007. This gap widened to 15–25% during 2008 before narrowing to 8–15.4% in 2009. From 2008 to the end of 2009, food inflation was highest in the Lusaka and the Copperbelt provinces, where households

engage least in agricultural activity. Food inflation was also high in Western and Central provinces in 2008, as floods led to poorer harvests. By contrast non-food inflation rates were quite similar across different provinces.

Figure 3: Consumer price indices constructed from CPI index using 2006 as the base
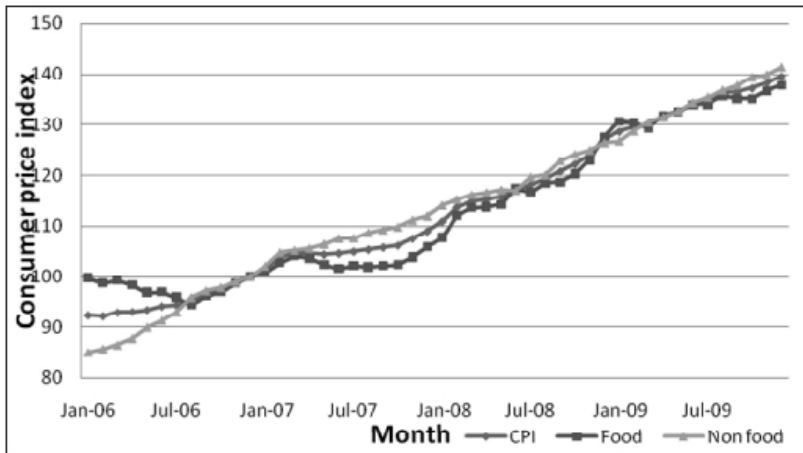
Source: CSO (2010).

Overall price indices can mask large variations in the underlying prices, so it is useful to examine the price changes of some key goods, services, and factors. Table 2 shows the provincial average prices of a 20L tin of maize grain. It is clear that the price of maize grain nearly doubled during 2008 for Southern and Copperbelt provinces and increased by around 60% for Lusaka, Northwestern, and Central provinces. During 2009 prices generally fell from their peaks at the end of 2008, although they continued to rise in Lusaka.

Table 2: Province average prices of 20L maize grain tin

	Maize grain price (Kwacha)				Percentage Change		
Province	Dec-06	Dec-07	Dec-08	Dec-09	Dec 07-Dec 06	Dec 08-Dec 07	Dec 09-Dec 08
Central	13161	16266	25669	22987	23.6%	57.8%	-10.4%
Copperbelt	12754	15279	30029	28220	19.8%	96.5%	-6.0%
Eastern	12449	15877	21867	21166	27.5%	37.7%	-3.2%
Luapula	17354	20766	26468	26455	19.7%	27.5%	0.0%
Lusaka	15788	15502	24917	28541	-1.8%	60.7%	14.5%
Northern	14337	18226	25652	27620	27.1%	40.7%	7.7%
North Western	14521	18545	29655	28055	27.7%	59.9%	-5.4%
Southern	11324	13610	26911	23534	20.2%	97.7%	-12.5%
Western*	15713	18989	18643	18954	20.8%	-1.8%	1.7%

Source: constructed from CPI price data provided by the CSO (2010).

A range of domestic and international factors led to the acceleration in maize and meal prices in the latter half of 2008 (Figure 4). First, there were large increases in the cost of farm inputs, notably fuel and fertiliser. The price of fertiliser doubled during the 2008/2009 input preparation period. This is reported to have caused smaller-scale farmers to hold out on selling maize grain in the hope of obtaining a higher price in order to offset rising fertiliser costs (FEWS NET 2008). Another significant factor was increased demand for Zambian maize grain and meal from Malawi. Shortages in Malawi gave rise to large price differentials between the two countries. This prompted significant volumes of maize to be channelled to Malawi through informal trade, thereby raising prices in Zambia. Finally, large-scale flooding in Southern, Western, and Central Zambia during the 2007/2008 planting season led to poor harvests in 2008 and heightened food insecurity in these areas.

Figure 4: Price indices of food commodities for 2006–2009
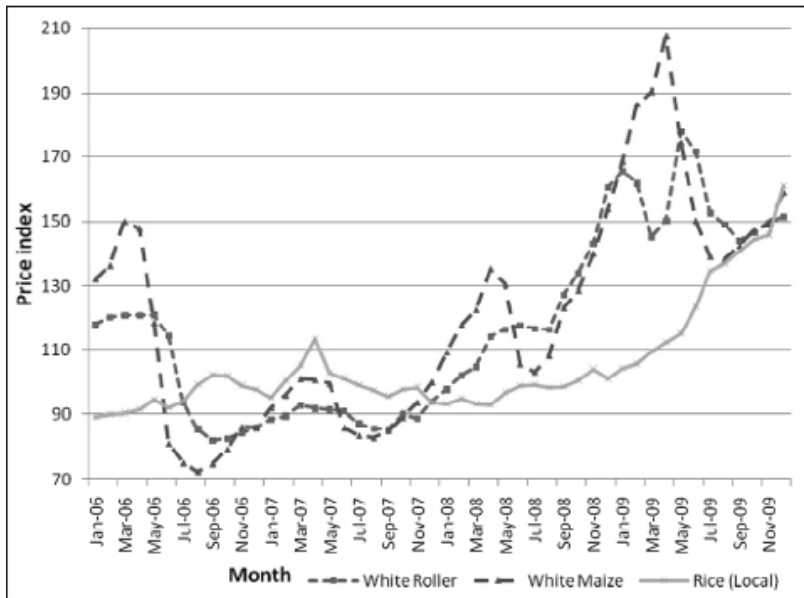
Source: constructed using CPI price data.

At the beginning of January 2009, the Zambian government intervened by supplying maize grain to millers who then sold meal at a subsidised price. This is probably the reason for the temporary drop in roller meal prices in March and April 2009. The harvest in 2009 was, however, good and as a result both grain and meal prices were lower in the latter half of 2009. On the other hand, other types of cereal have become more expensive (FEWS NET 2010). For example, the price of locally produced rice has increased by around 70% between the end of 2007 and December 2009. For non food commodities, the steady rise and then dramatic fall in the domestic price of petrol reflects, in part, the acceleration in world crude oil prices during 2008 followed by the dramatic drop in the oil price in October after the collapse of Lehmann Brothers (Figure 5).

Figure 5: Price indices of non-food commodities for 2006–2009
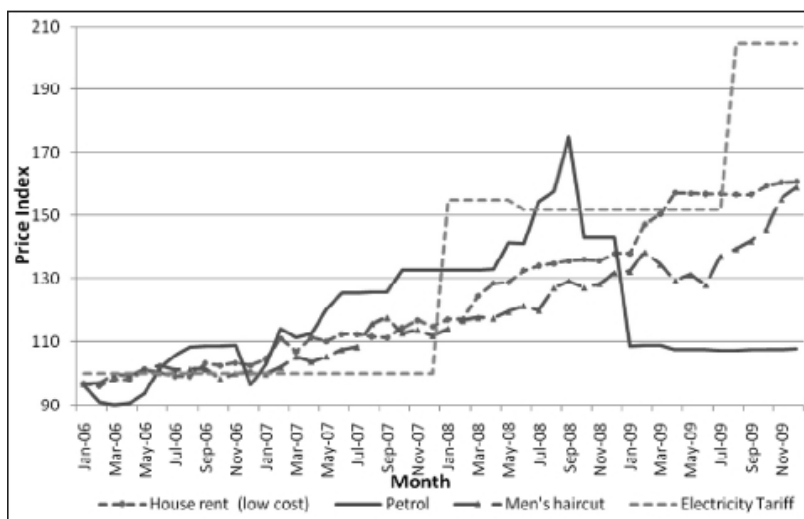
Source: constructed from CPI data.

Equally important was the decision to reduce excise duty on fuel from 60% to 30% for petrol and 36% to 7% for diesel in September 2008. Moreover, Zambia's Energy Regulation Board announced a further drop in the fuel price of 24% at the end of December 2008. Unlike other commodities, fuel prices have not returned to their 2008 levels. This has helped to offset increases in electricity tariffs, rent, and personal services. Electricity tariffs were increased by 54% at the beginning of 2008 to offset rising fuel costs, and a further 35% in mid-2009. Rents, which are typically adjusted at the beginning of the year, accelerated during 2008 and early 2009, but remained relatively stable for the rest of 2009.

Finally, Figure 5 also shows that the price of haircuts increased by 58% since 2006. Haircuts are a non-tradable good that consists largely of labour costs. This suggests that wages may have kept up with inflation.

Expenditure Shares

The impact on individual households of the price changes described above depends heavily on how important the goods and services are in household consumption. Table 2 shows the aggregate expenditure shares in 2006 for different types of food and non-food commodities, broken down by

expenditure quintile. There are dramatic differences in the expenditure patterns of the poor and the better off. Those in the bottom quintile spend almost three-quarters of their budget on food; conversely, those in the highest quintile spend almost 60% of their budget on non-food items. Thus better off households are disproportionately affected by rising rent, energy, furniture, and transportation costs. Since over 72% of urban households are in the top two expenditure quintiles, this implies that most urban households are significantly affected by changes in non-food prices.

Table 3: Aggregate expenditure shares by expenditure quintile in 2006

Food and non-food exp	Lowest quint	2nd	3rd	4th	Highest quint
Staple	35.2	29.4	24.6	20.8	12.3
Meat and dairy	4.2	4.7	5.2	6.3	6.6
Poultry, fish, and eggs	13.8	15.2	15.3	12.9	9.2
Fruit and veg	6.3	7.2	7.3	7.6	5.4
Beverage, ale, and tobacco	1.6	2.3	2.6	3.1	3.5
Tin food and condiments	13.4	11.1	9.5	7.6	4.5
Food	74.5	69.9	64.5	58.3	41.5
Clothing and footwear	9.5	11.0	12.1	11.4	12.6
Rent and household energy	4.6	5.7	7.4	10.2	10.5
Furniture and hh goods	0.0	0.2	0.5	2.0	5.8
Medical care	1.2	1.1	1.3	1.5	1.7
Transport	1.4	2.5	3.4	4.4	10.5
Recreation and education	1.6	2.4	3.0	3.6	7.5
Other goods and services	7.1	7.2	7.7	8.8	10.0
Non food	25.4	30.1	35.4	41.9	58.6

Source: CSO Zambia (2007).
Note: The expenditure shares presented are the shares of expenditure on the commodity out of total expenditure by all households in the relevant quintile

Conversely, most rural households are in the bottom three quintiles. Food shares are markedly higher for these quintiles. Breaking down expenditure shares by strata, Table 3 shows that small- and medium-scale farms have the highest food shares (67% and 63%) reflecting the high share of own produce in their consumption.[6] Non-agricultural rural households have a somewhat lower food share (55%) as they rely on food purchases, while large-scale farmers have a much smaller food share

(46%) because they have the highest income of all groups and so spend more on non-food items. Moreover, compared to urban households, large farmers mostly own their homes and so are unaffected by rent increases.

In urban areas, the food share of expenditure is much lower, primarily because of substantially higher rent and energy costs.   However, households living in low-cost housing areas had a much higher food share (46%) than those living in high-cost areas (31%), as well as much lower overall expenditure, suggesting that they were more vulnerable to the food-price increases in 2008.

Table 4: Aggregate expenditure shares by strata of household in 2006

Food and non food exp	Rural				Urban		
	Small farm	Medium farm	Large farm	Non-Agric	Low Cost	Medium Cost	High Cost
Staple	27.4	20.7	15.9	17.8	13.8	9.5	7.6
Meat and dairy	6.5	7.7	5.2	6.5	5.9	6.2	6.0
Poultry, fish and eggs	15.4	19.8	18.5	12.7	9.3	8.3	6.8
Fruit and veg	5.8	4.4	1.3	6.7	7.4	5.3	4.2
Beverage, ale and tobacco	2.7	2.4	2.6	3.3	3.5	2.7	3.6
Tin food and condiments	8.9	7.8	2.8	8.1	5.8	4.2	3.0
Food	66.7	62.8	46.3	55.1	45.7	36.2	31.2
Clothing and footwear	12.4	10.0	8.4	13.6	11.6	14.1	10.8
Rent and household	3.6	2.2	1.9	6.4	13.2	13.9	11.4
energy	1.1	1.7	11.9	3.9	4.2	6.0	9.0
Furniture and hh goods	1.4	1.3	1.4	1.5	1.7	1.2	2.0
Medical care	4.4	10.8	17.4	5.5	8.3	9.6	12.6
Transport	3.5	5.3	8.0	3.9	5.3	9.0	10.2
Recreation and education	6.8	5.8	4.7	10.1	10.1	10.0	12.8
Other goods and services							
Non food	26.4	31.3	49.0	34.8	44.3	53.8	56

Source: CSO Zambia (2007).

Of course, knowledge of expenditure shares does not translate directly into vulnerability. For agricultural households, the overall welfare change resulting from food-price increases depends on whether the households are net producers or consumers of food. Households that produce more than they consume are likely to be resilient to food-price increases, since they

can consume their own produce, and may benefit from increased revenue from farming sales. Their overall welfare also depends on changes in production costs and the significance of agricultural income in overall household income. Conversely, non-agricultural households are likely to be adversely affected by food-price rises, but these increases may be offset by increases in wages and business revenue.

Income Sources

Table 5 shows the share of households in different quintiles receiving income from a variety of sources, as well as the percentage of income they obtain from these sources. Interestingly, the majority of households in every quintile, except the top quintile, received some income from farming, and even in the top quintile, almost half of the households received some farming income. However, the importance of farming income varies dramatically by quintile, with more than two-thirds of income in the bottom quintile coming from farming, compared to less than 10% for those in the top quintile.

Conversely, the share of households with wage income rises sharply with income. Almost none of the bottom quintile receive wage income, whereas almost two-thirds of the top quintile do and wage income constitutes over half of all the income received by the top quintile. The preponderance and importance of non-farm business income also increases with per capita expenditure, constituting almost a quarter of income for the top quintile. Income from remittances and from financial assets is also more common among the better off, although neither income source constitute more than around 10% of income for any quintile.

Table 5: Share of households that report some income from income sources and aggregate income shares

Income	Share of households with income					% of income				
	Lowest quint	2nd	3rd	4th	Highest quint	Lowest quint	2nd	3rd	4th	Highest quint
Farm	84.2	83	74.7	60.1	48.9	67.4	49.7	36.8	22.2	9.2
Wage	1.8	10.7	20.7	37	64.7	1.8	9.0	15.9	28.0	51.3
Non-farm business	14.3	31.4	39.8	45.6	44.7	11.7	18.1	22.4	26.3	23.1
Remittances and in kind	15.3	28.4	31.8	31.3	30.9	7.3	8.7	10.2	8.4	3.7
Financial assets	10.3	20.1	22.6	29.7	36.7	3.1	3.8	4.3	5.8	8.0
Other	15.6	28.8	31.6	30.4	27.5	8.7	10.7	10.2	9.3	4.7

Source: CSO Zambia (2007).

The distribution of types of income across quintiles has important implications for the impact of price changes on welfare. In particular, the higher share of income from farming in the lower quintiles suggests that they are more likely to gain from food price increases. Conversely, welfare changes in the upper quintiles are likely to be sensitive to the assumptions made regarding wage changes. Tables 6 and 7 break down income sources by rural and urban strata. Unsurprisingly, the vast majority of rural households receive income from farming.

However, small- and medium-scale farmers are significantly diversified. Indeed, small-scale farmers only receive 42% of their income from farming, with 36% coming from wages and non-farm businesses. Non-agricultural households in rural areas receive 70% of their income from these two sources.

Table 6: Share of households that report some positive income from different sources

Share of hh with Income	Rural				Urban		
	Small farm	Medium farm	Large farm	Non-Agric	Low Cost	Medium Cost	High Cost
Farm	94.9	98.4	99.5	51.0	30.4	24.1	24.0
Wage	9.3	10.8	12.5	32.9	53.0	71.6	76.6
Non-farm business	28.2	21.9	28.3	47.9	48.5	38.3	30.1
Remittances and in kind	28.4	22.8	17.8	32.8	26.3	24.0	21.9
Financial assets	20.1	17.8	30.6	23.6	31.4	23.4	30.6
Other	28.8	26.0	30.5	27.1	24.6	19.0	17.1

Source: CSO Zambia (2007).

Table 7: Aggregate income shares from different sources by strata of households

Share of hh with Income	Rural				Urban		
	Small farm	Medium farm	Large farm	Non-Agric	Low Cost	Medium Cost	High Cost
Farm	42.3	57.7	84.7	9.4	4.9	1.7	2.0
Wage	16.0	13.2	8.7	38.1	46.9	65.0	63.4
Non farm business	20.0	11.6	3.4	32.8	27.6	21.3	20.2
Remittances and in kind	7.9	5.6	0.3	7.9	5.0	2.9	3.2
Financial assets	4.4	3.6	0.8	5.7	9.6	5.3	8.1
Other	9.3	8.2	2.1	6.3	6.1	3.9	3.2

Source: CSO Zambia (2007).

In urban areas, wage income dominates, constituting more than 60% of income for those in medium- and high-cost housing in urban areas. But here also, income sources are diversified, particularly for those in low-cost housing areas who receive over a quarter of their income from non-farm businesses. This pattern of income sources suggests that the key beneficiaries of food-price increases are likely to be large farmers, because 85% of their income comes from this source. Similarly, welfare changes for those in urban areas will be sensitive to assumed changes in wages. It also suggests that our estimates of welfare changes for urban households and for non-agricultural households in rural areas may be downwards biased, since increases in non-farm business income resulting from price rises are not included in our estimates of welfare changes. Similarly, income from remittances, assets, borrowing, and savings are important sources for a small fraction of households, but since there is no data on returns to these income sources during the period they are omitted from our estimates of welfare change.

Estimates of Welfare Changes

We now apply the methodology outlined above to estimate welfare changes between December 2006 and the same month in 2007, 2008, and 2009. All estimates are relative to December 2006. Our results show that price increases in Zambia since 2006 had extremely divergent impacts on households depending on whether they were net producers or consumers of food. In our simulation, the majority of rural households, as net food producers, experienced a gain in welfare since 2006 due to the rising value of their agricultural produce. By the end of 2008, this gain amounted to 7% of total household expenditure, although the slowing of food inflation and higher non-food inflation during 2009 reduced this gain to 3% by the end of that year (Table 8). These welfare gains increase if one assumes that wages rose in line with provincial inflation, but the difference is small because, as noted above, wages constitute a relatively small share of rural household income.

By contrast, urban households, who are overwhelmingly net food consumers, suffered a large loss in welfare between December 2006 and 2009 (Figure 6). This was due to both higher food and non-food costs. In the full wage adjustment scenario, the decline in welfare was still present over the period for urban households, but less severe. However, wage adjustments did not completely offset losses from inflation, because wages only constitute 47–65% of income for these households. In both wage

scenarios the sharpest drop in welfare was in 2008. In spite of lower food and fuel prices, urban households continued to lose in 2009, notably because of higher rent and electricity costs.

Table 8: The national, rural, and urban average welfare change for Dec 2007, 2008, 2009 relative to Dec 2006

Date	Zero wage growth			Full wage adjustment		
	National	Rural	Urban	National	Rural	Urban
Dec-07	0.7	4.2	-5.7	2.6	4.8	-1.5
Dec-08	-2.3	7.3	-20	2.6	8.9	-9
Dec-09	-8.4	3	-30	-1.2	5.4	-13

Source: Authors' calculations.

Figure 6: Urban and rural average welfare change for Dec 2007–2009 for (i) zero wage growth and (ii) wage growth in line with province inflation
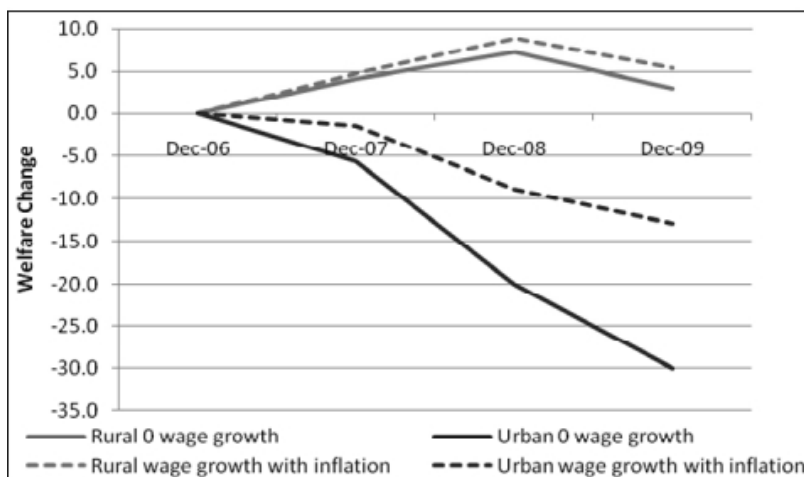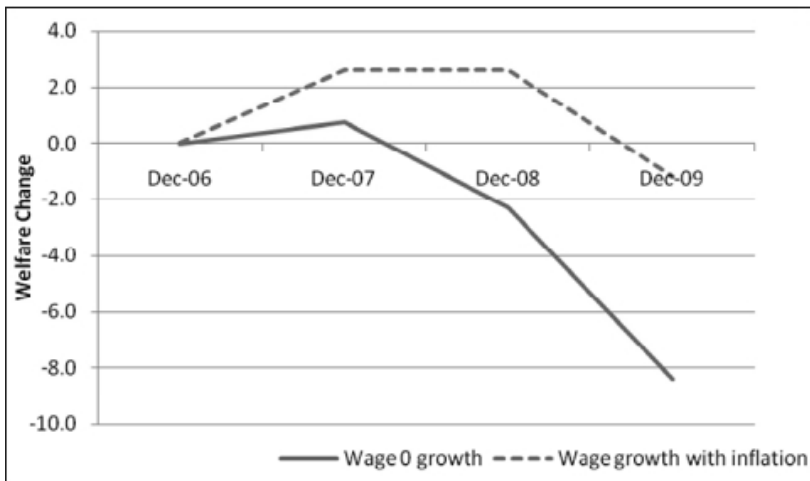

Source: Authors' calculations.

Because the change in welfare varied between significant gains and substantial losses for different households, the national welfare change showed contrasting accounts of the overall welfare trend depending on the assumptions made about wage increases. If one assumes that wages did not rise over the period, then overall welfare in Zambia improved by 0.7%

in the year 2007, but then fell sharply in the subsequent two years due to the heavy losses experienced by urban households (Figure 6). Despite high food inflation in 2008, the steepest fall in national welfare was in 2009 due to higher non-food prices, which decreased welfare for both rural and urban households. If wages are fully adjusted for inflation, the national welfare trend is driven by the gains of rural households in 2007 and 2008, only falling below zero in 2009 as non-food prices rise sharply.

Figure 7: National average welfare change for Dec 2007–2009 relative to Dec 2006 for (i) zero wage growth (ii) wage growth in line with province inflation

Source: Authors' calculations.

When households are categorised by strata, the relationship between agricultural production and welfare appears even stronger (Table 9). All categories of farming household benefit from food-price increases, the larger-scale farmers gaining more because of their concentration of income from this source. Rural non-agricultural households and all categories of urban households saw continual falls in welfare throughout the period.

Table 9: Average welfare change since Dec 2006 for different categories of household for (i) zero wage growth and (ii) wage growth in line with inflation

		Zero wage adjustment			Full wage adjustment		
Domain	Household	Dec-07	Dec-08	Dec-09	Dec-07	Dec-08	Dec-09
Rural	Small Scale	4.7	8.5	4.4	5.2	9.8	6.4
	Medium Scale	5.7	18	11	6.2	19	13
	Large Scale	6.8	17	17	7.2	18	18
	Non-Agric	-3.5	-14	-21	-1.3	-8.2	-12
Urban	Low Cost	-5.8	-20	-30	-2	-10	-15
	Medium Cost	-4.7	-18	-29	0.83	-3.7	-7.2
	High Cost	-5.8	-19	-29	0.39	-2.6	-5.6

Source: Authors' calculations.

Table 10 disaggregates the welfare changes into those arising from the consumption expenditure term in equation 2 and those due to increases in agricultural income, for the zero wage growth case.   Agricultural households fared better than non-agricultural households on both these components of welfare change. Not only did they receive a much larger increase in income from farm sales, but they were also more resilient on the consumption side because of their consumption of own-produced food. Medium and large farms benefited much more than small farms from the rising price of food, as they are more dependent on farm income. However, smaller farms benefited slightly more than large farms on the consumption side, reflecting the larger share of own produce consumed by small farmers, as well as their smaller share of non-food expenditure.

Table 10: Welfare change from consumption and agricultural production for zero wage growth

		Welfare change Consumption			Agricultural production		
Domain	Household	Dec-07	Dec-08	Dec-09	Dec-07	Dec-08	Dec-09
Rural	Small Scale	2.2	1.2	-3.4	2.5	7.3	7.9
	Medium Scale	0.13	0.36	-6	5.6	17.6	17
	Large Scale	-1.2	-2.4	-5	8	19.4	22
	Non-Agric	-3.6	-14	-21	0.1	0.32	0.31
Urban	Low Cost	-6.5	-21	-31	0.26	0.98	0.99
	Medium Cost	-4.9	-19	-29.7	0.19	0.68	0.69
	High Cost	-6	-19	-29.8	0.17	0.7	0.79

Source: Authors' calculations.