Welfare and Distributional Impacts of Price Shocks in Malawi:

A Non-Parametric Approach

Rui Benfica

Department of Agricultural, Food and Resource Economics

Michigan State University

East Lansing, MI 48824, USA

Selected Poster prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguaçu, Brazil, 18-24 August, 2012

WELFARE AND DISTRIBUTIONAL IMPACTS OF PRICE SHOCKS IN MALAWI: A NON-PARAMETRIC APPROACH

Rui Benfica[1]

Michigan State University

Abstract. This analysis uses measures of Compensating Variation (CV) and Net Benefit Ratios (NBR) to assess the short-run effects of higher prices on different income groups in rural and urban areas of Malawi. Compensating Variation analysis indicates that urban households, particularly the poorest are the most severely affected both in the aggregate consumption and also in terms of food consumption. In rural areas, relatively better off households are more negatively affected by overall price increases, but the poorest are the group that suffers the most with food price shocks. A fifty percent supply response of agricultural production would result in significant positive effects on rural household welfare. A significantly larger response would be required in maize production to yield significant benefits among households. Results are translated into tangible policy and programmatic recommendations to inform the design of interventions aimed at mitigating those effects and promoting economic growth and poverty reduction. This analysis suggest that policies should be oriented towards facilitating a supply response by households resulting in a significant increase in maize, other staple food and non-food production, supporting household livelihoods diversification, while putting in place programs to assist the most vulnerable groups.

Key Words: Compensating variation, distributional impacts, Malawi, net benefit ratio.

[1] Contacts: Telephone: 1-202-629-6168; Fax: 1-517-432-1800; E-mail: benficar@msu.edu.
The author would like to acknowledge the support from the World Bank, Poverty Reduction and Economic Policy, Africa Region. The author is solely responsible for the content presented in this paper.

WELFARE AND DISTRIBUTIONAL IMPACTS OF PRICE SHOCKS IN MALAWI: A NON-PARAMETRIC APPROACH

1. INTRODUCTION

Over the past few years there has been great concern over the increase of commodity prices worldwide, with particular emphasis to foods and fuels. As a country that imports all of its fuel and as a net food importer overall, Malawi is not an exception. Concerns over inflationary pressures have emerged recently following a policy debate around the effects of a possible policy induced currency devaluation that is feared to cause an increase in the price of imported goods and domestically produced commodities that rely on imported intermediaries or are traded internationally. A key question facing policy makers in Malawi is related to the impacts of those price increases on different income groups and what measures should be put in place to minimize the negative impacts and maximize potential opportunities arising for domestic producers.

This household level analysis is aimed at evaluating the potential welfare and distributional impacts of price increases, induced by policy or external shocks. Typically, this type of analysis requires the use of household level data for the pre- and post-price increase period, which makes it difficult to provide timely policy advice. In this paper we use a "rapid response methodology" proposed by Friedman and Levinsohn (2002) that uses Compensating Variation (CV) measures and does not require the post price increase household level survey data. Using household level data from 2004/5 and detailed price data for 2007-2010, the study applies partial equilibrium analysis techniques, more precisely individual and aggregate CV measures. The paper goes one step ahead and uses those measures to come up with the actual amount that would be needed to compensate specific groups in the short run and the fiscal cost it would imply. In addition to this methodology and in order to bring up the production side of the picture, and assess likely benefits, we use Net Benefit Ratio (NBR) analysis (Deaton, 1989) for food and agricultural commodities (and separately for maize) to estimate the first-order impacts of price increases with focus on the identification of relative effects across major household income groups (as producers and consumers) in urban and rural areas. This analysis is not designed to address all issues and respond to all questions, but rather a practical assessment using household level and price data to inform policy.

The route for this paper is as follows. First, we briefly describe the data sources used in the analysis. Second, we describe the analytical methods used and the simulations proposed to assess the distributional impacts of price changes. Third, we present and discuss the results of the CV and NBR analysis and simulations. Finally, we summarize and discuss the implications of the findings for policy/interventions aimed at mitigating the negative effects of price increases on selected groups and maximize the opportunities arising for domestic producers.

2. DATA

This analysis uses household level data from the Malawi Integrated Household Survey II undertaken in 2004/5 (IHS2). The survey was conducted by the National Statistical Office (NSO) in the period March 2004 through April 2005. It collected data from a national sample of 11,280 rural and urban households. The sampling design is representative at both national, rural and urban, and district level hence the survey provides reliable estimates for those areas (NSO, 2005). It covers topics ranging from household demographics, consumption patterns and expenditure levels, agriculture, livestock, and fisheries production and marketing, child anthropometry, among other variables. For the purposes of this analysis we use this data to generate variables related to household consumption expenditure by commodity.

In addition to the survey data, we use information on prices of key items from the Consumer Price Index (CPI) database from the National Statistical Office, for the period 2000-2010, to generate the necessary price change data used in the models.

3. METHODOLOGY

This analysis uses two partial equilibrium analysis methodologies to evaluate the effects of price changes on household welfare. First, an aggregated Compensating Variation (CV) analysis, that is focused exclusively on the consumption side, to evaluate the monetary losses incurred by different household groups in rural and urban areas as a result of price increases of a full set of goods and services overtime. Second, the analysis undertakes Net Benefit Ratio (NBR) analysis, initially focused in the aggregate set of food and agricultural commodities and then, separately,

on maize, a widely domestically produced/consumed commodity. This methodology evaluates the net effect of price increases on households as producers and consumers. The following is a more elaborate, but brief, description of the approaches.

3.1. Compensating Variation (CV) Analysis

This evaluation of welfare and distributional impacts of price changes looks at measures of *Compensating Variation (CV) – the amount of money sufficient to compensate households following price changes and enable the return to the initial levels of utility* (Friedman and Levinsohn, 2002). This approach uses household survey data from before the on-set of price increases to compute budget shares of individual commodities or aggregates per household (Wi^h). Then, it merges these data with price change data for selected consumption items (Pi) observed in urban and rural areas over a specified period of time. Given a price increase, the higher the budget share of a household for a given good or service the higher will be the CV. The first-order approximation of Compensating Variation (CV) is:

$$(1) \qquad \Delta lnC^h = \sum_{i=1}^{n} Wi^h \Delta lnPi$$

Where, i refers to individual goods (or aggregates) in the commodity system and h refers to the household.

The analysis includes 7 commodity aggregates and 10 household groups, i.e., quintiles of household consumption expenditure per capita in urban (5) and rural (5) areas of Malawi. Budget shares are calculated for each household using the IHS2 consumption expenditure data. Price change data are computed from the NSO price series. For the purposes of this analysis, we consider price changes from 2007 to 2010.[2]

The analysis derives individual as well as aggregate CVs for the different groups of households in urban and rural areas and estimates the Malawi Kwacha (MK) 2010 value necessary to compensate households to return to 2007 utility levels, i.e., what would be the cost of supporting, through some kind of intervention, the return to original utility levels.

[2] The analysis makes an implicit assumption is about the stability of consumption expenditure patterns between the survey year (2004/5) and 2007. We also assume that there is no substitution in consumption as households face and respond to price changes.

3.2. The Net Benefit Ratio (NBR) Analysis

The welfare impact of rising food prices on welfare depends on several factors. These include the extent of price transmission, the number of net buyers or net sellers of the commodities in question, the share of consumer's budgets devoted to the items overall, the extent of own-consumption relative to market purchases, and the effect of price increases on real wages (Simler and Fox, 2008). Deaton (1989, 1997) suggests a simple approach for estimating the short-run impact of an increase in food prices on household welfare. The approach consists in the estimation of a Net Benefit Ratio (NBR). The ratio is the difference between the production ratio (PR) and the consumption ratio (CR). The basic model equation follows:

$$\Delta W^h = \sum_{i=1}^{n} \Delta Pi(PRi^h - CRi^h) \qquad (2)$$

Where, ΔW^h is the resulting change in welfare, expressed as a percentage of total expenditures of household h, ΔPi is percentage change in commodity i prices (s), PRi^h is the production ratio expressed as commodity i sales divided by household h consumption expenditure, and CRi^h is consumption ratio, expressed as the value of commodity i purchases divided by household h consumption expenditure. This ratio can be compute for individual commodity i or for aggregates of commodities.

The direction of the impact of a price increase will depend on whether the household is a net buyer or a net seller of the commodity i commodities in question. This measure can be interpreted as the elasticity of real income with respect to changes in the price of the commodities. For net sellers this elasticity is positive (winners) and for net buyers negative (losers). The magnitude of the impact is determined by the value of net sales (purchases) relative to a household's expenditure.

The analysis generates information about the proportion of net sellers, net buyers and the NBRs for households by level of expenditures, area of residence (urban/rural), gender of the head, and poverty status in 2005. This methodology has been extensively used to assess the first-order welfare effects of a food price increase in many contexts including recent applications to Ethiopia (Loening and Oseni, 2007), Uganda (Simler and Fox, 2008), and Mozambique (Arndt et al., 2008).

In this paper we estimate the NBR for the aggregate of food and agricultural commodities, and individually for maize, a key crop that is widely produced, consumed and traded in rural and urban areas of Malawi and internationally. In addition to the generation of baseline NBRs and net seller/buyer position, we introduce a supply response scenario and evaluate the welfare and distributional implications to rural and urban households.

4. DISCUSSION OF RESULTS

4.1. Compensating Variation (CV) Analysis

Compensating variation (CV) measures – *the amount of money sufficient to compensate households following price changes and enable the return to the pre-change levels of utility* - are used to evaluate which household groups in urban and rural areas lose more in the presence of price shocks. As indicated earlier the magnitude of the effects will depend on the weight of the individual commodities in total household expenditures (budget shares) and the size of the price changes of those commodities that all households face. In this analysis, we first look at these two factors and then look at the actual CV measures.

Table 1 presents the budget shares for selected goods and services. There are five results that stand out. First, food expenditure shares are the highest in both rural (77%) and urban (64%) areas. Second, in both rural and urban areas the poorest households experience higher average food budget shares than their relatively better-off counterparts. Third, housing/utility costs are the next most important expenditure item in urban areas (6.9%) followed by transport expenditures (5.8%) with a greater burden on the relatively well-off households. Fourth, in rural areas spending in clothing/footwear is the second most important spending item (4.6%). Finally, while housing/utilities and transportation expenses are relatively less important overall, in urban areas, they present a greater burden on relatively less poor households than in rural areas.[3]

[3] Note that all reported differences in budget shares across rural and urban areas and lower and higher quintiles within each area are statistically different, considering a 95% confidence interval.

Table 1. Household Budget Shares for Selected Aggregate Goods and Services, Malawi, 2005

Goods and Services	Household budget Shares by Area of Residence					Confidence Interval (+/-)	
	Urban Areas		Rural Areas				
	Share	SE	Share	SE	Difference		
Food and Beverages	63.8	0.44	77.0	0.14	-13.3	0.8	*
Alcohol and Tobacco	1.7	0.13	2.9	0.06	-1.2	0.3	*
Clothing/Footwear	5.2	0.14	4.6	0.06	0.6	0.3	*
Housing/Utilities	6.9	0.19	1.0	0.04	5.9	0.3	*
Furnishing	4.6	0.12	3.9	0.03	0.7	0.2	*
Transport	5.8	0.26	3.0	0.07	2.9	0.5	*
Misc.Goods/Services	4.5	0.08	3.4	0.03	1.1	0.1	*

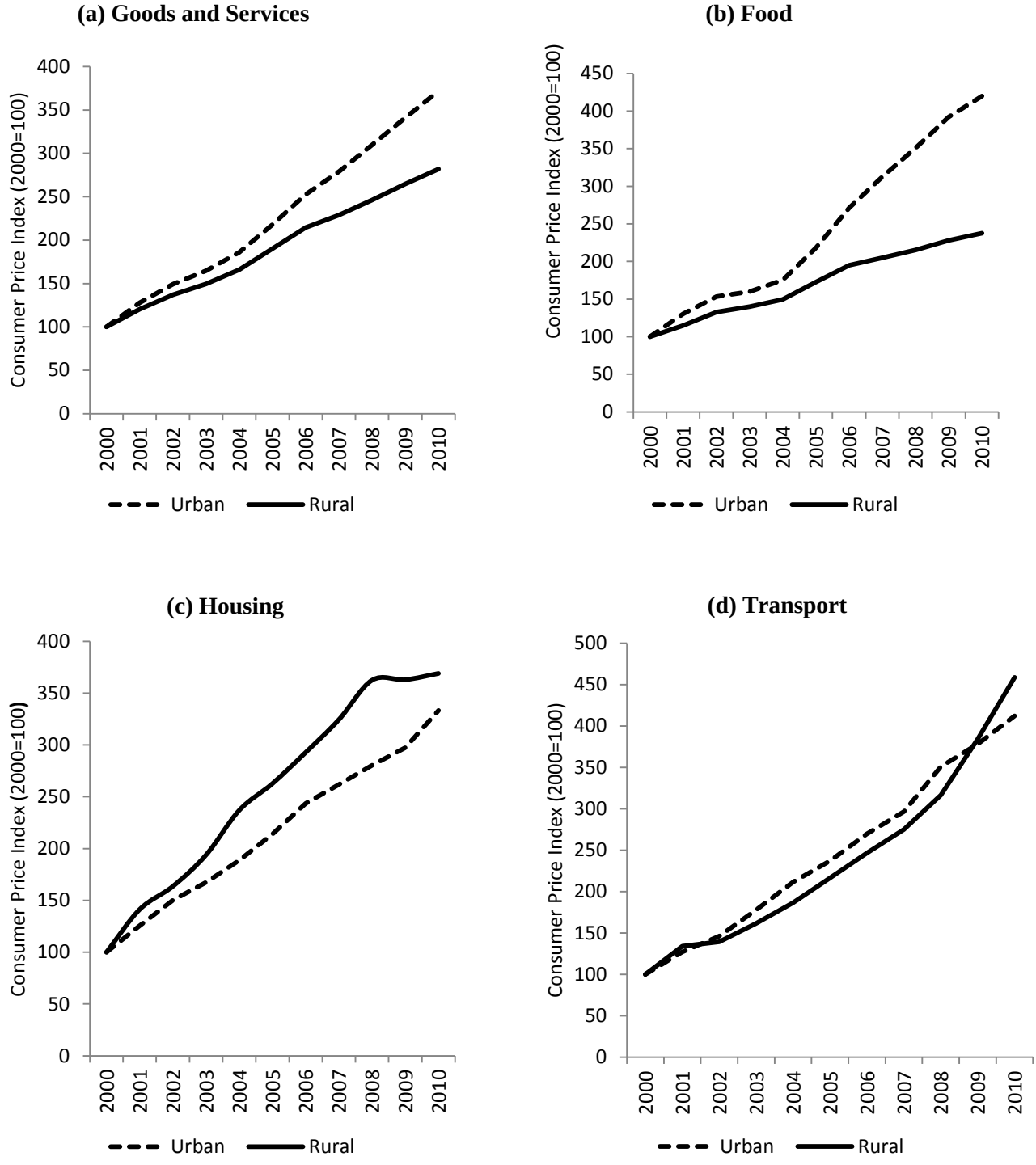
Household Budget Shares by Bottom and Top Quintiles

Goods and Services	Urban Areas					Confidence Interval (+/-)	
	Bottom Quintile		Top Quintile				
	Share	SE	Share	SE	Difference		
Food and Beverages	78.0	1.23	57.0	0.59	21.0	3.9	*
Alcohol and Tobacco	0.7	0.20	2.1	0.20	-1.5	1.3	*
Clothing/Footwear	2.4	0.48	5.7	0.19	-3.3	1.3	*
Housing/Utilities	2.0	0.55	8.4	0.26	-6.4	1.7	*
Furnishing	5.5	0.58	4.7	0.16	0.8	0.5	*
Transport	0.8	0.37	8.4	0.41	-7.5	2.7	*
Misc.Goods/Services	5.8	0.45	4.2	0.09	1.6	0.7	*
Goods and Services	Rural Areas					Confidence Interval (+/-)	
	Bottom Quintile		Top Quintile				
	Share	SE	Share	SE	Difference		
Food and Beverages	81.4	0.26	72.0	0.37	9.4	1.0	*
Alcohol and Tobacco	1.8	0.12	3.8	0.16	-2.0	0.4	*
Clothing/Footwear	2.9	0.11	5.3	0.13	-2.4	0.3	*
Housing/Utilities	0.4	0.06	1.9	0.10	-1.4	0.3	*
Furnishing	4.4	0.07	3.8	0.10	0.6	0.2	*
Transport	1.2	0.09	5.6	0.22	-4.4	0.6	*
Misc.Goods/Services	3.9	0.08	2.9	0.05	1.0	0.2	*

Note: * The last column indicates a statistically significant difference in budget shares between rural and urban areas (top panel) and between bottom and top quintiles in each area (bottom panels). The confidence intervals are related to the difference of in budget shares. Source: Authors calculations based in Malawi IHS2 (2004/5).

Figure 1. Consumer Price index: Overall, Food, Transport and Housing (2000-2010)

(2000=100)



Source: Malawi NSO (2011).

In terms of price changes, the panels in Figure 1 present the evolution of the CPI (2000=100) over the past decade for all goods and services (a), and the major expenditure items: food and beverages (b), housing and utilities (c), and transport (d).

Overall, prices have been on the rise, with urban areas standing out relative to rural areas (panel a). This is particularly due to high food price inflation that is notably strong in urban areas since 2005 (panel b). Housing/utilities have had relatively higher rates of increase in rural areas, with a tendency to some convergence in recent years. Increases in transport prices have been quite similar although urban transport costs have been in a steeper rise since 2008, likely due to the increases in world fuel prices.

For the purposes of our analysis we consider price changes between 2007 and 2010 – by computing individual goods and services inflation rates for the aggregate expenditure groups considered for the analysis. Table 2 presents the price changes in Malawi, and by area of residence, over the period.

Table 2. Price Changes (2007-2010)

Goods and Services	Price Changes (2007-2010) (percent)		
	Malawi	Urban	Rural
Food and Beverages	20.7	34.3	16.1
Alcohol and Tobacco	37.9	38.8	37.3
Clothing/Footwear	26.4	27.9	25.7
Housing/Utilities	20.2	27.3	13.8
Furnishing	52.3	31.4	61.7
Transport	48.2	39.0	66.8
Misc. Goods and Services	36.0	34.4	37.9
All Goods and Services	26.6	33.3	23.1

Source: Malawi NSO (2011).

Among the major consumer items, it is particularly important to highlight the increase in food prices in urban areas, but also those of housing and transportation. In rural areas, food and housing price inflation have been particularly moderate, and the price of non-food items, such as transportation, have been quite significant. Alcohol and tobacco have had relatively high increases in both areas but they have relatively low shares in consumer budgets.

The CV measures (Table 3) indicate that the impact of price increases on households is not uniform across geographic regions and wealth groups. The differences are, to a great extent, due to geographical variation in price changes and household consumption expenditure patterns. Several results stand out. First, the aggregate CV (accounting for all goods and services) is significantly higher in urban areas (31% of initial household expenditure) than in rural areas (21%), implying that urban households are the ones most adversely affected by price increases.

Second, when looking at the relative effect of the aggregate price changes across the different income groups in each area, we find some significant differences between households in urban and rural areas. Indeed, as presented in Table 3 (comparing top and bottom quintile households) and illustrated in Figure 2 (panel a), in urban areas the poorest households are the ones that need the greatest relative amount (33%) of new income to return to 2007 (pre-price increase) consumption levels, and that amount declines as household expenditure increases (30.7%). An opposite result is found for rural areas where poor households need the least relative compensation (20%) to get back to pre-price increase consumption levels, and that increases with expenditure levels – so relatively richer households bear a great deal of the burden (22.1%). This have to do with the fact that food price increases in rural areas have been relatively smaller and poor households spend relatively less than wealthier households in clothing, alcohol/tobacco and transportation, items for which prices have increased substantially over the period.

Third, in terms of individual items, i.e., the item specific attribution to consumption loss, it is worth noting that, when compared to rural areas, CVs in urban areas are higher for virtually all items, but the levels of the CVs and the differences are in general relatively small (Table 3). One exception is food for which average urban CV (22%) is almost the double of that for rural areas (12%), which means that urban households bear most of the burden of food price increases. In addition to that, in spite of similarities in the overall trend - higher CVs for the poorest relative to other groups - differences in CVs across income groups (poorest to richest quintiles) are a lot more accentuated in urban areas, ranging from 27% to 19% (Figure 3, Panel a), than in rural areas where they are very similar, ranging from 13% to 11% (Figure 3, Panel b).[4]

[4] Note that all reported differences CVs across rural and urban areas and lower and higher quintiles within each area are statistically different, considering a 95% confidence interval.

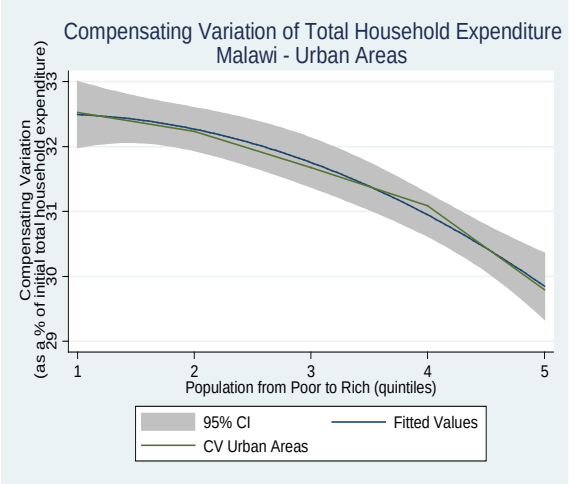
Table 3. Compensating Variation (% of initial household expenditure)

Goods and Services	Compensating Variation (as a % of initial household expenditure)					Confidence Interval (+/-)	
	Urban Areas		Rural Areas				
	CV	SE	CV	SE	Difference		
Food and Beverages	21.7	0.15	12.3	0.02	9.4	0.2	*
Alcohol and Tobacco	0.7	0.05	1.1	0.02	-0.4	0.1	*
Clothing/Footwear	1.5	0.04	1.2	0.01	0.3	0.1	*
Housing/Utilities	1.9	0.05	0.1	0.01	1.7	0.0	*
Furnishing	1.4	0.04	2.4	0.02	-1.0	0.1	*
Transport	2.3	0.10	2.0	0.05	0.3	0.3	*
Misc.Goods/Services	1.7	0.03	1.2	0.01	0.5	0.0	*
All Goods/ Services	31.5	0.07	20.9	0.04	10.6	0.2	*
Household Budget Shares by Bottom and Top Quintiles							
Goods and Services	**Urban Areas**					Confidence Interval (+/-)	
	Bottom Quintile		Top Quintile				
	CV	SE	CV	SE	Difference		
Food and Beverages	26.5	0.43	19.4	0.20	7.1	1.3	*
Alcohol and Tobacco	0.3	0.08	0.8	0.08	-0.6	0.5	*
Clothing/Footwear	0.7	0.14	1.6	0.05	-0.9	0.4	*
Housing/Utilities	0.5	0.15	2.3	0.07	-1.7	0.5	*
Furnishing	1.7	0.18	1.5	0.05	0.2	0.4	*
Transport	0.3	0.15	3.3	0.16	-2.9	1.1	*
Misc.Goods/Services	2.1	0.17	1.6	0.03	0.6	0.3	*
All Goods/ Services	32.7	0.18	30.7	0.11	1.9	0.7	*
Goods and Services	**Rural Areas**					Confidence Interval (+/-)	
	Bottom Quintile		Top Quintile				
	CV	SE	CV	SE	Difference		
Food and Beverages	13.0	0.04	11.5	0.06	1.5	0.2	*
Alcohol and Tobacco	0.7	0.04	1.4	0.06	-0.7	0.2	*
Clothing/Footwear	0.8	0.03	1.4	0.03	-0.6	0.1	*
Housing/Utilities	0.1	0.01	0.3	0.01	-0.2	0.0	*
Furnishing	2.7	0.04	2.3	0.06	0.4	0.2	*
Transport	0.8	0.06	3.7	0.15	-.3.0	0.3	*
Misc.Goods/Services	1.3	0.03	1.0	0.02	0.3	0.0	*
All Goods/ Services	20.0	0.07	22.1	0.13	-2.1	0.3	*

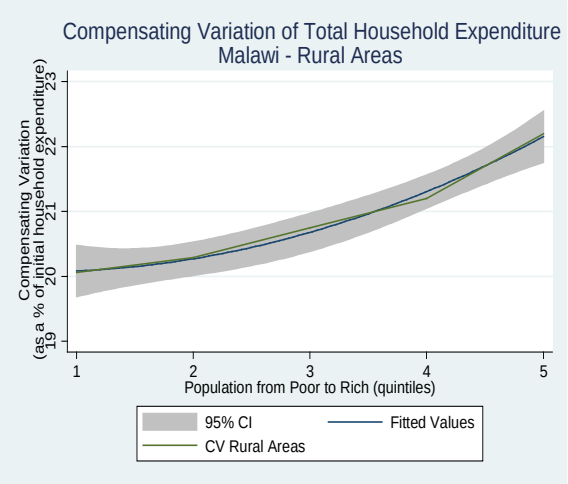
Note: * The last column indicates a statistically significant difference in CVs between rural and urban areas (top panel) and between bottom and top quintiles in each area (urban and rural areas in bottom panels). The confidence intervals are related to the difference of in CVs.
Source: Authors calculations based in Malawi IHS2 (2004/5).

Figure 2. Compensating Variation for Total Household Expenditures, Rural and Urban Areas

(a) Urban Areas, by quintiles of PCE



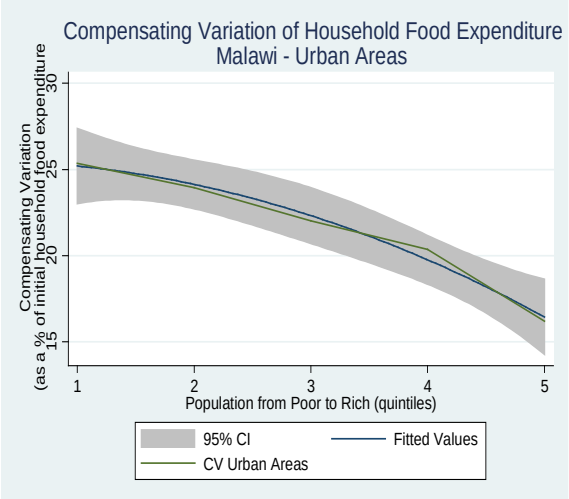
(b) Rural Areas, by quintiles of PCE



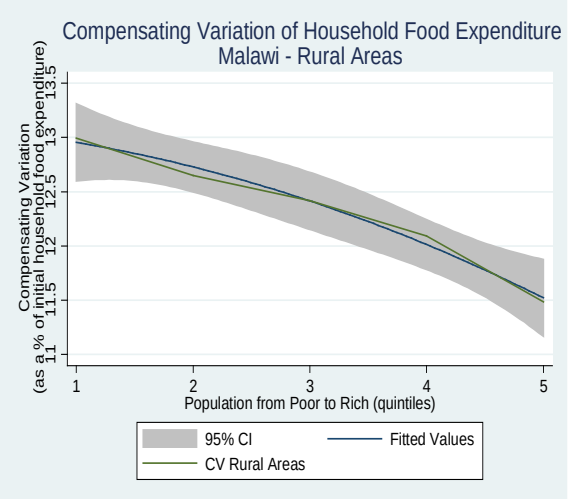
Source: Author's computations.

Figure 3. Compensating Variation for Food Items, Rural and Urban Areas

(a) Urban Areas, by quintiles of PCE



(b) Rural Areas, by quintiles of PCE



Source: Author's computations.

Based on these results, we estimate the total value in terms of Malawian Kwachas of the loss of utility incurred by the different household groups in rural and urban areas, i.e., how much it would cost to compensate the households for the lost consumption as a result of the price increases over the period in consideration. Note that we use here the period 2007 to 2010, but the results would apply to price changes of similar relative magnitude over any given period of time provided CPI deflators were used to undertake the necessary adjustments. In this case, since we used survey data from 2005 but want to consider 2007 as the baseline year for which pre-price increase utility levels are considered, we had to use CPI deflators for the individual consumption items in order to get the adequately adjusted monetary estimates for that baseline year. Once the CV values were estimated we report them in 2010 MK terms.

Note that average household CV values are extrapolated to the total population of households in each representative household group. Table 4 presents estimates for food (the major consumption item) and total expenditures, highlighting the poorest quintile in rural areas and the two poorest quintiles in urban areas.

Table 4. Estimation of CVs in Monetary Terms – Food/Total (2007 Levels Deficit in 2010 Prices)

Area of Residence and Wealth Quintile	Population Distribution	Compensating Variation per Household				"Total Compensating Variation" (all Households)	
		Food Consumption		Total Expenditure			
		(%)	(MK)	(%)	(MK)	Food (MK)	All Expenditure (MK)
Urban							
Poorest	91,060	26.7	28,409	32.6	30,701	2,586,866,362	2,795,589,838
Q2	91,060	25.4	33,527	32.5	37,988	3,052,956,838	3,459,130,540
Q3	91,060	24.6	45,022	32.2	52,302	4,099,725,184	4,762,638,443
Q4	91,060	23.6	52,956	32.1	63,924	4,822,113,058	5,820,863,891
Richest	91,060	18.2	121,260	30.1	177,465	11,041,873,646	16,159,850,938
All Urban	455,298	21.5	281,174	31.3	362,379	25,603,535,088	32,998,073,651
Rural							
Poorest	481,472	12.9	9,021	20.1	15,087	4,343,240,869	7,264,157,697
Q2	481,472	12.6	11,978	20.3	20,776	5,766,911,809	10,003,159,701
Q3	481,472	12.3	14,864	20.9	27,182	7,156,464,939	13,087,164,760
Q4	481,472	11.8	18,541	21.5	36,246	8,926,791,351	17,451,392,190
Richest	481,472	11.0	35,027	23.0	78,629	16,864,373,301	37,857,864,233
All Rural	2,407,359	12.2	89,430	21.0	177,921	43,057,782,268	85,663,738,582

Source: Author's calculations.

Given the earlier results on relative effects across space and wealth groups, and the fact that, if any intervention to mitigate the negative effects of price increases is to be implemented, will likely have scarce resources available, we focus on the costs to compensate a selected group of households – the 40% poorest urban (182,000 households or 838,000 individuals) and the 20% poorest rural (482,000 households or 2.1 million individuals) households. Table 4 presents a complete set of results for alternative targeting considerations.

Estimates indicate that it would cost approximately 13.5 billion MK to be able to compensate the bottom 20% of households in rural (7.3 billion MK) and 40 % of the bottom urban households (6.2 billion MK) areas for the loss of total utility as result of the price increase corresponding to a three year period. Focusing exclusively on food, the major consumption item for households in both rural and urban areas, it would cost 9.9 billion MK, corresponding to 4.3 billion MK in rural and 5.6 billion MK in urban areas to compensate for the period.[5] Note that the focus on food is better supported by the evidence and would be more justified on a cost and equity stand point as well, because aggregate CVs are relatively more equal across groups, but losses due specifically to food price inflation are significantly higher among the poorest in both urban and rural areas.

4.2. Net Benefit Ratio (NBR) Analysis

The NBR analysis adds to the picture the production side of the equation to account for the fact that higher prices, while hurting consumers, as illustrated above, have the potential to benefit domestic producers that take advantage of higher prices to respond to marketing opportunities.

In this analysis we focus at two levels. First, on the aggregate NBR that evaluates the net effects of price increases in food and agricultural commodities, most of which are both produced and consumed by the households. Second, we look at NBRs for Maize, a commodity widely produced and consumed by households in Malawi. For each case, we evaluate the net position of households (net sellers versus net buyers) and the effects of price increases on real household income, illustrated by the net benefit ratios, across rural and urban areas, by wealth status (per capita expenditure quintiles), poverty status (non-poor, poor, ultra-poor) and gender of the

[5] Converted to an annual basis, the total compensating amount corresponds to approximately 4.5 billion MK to compensate the bottom 20% of households in rural (2.4 billion MK) and 40% of households in urban areas (2.1 billion MK) for the loss of total utility. Focusing exclusively on food, would cost annually 3.3 billion MK, corresponding to 1.4 billion MK in rural and 1.9 billion MK in urban areas.

household head. Then, for each case, we simulate the effects of supply response scenarios. The following sub-sections describe the results.

4.2.1. Net Benefit Ratio (NBR) Analysis of Food and Agricultural Commodities

The NBR for food and agricultural commodities represent the effect of a doubling in the price of those items on real household income. The purpose here is to get a sense of the direction and relative magnitude of the effects across space, gender, poverty status and wealth dimensions.

Since the NBR is determined by the relative net (seller/buyer) position of households, the analysis starts by looking at the proportion of net sellers and net buyers of the food/agricultural products. Table 5 shows that just over a quarter of households nationwide are net sellers of food/agricultural products, with shares varying widely between urban (3.0%) and rural (32%) areas. In both rural and urban areas, the incidence of net sellers (buyers) increases (decreases) with wealth. Also, overall poorer and female-headed households exhibit lower (higher) incidences of net sellers (buyers).

Net benefit ratio analysis indicates that food/agricultural product price increases hurt real incomes of households in all income groups in both rural and urban areas when there is no supply response. A doubling in the price of food/agricultural products would reduce real household income in about 5.4% nationally, with significant differences between rural (only 3.4% reduction) and urban areas (about 20% reduction). In each area the poorest households are being the most severely hurt, with losses in real income close to 27% among the poorest in urban areas and 9% among poorest in rural areas.

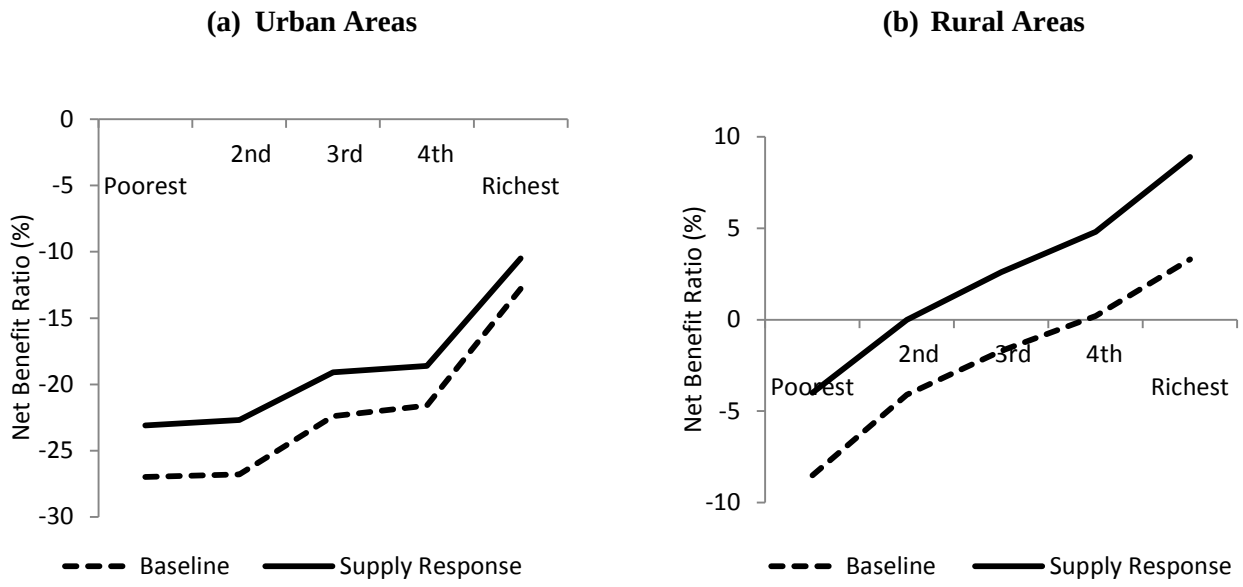
Negative effects fall with income levels in both areas, with the rural households faring relatively better than their urban counterparts - Table 5 and dotted line (baseline) in Figure 4. This result follows from the fact that there are relatively more households that produce food and are in a net seller position in rural areas than in urban areas. In fact, the negative effects are not only relatively smaller among rural households, but in those areas the relatively less poor do actually potentially benefit from price increases – a positive NBR of 2.9% for the richest households. As expected, net benefit ratios are lower for female headed and relatively poorer households.

Table 5. Aggregate Net Position, Effects of Agricultural Products' Prices and Supply Response

	Estimated Impact of Food and Agricultural Products Price Shocks			Policy Simulation: 50% increase in Agricultural Output	
	Net Position (% of households)		Net Benefit Ratio (NBR) Effect of 100 % Food/Agricultural Price Increase	Effect of on NBR of a 50% Agricultural Supply Response	
	Net Sellers	Net Buyers	NBRo	NBR1	Change in NBR (NBR1-NBRo)
Malawi	27.9	72.1	-5.4	-1.2	4.2
PC Expenditure Quintiles					
Poorest	23.5	76.5	-9.3	-4.8	4.5
2nd	28.3	71.7	-5.8	-1.8	4.0
3rd	32.8	67.2	-3.9	0.2	4.1
4th	31.2	68.8	-3.5	0.9	4.4
Richest	24.3	75.7	-2.1	2.4	4.5
Area of Residence					
Urban	3.0	97.0	-19.7	-16.7	3.0
Poorest	2.3	97.7	-27.0	-23.1	3.9
2nd	2.8	97.2	-26.8	-22.7	4.1
3rd	5.2	94.8	-22.4	-19.1	3.3
4th	2.3	97.7	-21.6	-18.6	3.0
Richest	2.6	97.4	-12.8	-10.5	2.3
Rural	31.5	68.5	-3.4	1.1	4.5
Poorest	24.1	75.9	-8.8	-4.0	4.8
2nd	30.1	69.9	-4.4	0.0	4.4
3rd	34.4	65.6	-1.7	2.6	4.3
4th	37.5	62.5	-0.8	4.8	5.6
Richest	36.1	63.9	2.9	8.9	6.0
Poverty Status					
Ultra-Poor	22.7	77.3	-9.9	-5.3	4.6
Poor	26.1	73.9	-7.5	-3.3	4.2
Non-Poor	29.8	70.2	-3.2	1.1	4.3
Sex of the household head					
Male	29.9	70.1	-4.7	-0.2	4.5
Female	19.1	80.9	-8.8	-5.5	3.3

Source: Malawi IHS2 (2004/5)

Figure 4. Net Benefit Ratio (NBR) for Food and Agricultural Products (Baseline and Supply Response Scenarios)



Source: Author's computations.

We perform a simple supply response simulation scenario – increase in agricultural production of about 50%. We assume that net sellers sell about 75% of that increase and net buyers sell only about 25% of the additional output.

Results (Table 5 and black line (supply response) in Figure 4) indicate that this would generate some positive effects on all household groups. In urban areas, given the relatively lower food production levels and greater dependence on purchases at baseline, the increased production would still leave all households bearing a negative income effects, i.e., higher but still negative NBRs in Figure 4, Panel (a). In rural areas, however, only the poorest households would remain at a loss, with the other groups generating positive NBRs. So, higher food prices with a positive supply response are capable of generating positive net benefits.

4.2.2. Net Benefit Ratio (NBR) Analysis for Maize

We now focus on the effects of increases in the price of maize, a commodity widely produced and consumed by over 90% of Malawian households in both rural and urban areas (NSO, 2005). Regarding the net position of households, Table 6 shows that only about a quarter of households nationwide are net sellers of maize, with shares varying widely between urban (6.7%) and rural (32%) areas. In both rural and urban areas, like in the case of food/agricultural products, the incidence of net sellers (buyers) increases (decreases) with wealth. Also, overall poorer and female-headed households exhibit lower (higher) incidences of net sellers (buyers).

In order to get a sense of the distribution and concentration of sales and maize consumption among households, a driver of the distribution of potential benefits/losses, we look at the average value of household sales by rural and urban households across wealth groups. While maize consumption - both total and purchased - is fairly similar across different income groups in both urban and rural areas it is the value of maize sales that is highly unequal with richer households selling a great deal and the poorer ones selling significantly lower amounts. There is a much higher concentration of maize sales than maize purchases. Gini Coefficients for sales are 0.87 and 0.76 for urban and rural areas, respectively. For maize purchases it is only 0.33 in both areas.

Maize net benefit ratio analysis indicates that, in the absence of supply response, maize price increases hurt real incomes of households in all income groups in both rural and urban areas. A doubling of the price of maize would reduce real household income in about 10% in both rural and urban areas, with the poorest households in each area being the most severely hurt with losses in real income close to 20% .

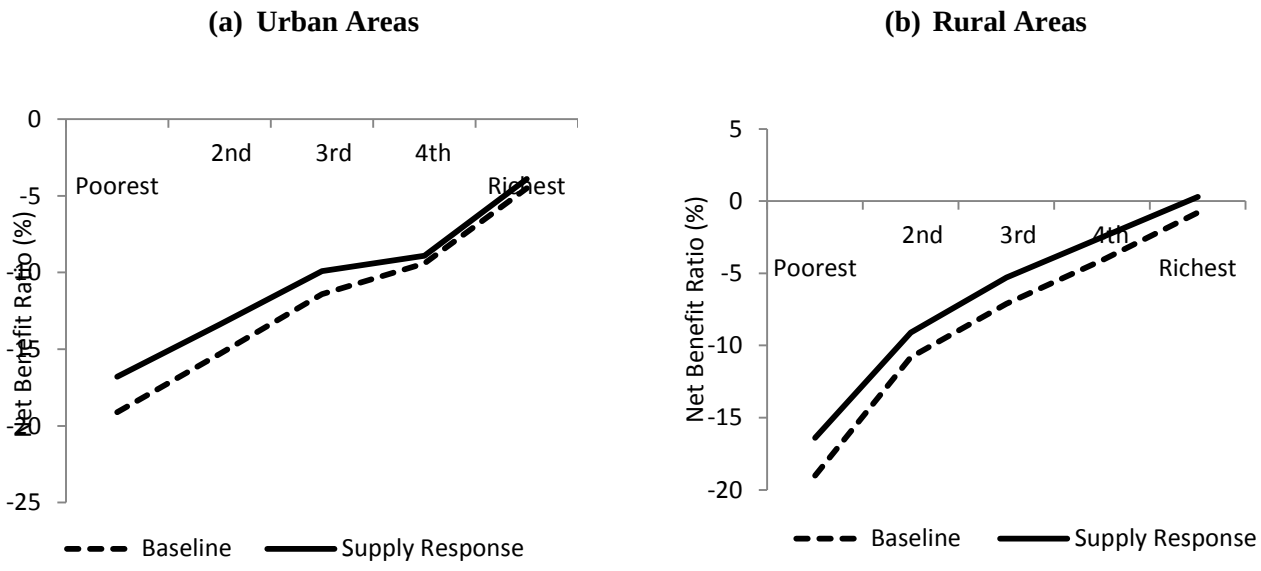
The negative effects fall with income levels in both areas, with the rural households faring relatively better than their urban counterparts - Table 6 and Figure 5, panels (a) and (b). This result follows from the fact that there are relatively more households that are net sellers of maize in rural areas than in urban areas and they have relatively high net sales. As expected maize net benefit ratios are lower for female headed and relatively poorer households.

Table 6. Net Position, Effects of Increased Maize Prices and Supply Response on Real Income

	Estimated Impact of Maize Price Shocks			Policy Simulation: 50% increase in Maize Output	
	Net Position (% of households)		Net Benefit Ratio (NBR) Effect of 100% Price Increase	Effect of on NBR of a 50% Maize Supply Response	
	Net Sellers	Net Buyers	NBRo	NBR1	Change in NBR (NBR1-NBRo)
Malawi	26.8	73.2	-10.5	-8.4	2.1
PC Expenditure Quintiles					
Poorest	13.6	86.4	-19.0	-16.4	2.6
2nd	21.4	78.6	-11.4	-9.7	1.7
3rd	32.9	67.1	-7.9	-6.2	1.7
4th	36.3	63.7	-5.6	-4.2	1.4
Richest	40.1	59.9	-2.5	-1.5	1.0
Area of Residence					
Urban	6.7	93.3	-10.0	-8.6	1.4
Poorest	5.0	95.0	-19.1	-16.8	2.3
2nd	4.8	95.2	-15.3	-13.4	1.9
3rd	6.5	93.5	-11.4	-9.9	1.5
4th	4.9	95.1	-9.4	-8.9	0.5
Richest	14.5	85.5	-4.5	-3.9	0.6
Rural	31.9	68.1	-10.6	-8.4	2.2
Poorest	15.7	84.3	-19.0	-16.4	2.6
2nd	25.7	74.3	-10.8	-9.1	1.7
3rd	39.6	60.4	-7.1	-5.3	1.8
4th	43.6	56.4	-4.1	-2.5	1.6
Richest	47.4	52.6	-0.8	0.3	1.1
Poverty Status					
Ultra-Poor	14.2	85.8	-19.7	-16.9	2.8
Poor	20.2	79.8	-15.4	-12.9	2.5
Non-Poor	29.2	70.8	-5.5	-3.9	1.6
Sex of the household head					
Male	27.7	72.3	-10.0	-7.9	2.1
Female	21.9	78.1	-12.8	-10.7	2.1

Source: Malawi IHS2 (2004/5)

Figure 5. Net Benefit Ratio (NBR) for Maize and Maize Product
(Baseline and Supply Response Scenarios)



Source: Author's computations.

A supply response scenario of 50% maize production increase is simulated, assuming that net sellers of maize sell 75% of the output, while net buyers sell 25%. Results in Table 6 and black line (supply response) in Figure 5 (a) and (b) indicate that this would generate some positive effects on all household groups, but the majority of households in both urban and rural areas would still be potentially negatively affected in spite of this supply response.

5. SUMMARY AND IMPLICATIONS

This analysis looked at the impacts and policy implications of higher consumer prices in Malawi, induced by policy or external shocks. It uses Compensating Variation (CV) and Net Benefit Ratio (NBR) analysis methods to identify the relative impact on different household income groups in rural and urban areas of Malawi to better support the design and targeting of policies aimed at mitigating those effects and promoting economic growth and poverty reduction.

Overall, price increases observed in recent years are more accentuated in urban areas. Compensating Variation (CV) analysis indicates that the more market dependent urban households, particularly the poorest are the most severely impacted in the aggregate and also in terms of food consumption. In rural areas, relatively richer households are more negatively affected by overall price increases (accounting for all goods and services), but the poorest are the group that suffers the most as a result of food price increases.

These findings are translated into actionable quantitative programmatic recommendations. Estimates indicate that, on an annual basis, it would cost approximately 4.5 billion MK to compensate the bottom 20% of households in rural (2.4 billion MK) and 40% of households in urban areas (2.1 billion MK) for the loss of total utility. Focusing exclusively on food, which is strongly supported by the findings, it would cost annually 3.3 billion MK, corresponding to 1.4 billion MK in rural and 1.9 billion MK in urban areas.

The study undertakes Net Benefit Ratio (NBR) analysis for aggregate food/agricultural production and for maize individually. Several results stand out. First, net benefit ratio analysis for food/agricultural products indicates that price increases hurt real incomes of households in all income groups in both rural and urban areas when there is no supply response. In each area the poorest households are being the most severely hurt, with negative effects falling with income levels in both areas, with the rural households doing relatively better than their urban counterparts. Negative effects are not only relatively smaller among rural households, but in those areas the relatively less poor do actually potentially benefit from price increases. Net benefit ratios are lower for female headed and relatively poorer households. Results indicate that a supply response consisting in 20% increase in aggregate food/agricultural production would generate some positive effects on all household groups, but households in urban areas would still bear a negative income effect. In rural areas, however, only the poorest households would remain at a loss, with the other groups generating positive NBRs. This means that with the appropriate set of policies designed to support agricultural supply response in a high price environment, rural households can actually rip some benefits.

Second, maize NBR analysis shows that over 90% of households in urban areas and about 70% in rural areas are net buyers of maize, i.e., have negative NBRs, being, therefore potential losers in the event of massive price increases. The defined increase in maize prices would lead to a loss

of 10% in real income with households of all income groups in rural and urban areas losing. In each area, the poorest households have the smallest number of net sellers and bear the highest losses in real incomes when maize prices increase. We find that, while maize consumption is relatively well distributed across income groups, maize sales are very concentrated among the relatively well-off households in both areas, but more notably in urban areas. This is a limitation for the observance of broad-based benefits. Policy simulations suggest that, given the severity of the situation, even a supply response translated in 50% increase in current production levels, while increasing the volume of sales and reducing household dependency on maize purchases, would still leave the majority of households bearing a negative effect of massive maize price increases.

The results in this analysis suggest that policies should be oriented towards facilitating a supply response by households resulting in a significant increase in maize, other staple food and non-food production, supporting household livelihoods diversification, while putting in place programs to assist the most vulnerable groups.

REFERENCES

Arndt, C., R. Benfica, N. Maximiano, A. Nucifora, J. Thurlow. 2008. "Higher food prices and responses for Mozambique." Agricultural Economics 39, 2008: 497-511.

Deaton, A. 1997. "The Analysis of Household Surveys: A Microeconometric Approach to Development." World Bank and Johns Hopkins University Press, Washington, DC.

Deaton, A. 1989. "Rice prices and income distribution in Thailand: A non-parametric analysis." Economic Journal 99(395): 1–37.

Friedman, J., J. Levinsohn. 2002. "The Distributional Impacts of Indonesia's Financial Crisis on Household Welfare: A Rapid Response Methodology". The World Bank Economic Review, Washington DC.

Loening, J., and G. Oseni. 2007. "Approximating rural and urban welfare effects of food price inflation in Ethiopia." World Bank, Washington, DC. Mimeo.

NSO - Malawi National Statistics Office. 2005. "Integrated Household Survey 2004-2005." Zomba, Malawi.

Simler, K., and L. Fox. 2007. "The Impact of Higher Food Prices on Poverty in Uganda." World Bank, Washington, DC. Mimeo.