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This paper is a draft submission to

Inequality—Measurement, trends, impacts, and policies

5–6 September 2014 Helsinki, Finland

Food Price Heterogeneity and Income Inequality in Malawi: Is Inequality Underestimated?

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May 16, 2014

Abstract

The paper uses data from the Second and the Third Integrated Household Surveys to examine whether the poor pay more for food in Malawi, and the consequences of the poverty penalty on inequality measurement. The results show that regardless of location and year, poor households pay more for food compared to nonpoor households. It is found that measured inequality based on a new consumption aggregate is much higher than official inequality figures. The paper also finds that nominal inequality underestimates "real" inequality, with the underestimation ranging from 3.9% to 7.1% for the Gini coefficient, 8.4% to 16.2% for the Thiel L, and 0.11% to 24.5% for the Thiel T. The paper therefore finds that official inequality figures understate the inequality problem in Malawi. The high inequality levels may partly explain the puzzle of high economic growth which has led to marginal poverty reduction in Malawi as these high levels of inequality could be impeding the poverty reducing effect of economic growth.

Keywords: poverty penalty; inequality; Malawi

1 Introduction

A number of studies (e.g. Attanasio and Frayne, 2006; Beatty, 2010; Gibson and Kim, 2013) have found evidence that food prices maybe regressive in the sense that the poor compared to the non-poor pay more for food. A number of reasons are given in the literature for the existence of this poverty penalty (see e.g. Muller (2002) and Mendoza (2011)). First, serving the poor may be more costly, either because they live in remote areas with higher transport costs or because they live in informal environments, where poor infrastructure and weak legal rights make it risky for retailers to set up and so a price premium is charged to recoup these extra costs (Mendoza, 2011). Second, the poor face greater liquidity constraints, as such they may buy food in small quantities or at suboptimal periods, and therefore not enjoy quantity/bulk discounts, which in turn leads to higher unit prices (Rao, 2000; Beatty, 2010). Additionally, in a developing country context, liquidity constraints and a lack of proper postharvest storage facilities

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or a combination of both may force the poor to buy food at suboptimal periods. For instance, World Bank (2007) finds that maize- a staple food in Malawi- is sold cheaply immediately after harvest but bought expensively during the lean season. Third, the poor may bear higher search costs which result into the poor paying more for food. The higher search costs can be due to either the fact that anything earned or produced by the poor goes towards satisfying basic needs and therefore search related activities have a relatively higher opportunity cost or that they live in geographically disperse rural areas, where transport infrastructure is less developed which in turn entails that searching is more costly.

The existence of a poverty penalty in food purchases has implications on both equity and efficiency. The double dividend of increased efficiency and equity (Muller, 2002) arising from improved food market performance may be due to the fact that as the prices paid by the poor converge to the prices paid by everyone else, real inequality would fall while at the same time resources would be more efficiently allocated (Gibson and Kim, 2013). Additionally, and of interest in this paper, a poverty penalty in food purchases has implications on the measurement of income inequality. This is especially so in developing countries because according the Engel's Law, the poor's food budget share is higher than the nonpoor's, and therefore the inequality augmenting effect of regressive food prices may even be more pronounced in a context where the majority are poor. With regressive food prices, nominal income inequality may underestimate the extent of income inequality. For instance, Rao (2000) finds that food prices are income dependent in India, and that after adjustment for this effect, the Gini coefficient for real income is from 12% to 23% higher than the Gini for nominal income. Additionally, a number of poverty and inequality studies (e.g. Günther and Grimm (2007); Muller (2008)) find evidence of substantial gains in accuracy by deflating income or consumption more precisely.

As noted by Muller (2008), deflation of welfare using regional or national level price indices in developing countries is the norm rather than the exception. However, the design of policies against income inequality requires its accurate measurement. Official inequality measures in Malawi deflate consumption-an income proxy- by using regional consumer price index (CPI) series. They therefore do not control for the fact that households may face different food prices (see for example NSO (2012a)), and consequently may potentially be underestimating income inequality, and hence be providing a misleading picture of the extent of inequality in Malawi. To the best of my knowledge no study has looked at the impact of accounting for income dependent food prices on income inequality in Malawi. This paper therefore closes this gap in knowledge by focusing on two issues. First, the paper seeks to establish whether or not the poor pay more food in Malawi. Second, the paper investigates the consequences of the poverty penalty on the levels of and trends in measured income inequality in Malawi. As is shown in Section 2, Malawi has been experiencing high economic growth rates over the period 2004-2011. However, official figures indicate that income inequality worsened over the same period.

By allowing for the possibility of a poverty penalty in food purchases, this paper, examines whether inequality was actually worse than officially estimated. This re-estimation of income inequality may also shed some light on why despite impressive economic growth figures poverty has only barely declined in Malawi. As has been shown in the poverty-inequality-growth literature, increasing inequality may hamper the poverty reducing effect of economic growth. For instance, Ravallion (2001) finds that of those countries which registered improvements in living standards in a sample of 50 developing countries, the reduction in poverty is larger for those countries where inequality is falling. Besides, if inequality is actually underestimated, it raises questions with respect to the poverty reducing effects of future growth. Fosu (2009) finds that the impact of income growth on poverty reduction in a number of sub-Saharan African and non- Sub-Saharan African countries is a decreasing function of initial inequality.

The remainder of the paper is organized as follows. Section 2 looks at trends in economic growth, poverty, and inequality in Malawi. A description of the data used in the study is given in Section 3. Section 4 presents the methodology and variables used. This is followed by the empirical results in Section 5. Finally, Section 6 concludes.

2 Growth, Poverty, and Inequality in Malawi

The Malawian government has pursued poverty reduction efforts through various strategies emphasizing economic growth, infrastructure development, and the provision of basic social services. These strategies include the Poverty Alleviation Program (1994); the Malawi Poverty Reduction Strategy (2002-2005); and, more recently, the Malawi Growth and Development Strategy (MGDS) (2006-2011 and 2011-2016). Although, Malawi has experienced a strong economic growth performance in the recent past, the impact of this growth on poverty and income inequality has been mixed. Table 1 provides selected economic indicators for Malawi over the period 2004 and 2011. The economy grew at an average annual rate of 6.2% between 2004 and 2007, and surged further to an average growth of 7.5% between 2008 and 2011. Malawi's economy is agrobased, with the agricultural sector accounting for about 30% of GDP over the period 2004-2011. Over the same period, the agriculture sector was by far Malawi's most important contributor to economic growth, with a contribution of 34.2% to overall GDP growth (NSO, 2012b). Given that economic growth was primarily driven by growth in the agriculture sector, and considering that about 90% of Malawians live in farm households (Benin et al. 2012), one would expect that this impressive growth would lead to significant reductions in poverty.

Official poverty statistics indicate that the high economic growth rates over this five year period, however, could only translate into marginal poverty reduction. Official poverty figures in Table 1 show that the percentage of poor people in Malawi was

52.4% in 2004, and marginally declined to 50.7% in 2011. Interestingly, the high economic growth rate had contrasting effects on rural and urban poverty. For the period 2004-2011, the poverty headcount in rural areas minimally increased from 55.9% to 56.6% while urban poverty declined from 25.4% to 17.3%. Ironically, this dismal poverty reduction performance coincided with the Farm Input Subsidy Program (FISP), which every year provides low-cost fertilizer and improved maize seeds to poor smallholders who are mostly rural based. Implementation of the FISP started in the 2005/6 cropping season, and in the 2012/13 financial year, the programme represented 4.6% of GDP or 11.5% of the total national budget (World Bank, 2013).

In terms of inequality, official figures suggest that the high economic growth rates did not only fail to lead to substantial poverty reduction but also worsened income inequality. Table 1 shows that nationally, the Gini coefficient increased from 0.390 in 2004 to 0.452 in 2011. The magnitude of the disequalising effect of growth varies with location. It was more pronounced in rural areas which saw the Gini coefficient increase from 0.339 in 2004 to 0.375 in 2011 while the urban Gini coefficient rose from 0.484 to 0.491 over the same period. The preceeding discussion shows that many people did not benefit from the high economic growth registered by Malawi; suggesting that growth was not inclusive. Further to this, rural households compared to their urban counterparts were the most excluded from the benefits of the high economic growth.

The above economic growth and poverty story for Malawi represents a paradox in the sense that if the economy was growing as officially estimated why did poverty not decline significantly? Four possible hypotheses can be put forward to explain this paradox. First, economic growth could have been completely disconnected from household expenditures, suggesting that the additional income went completely into enterprises' benefits, investments, taxes, and/or outside the country and/or accrued to rather few agents not necessarily covered by the household surveys (Günther and Grimm, 2006). A second explanation might be that the levels of economic growth were overestimated. This reflects a common phenomenon in many developing countries where data are unreliable. A number of studies (e.g. Jayne et al., 2008; Dorward et al., 2008; Ricker-Gilbert et al., 2011) have cast doubts over the accuracy of official maize production statistics. They all point to an overestimation of maize production data, which in turn could have led to inflated GDP figures.

A third possible explanation for this paradox could be that due to methodological shortcomings, official poverty figures underestimate the decline in poverty. A recent re-examination of these poverty figures shows that the decrease in poverty was much larger than officially estimated. Beck et al. (2014) estimate new regional poverty lines and poverty rates for Malawi using a new consumption aggregate. Their approach relative to the official one is more robust as they use an entropy-based approach to ensure that poverty lines are reflective of consumption bundles that are utility-consistent across space and over time. Their results show a more substantial decline in poverty between 2004 and 2011 of 6.1 percentage points. Further to this, Beck et al. (2014) find that these results are consistent with improvements in several other non-monetary dimensions of well-being. A fourth explanation for the paradox might be that income inequality could be worse than officially estimated. If one considers that poverty, inequality, and growth are interrelated (see for example Ravallion (2001)), high levels of inequality can impede the poverty reducing effect of economic growth. This paper focuses on this explanation for the puzzle. Thus, although official estimates show that inequality was worsening, by allowing for income dependent food prices, the re-assessment of inequality made in this paper provides useful insights into whether or not official inequality statistics are understating the inequality problem.

3 Data

The data used in the paper come from the Second and the Third Integrated Household Surveys (IHS2 and IHS3) conducted by the National Statistical Office (NSO). The two surveys are comparable overtime, and they are statistically designed to be representative at both national, district, urban and rural levels. Both surveys used a stratified two-stage sample design where all districts constitute the strata. Within each district, and for IHS2 and IHS3 respectively, the primary sampling units (PSUs) selected at the first stage are the census enumeration areas (EA) defined for the 1998 and 2008 Malawi Population and Housing Censi. Sample EAs were selected within each district systematically with probability proportional to size. In the second stage, a random systematic sampling was used to select households from the household listing for each sample EA. The IHS2 was done from March 2004 to March 2005, while the IHS3 was conducted from March 2010 to March 2011. The total number of households for IHS2 is 11280; 1440 (representing 12.8%) are urban households, and 9840 (representing 87.2%) are rural households. The IHS3 collected information from a sample of 12271 households; 2233 (representing 18.2%) are urban households, and 10038 (representing 81.8%) are rural households.

Both surveys collected socio-economic and demographic information on households, and individuals within the households. Additionally, the surveys recorded information on food consumption at the household level using the last seven days as the recall period. They collected data on 115 and 124 food items in 2004/5 and 2010/11 respectively which are organized in eleven categories: cereals, grains and cereals products; roots, tubers and plantains; nuts and pulses; vegetables; meat, fish and animal products; fruits; cooked food from vendors; milk and milk products; sugar, fats and oil; beverages; and spices and miscellaneous. Quantity unit codes, ranging from standard units such as kilograms and litres to non-standard units such as heaps, pails, plates, cups and basins are converted into grams by using conversion factors. The quality of conversion factors is critical as it can affect the calculation of unit values for food items consumed by a household, which in turn can affect the computation of total household consumption expenditure i.e. the welfare indicator. Verduzco-Gallo and Ecker (2014) find that official conversion factors which come with the data have inconsistencies and errors, and they consequently develop a new set of conversion factors to address these problems. Similar to Beck et al. (2014), this paper uses the revised set of conversion factors to generate unit values and a new annualized consumption aggregate for each household. Both the official and the new consumption aggregates have the same non-food component, but only differ in their food component. Beck et al. (2014) provide a detailed comparative analysis of the two food aggregates. In summary, the new conversion factors lead to significant differences in the two food aggregates especially for IHS3; this in turn affects the consumption aggregate. The new consumption aggregate for IHS2 follows a very similar pattern to that of the NSO, however, for IHS3, the new consumption aggregate is significantly larger than the officially supplied one.

Total quantity of food consumed in a household is the sum of purchased food, own production, and gifts. Since this paper is concerned with the existence of a poverty penalty in the food market and its impact on inequality, I focus on purchased food only, and leave out food consumed from the other two sources. Table 2 shows the structure and pattern of food consumption by source and location. Three things are noteworthy about the figures in the table. First, as would be expected, food from the market constitutes the largest share (about 83% for both survey years) of food consumed by urban households while for rural households most of the food is from own production (about 54% and 51% for IHS2 and IHS3 respectively). Second, the share of purchased food and food from own production by urban households remained fairly stable over the two years, however, rural households experienced a shift away from own production to purchased food. In IHS2, the share of own production was about 54% but this went down to about 51%, at the same time, the share of purchased food rose from about 34% in IHS2 to about 39% in IHS3. This means that rural households are turning more to the market for their food needs. Third, for both survey years and areas, food from gifts make up the smallest share of total food consumed.

4 Methodology

4.1 Measurement of a Poverty Penalty

The paper focuses on the two years 2004/5 and 2010/11 for which comparable data are available; each year is further disaggregated into rural and urban households. To measure whether the poor pay more for food in Malawi, I consider a poverty penalty as a form of consumption-related inequality in prices i.e. price inequality which is related to socioeconomic status, and compute concentration indices of price indices. Concentration indices are commonly used in the health economics literature to measure socioeconomic inequality in various health outcomes. It has been used, for example, to measure and to compare the degree of socioeconomic-related inequality in malnutrition (Wagstaff et. al., 2003), and in health subsidies (O'Donnell et al., 2007). To test for the existence of a poverty penalty, one can alternatively regress a household specific price index on per capita consumption and other controls (see for example Muller (2002) and Beatty (2010)). Per capita consumption is used here to capture the economic status of a household.

A key advantage of the concentration index approach over the regression approach is that the magnitude of the poverty penalty can be compared conveniently across time periods, and areas. I calculate concentration indices of a household level Laspeyres price index. In constructing the price index, I use the budget of the average household as the base. A detailed discussion of the Laspeyres price index can be found in for example Deaton and Tarozzi (2004). Instead of generating an overall price index for each household, I follow Rao (2000), and calculate a food only price index for each household. This is necessitated by the fact that the survey data for the two years under review do not have price information on non-food items such as health, education, housing, transport, durables, and clothing. This is obviously a disadvantage, however, food comprises about 60% of the budget for the two periods, which makes using a food price index defensible. The two surveys did not collect detailed food prices; I instead use unit values as proxies for prices. Unit values are calculated as expenditure on a food item divided by quantity purchased. A household specific Laspeyres price index for household i in area $g = rural, urban$, which purchases a food item $l \in L$, is given by

$$P_{ig}^{LA} = \frac{\sum_{l=1}^{L_i} p_{l\text{g}}^{i} q_{l\text{g}}^{0}}{\sum_{l=1}^{L_i} p_{l\text{g}}^{0} q_{l\text{g}}^{0}} \tag{1}$$

where $p_{l\text{g}}^{i}$is the price of a food item paid by a household,

$$q_{l\text{g}}^{0} = \frac{1}{N_g} \sum_{i=1}^{N_g} w_{ig} q_{l\text{g}}^{i} \tag{2}$$

is a weighted mean quantity of a food item for area g, and

$$p_{l\text{g}}^{0} = \frac{1}{N_g} \sum_{i=1}^{N_g} w_{ig} p_{l\text{g}}^{i} \tag{3}$$

is a weighted mean price of a food item for area g.

The interpretation of the price index is as follows: values greater than one suggest that a household paid more than average for its food basket, and values less than one imply that the household paid less than the average. Although information was collected on 115 and 124 food items in 2004/5 and 2010/11 respectively, the calculation of the household specific index is based on a restricted sample of food items consumed by more than 20 households in an area. This ensures that the price index is not driven by food items consumed by very few households. The restriction reduces the number of food items covered to 96 in 2004/5, and 113 in 2010/11 respectively. These food items respectively represent 99.4% and 99.6% of the average household's budget in 2004/5 and 2010/11. Although the cutoff of 20 households is arbitrary, alternative cutoffs such as 10 and 15 were also tried, but the results remain qualitatively unchanged. A major difference between the price index developed in this paper, and the official CPI series is that the official series comprise food and nonfood components while the new indices are based on food only. The official CPI for the two years 2004/5 and 2010/11 were constructed using the same procedure. The CPI was developed using price data collected by National Statistical Office (NSO) for February/March of each period, along with the national basket weights for 42 food and non-food items: twenty-nine items representing food and beverages and thirteen items accounting for non-food consumption.

The concentration index for the Laspeyres price index is expressed as (see e.g. van Doorslaer and Koolman (2004)),

$$C_g = \frac{2}{\mu_g} cov_w(P_{ig}^{LA}, R_{ig}) \tag{4}$$

where, $cov_w(.)$ is a weighted covariance, and

$$\mu_g = \frac{1}{N_g} \sum_{i=1}^{N_g} w_{ig} p_{ig} \tag{5}$$

is a weighted mean price, N_g the sample size of each area, w_{ig} is a sampling weight of household i (with $\sum_{i=1}^{N_g} w_{ig} = N_g$), and R_{ig} is a weighted relative fractional rank of the ith household in the consumption distribution, with households ranked from the poorest to the richest, and is defined as

$$R_{ig} = \frac{1}{N_g} \sum_{j=1}^{i-1} w_{jg} + \frac{1}{2} w_{ig} \text{ where } w_0 = 0 \tag{6}$$

R_{ig}, thus represents the weighted cumulative proportion of the population up to the midpoint of each individual weight.

A concentration index varies between -1 and +1. Negative values indicate a disproportionate concentration of high food prices among the poor i.e. the poor pay more for food, while the opposite is true for positive values. When there is no inequality in food prices paid by households, the concentration index is zero. The magnitude of the concentration index reflects both the strength of the poverty penalty, and the degree of variability in prices. As shown by Koolman and van Doorslaer (2004), one can also place an intuitive interpretation on the values of the concentration index. They show that multiplying the value of the concentration index by 75 gives the percentage of the price index that would need to be (linearly) redistributed from the poorer half to the richer half of the population to achieve a distribution with an index value of zero i.e. where there is no poverty penalty in food purchases. The presence of a poverty penalty can be statistically checked by testing the null hypothesis $H_0 : C_g = 0$ against the alternative $H_a : C_g < 0$.

Since the Laspeyres price index is household specific, there is no guarantee that food items consumed by one household will exactly be the same as those consumed by another. This lack of overlap can bias our results given that for poorer households some food items are too expensive for them to purchase. However, as noted by Rao (2000), due to liquidity constraints, if they had purchased these items it is likely that they did not benefit from quantity discounting because they would have purchased them in smaller quantities. Hence, this lack of overlap can in all likelihood only lead to an underestimation of the poverty penalty rather than a reversal of the general conclusions of this paper.

4.2 Measurement of Inequality

Official inequality measurement in Malawi uses the Gini coefficient, and generalized entropy class of inequality indices (see for example NSO (2012a)). In order to be consistent with official statistics, and to ensure comparability, I use these two measures of inequality.

The Gini coefficient, G_g, is defined as follows (see for example Wagstaff et. al (2003))

$$G_g = \frac{2}{\mu'_g} cov_w(y_{ig}, R'_{ig}) \tag{7}$$

where, $\mu'_g = \frac{1}{N_g} \sum_{i=1}^{N_g} w_{ig} y_{ig}$ is the weighted mean of a per capita consumption expenditure y_{ig} for area g, and $cov(.)$ is a covariance, R'_{ig} denotes the fractional rank of household i (i.e. ranked by y_{ig}). The value of the Gini coefficient ranges between 0 and 1, with 0 implying perfect equality, and 1 denoting perfect inequality.

The generalized entropy class of inequality indices, $GE(\theta)_g$ are defined as follows (Duclos and Araar, 2006)

$$GE(\theta)_g = \begin{cases} \frac{\theta}{\theta(\theta-1)}\left[\frac{1}{N_g}\sum_{i=1}^{N_g} w_{ig}\left(\left(\frac{y_{ig}}{\mu'_g}\right)^{\theta}-1\right)\right], \text{ if } \theta \neq 1,0 \\ \frac{1}{N_g}\sum_{i=1}^{N_g} w_{ig}\log\left(\frac{\mu'_g}{y_{ig}}\right), \text{ if } \theta = 0 \\ \frac{1}{N_g}\sum_{i=1}^{N_g}\frac{w_{ig}y_{ig}}{\mu'_g}\log\left(\frac{y_{ig}}{\mu'_g}\right), \text{ if } \theta = 1 \end{cases} \tag{8}$$

Where; μ'_g and N_g are as defined before. The values of GE vary between 0 and 8, with zero representing an equal distribution and higher values representing a higher level of inequality. The parameter θ represents the weight given to distances between y_{ig} at different parts of the y_{ig} distribution, and can take any real value. For lower values of θ , GE is more sensitive to changes in the lower tail of the distribution of the welfare indicator, and for higher values GE is more sensitive to changes that affect the upper tail. If $\theta = 0$, $GE(\theta = 0)$ gives the Theil's L inequality index also known as the mean log deviation measure (MLD); if $\theta = 1$, $GE(\theta = 1)$ gives the Theil's T inequality index.

In order to capture the different levels of precision with respect to deflation and their impact on measured inequality, three per capita consumption expenditure variables are used namely; nominal per capita consumption expenditure, real per capita consumption expenditure with the official CPI series as deflators, and finally, real per capita consumption expenditure with the new household specific price indices used as deflators, and this case only the food component is deflated. I also use the official nominal and real (deflated by official CPI series) per capita expenditure. This essentially replicates official inequality estimates, and allows for a comparison of the results based on the new and the official consumption aggregates.

5 Results

Before turning to the results of the possible existence of a poverty penalty in food purchases in Malawi and its impact on measured inequality, I first discuss summary statistics of the different price indices and the annualized nominal and real consumption expenditure aggregates. The results for this analysis are reported in Table 3. For both survey years and areas, the results indicate that the household-specific price indices are higher than the official ones; suggesting that official CPI figures underestimate inflation. As would be expected, urban areas have higher inflation than rural areas. The results also show that the new nominal consumption aggregates are higher than the official ones. This means that the adoption of the more consistent conversion factors leads to nonnegligible changes in the indicators of welfare.

A comparison of the official nominal and real consumption aggregate shows that the impact of using the official deflator differs for IHS2 and IHS3. For IHS2, and at the national level, nominal consumption in Malawi Kwacha (MK) declines slightly after deflation from MK25104.62 to MK25040.68; a decline of about 0.3%. Perhaps reflecting the fact that prices are lower in rural areas, nominal consumption for rural areas is 3.4% higher than real consumption. The reverse holds for urban areas as deflation leads to a 10.7% drop in nominal consumption. For IHS3, a more consistent pattern is observed, here real consumption at the national level and for rural and urban areas, is higher than nominal consumption. The results also show that the increase consumption after adjusting for purchasing power is more pronounced in rural areas.

Turning to the new consumption aggregate, the results indicate that when the official deflator is used to deflate the new consumption aggregate, the pattern observed earlier for the official aggregate generally persists. That it is, at the national level, nominal consumption relative to real consumption is higher for IHS2 but lower for IHS3. In contrast, when the household specific price index is used to deflate the new consumption aggregate, the results show that deflation leads to lower real consumption for all periods and all areas. For instance, nationally, real consumption is about 18.2% and 24.5% lower than nominal consumption for IHS2 and IHS3 respectively. These results thus suggest that allowing for the fact households face different prices for food, leads to substantial reductions in nominal consumption. This in turn means that using the official price deflator leads to a misleading picture of household welfare as it shows that household welfare is better than it really is. Given these results, a more pertinent question is: does this decline in the welfare indicator as a result of deflation vary with household economic status? Put differently, do the poor pay more for food or face a poverty penalty in the food market? I answer this question next.

5.1 Poverty penalty

The existence of regressive food prices would mean that deflation of consumption as a welfare indicator is skewed against poor households. Table 4 reports concentration indices of the household specific Laspeyres price index for IHS2 and IHS3 disaggregated by location. I use the concentration indices to assess whether or not poor households face a poverty penalty when they purchase food. Negative values indicate a concentration of high food prices among poor households, and hence poor households pay more for food. The magnitude of the concentration indices reflect the strength of the poverty penalty. The table also include test results of the hypothesis that a concentration index is negative.

Concentration indices for all the survey periods, and areas are negative, and the null that a concentration index is zero is rejected in a favour of the alternative that it is negative. This means that regardless of location, poor households pay more for food compared to nonpoor households. The concentration indices are smaller (i.e. more negative) for rural households than for urban households; suggesting that the poverty penalty is more pronounced in rural areas than in urban areas. The rural-urban difference in the poverty penalty for IHS2 is -.024, and this difference is statistically significant with a z-statistic (p-value) of -5.7 (0.00). Similarly, for IHS3, the difference is -0.062, and it is statistically significant with a z-statistic (p-value) of -7.7 (0.00). Further to this, the results show that the poverty penalty was declining overtime as it was worse for IHS2 than for IHS3. For instance, at the national level, the difference in the concentration indices between two years is -0.017 and this difference is statistically significant with a z-statistic (p-value) of -5.8 (0.00).

As pointed out earlier, rescaling a concentration index by 75 gives a more intuitive interpretation of a concentration index which is the percentage of the price index that would need to be (linearly) redistributed from the poorer half to the richer half of the population to have a situation where neither the poor nor the nonpoor pay more for food. It is evident from the results that for IHS2, if about 2.1% of the price paid the poorer half of the Malawian population was redistributed to the richer half of the population then there would be no poverty penalty in food purchases. The corresponding figure for IHS3 is about 0.8%; suggesting that the need for a redistribution scheme which favours the poor has been declining overtime. The results also indicate for the two years under study, the redistribution is more needed in rural areas than in urban areas. Redistribution can be achieved through deliberate government interventions which seek to ensure that the poorer half of the population would be paying less for food through for example improving the poor infrastructure and weak legal rights associated with where the poor live that make it risky for retailers to set up or a relaxation of liquidity constraints faced by the poor, or a minimization of postharvest losses through the provision of reliable and affordable storage facilities.

5.2 Inequality

I now turn to a discussion of the impact of the poverty penalty on the measurement of levels and trends in measured consumption inequality in Malawi. In order to get a sense of how the distribution of consumption is affected by the presence of the poverty penalty, I first look at percentile-specific average consumption by location and year. The results are shown in Table 5. The results also include the percentage change in consumption following deflation for each percentile. A comparison of the official and new nominal consumption aggregates across the percentiles reveals that there is only a small difference at the lower end of the consumption distribution but the difference is more evident at the upper end of the distribution. This implies that using the revised conversion factors leads to a much improved measurement of consumption especially for the richest households. The pattern of the impact of deflation across the different percentiles of consumption depends of the deflator employed. When the official deflator is used on both the official and new consumption aggregate, real consumption is larger than nominal consumption in the first percentile, but this difference progressively declines (and is some cases reversed) as one moves up to the 99th percentile. This means that using the official deflator leads to the conclusion that deflation changes the distribution of consumption in favour of the poor.

A reverse pattern is noticed when the household-specific deflator is used. Although, deflation leads to decreasing consumption for all years and locations, the decline is more substantial for the poorest households. For example, for IHS2, deflation leads to a 27.8% drop in consumption for households in the first percentile, and the corresponding change for IHS3 is 28.2%. Turning to the 99th percentile, the results show that deflation reduces nominal consumption by 8.9% and 18.7% for IHS2 and IHS3 respectively. Thus, the tails of the consumption distribution are differentially impacted by deflation with the poorest households experiencing larger declines in their consumption. This implies that when one allows for the fact that households face different food prices, there is a shift in the distribution of consumption to the disadvantage of the poorest households. This is simply a reflection of the earlier finding that the there is a poverty penalty when it comes to food purchases in Malawi. These observed differences in how the official and the new deflation shift the distribution of consumption suggest that measured inequality is worse under the new deflation scheme.

I now turn to results of the exact consequences of deflation on measured consumption inequality. Official inequality measures are reproduced in Table 6. The table also contains inequality measures based on nominal consumption. This helps to ascertain the effect of the official deflator on the measurement of consumption inequality. It is evident from the Gini coefficient, Thiel L, and the Thiel T results that the figures before and after deflation differ only marginally. For instance, at the national, the Gini coefficient for IHS2 before deflation is 0.3988 and after deflation it is 0.3900. For IHS3, the before and after deflation Gini coefficients are 0.4592 and 0.4498 respectively. These differences are economically insignificant, and they are also statistically insignificant with a z-statistics (p-values) of 0.4 (0.33) and 0.5 (0.32) for IHS2 and IHS3 respectively. This means that the official "real" inequality figures are no different from nominal inequality figures.

I now look at the inequality results for the new consumption aggregate presented in Table 7. The results for all the three inequality measures indicate that the official deflator does not really matter when it comes to inequality measurement as there are only marginal differences between inequality based on nominal consumption and real consumption. What is also clear from the results is that measured inequality based on the new consumption aggregate is much higher than that based on the official consumption aggregate. For instance, at the national level, nominal inequality as measured by the Gini coefficient is underestimated by 10.4% for IHS2, and by 5.7% for IHS3. Additionally, the underestimation is more evident for rural areas than for urban areas; it is 18.4% for IHS2 and 11.8% for IHS3. These higher inequality results are consistent with the earlier finding that the adoption of the new conversion factors in generating the consumption aggregates leads to much larger consumption levels for households at the top end of the consumption distribution. The trends in the inequality results also show that inequality was worsening over the two year period; and this is consistent with trends from the official figures.

When the household-specific price deflator is used on the new consumption aggregate, the inequality results point to evidence that nominal inequality significantly underestimates "real" inequality. The extent of the underestimation ranges from 3.9% to 7.1% for the Gini coefficient, 8.4% to 16.2% for the Thiel L, and 0.11% to 24.5% for the Thiel T. This means that the poverty penalty as expected leads to a quantitatively substantial understating of inequality in Malawi. Hence, official inequality statistics grossly understate the inequality problem. And as noted earlier, this may partly explain the puzzle of how economic growth which is associated with minimal poverty reduction in Malawi as these high levels of inequality could be impeding the poverty reducing effect of economic growth. The high inequality can also have serious implications on the long term effectiveness of future poverty reduction strategies since as found by Fosu (2009) the impact of income growth on poverty reduction is a decreasing function of initial inequality.

5.3 Robustness checks

The above results are based on unit values as proxies for food prices. Since the food products are clearly heterogeneous, the household specific price index can be contaminated by quality effects to the extent that quality is income/consumption expenditure-dependent (Gibson and Kim, 2013). Quality effects might occur if higher observed unit values are not reflective of higher prices but rather the purchase of goods of higher quality (Attanasio and Frayne, 2006). Would the conclusions from the above results be robust to controlling for quality effects? To check the robustness of the results, I first net out quality from the unit values, and recalculate the household specific Laspeyres price index (equation(1)). I follow Deaton (1988, 1997), and assume that the unit values ν_{ig} for a food product purchased by a household can be decomposed as follows

$$\ln \nu_{ig} = \ln p'_{ig} + \ln m_{ig} \tag{9}$$

where m_{ig} is a measure of quality. The absence of quality effects (i.e. $m_{ig} = 1$) implies that unit values are equal to prices, p'_{ig}. According to Deaton (1988, 1997), the demand for quality depends on the log of total household consumption expenditure x_{ig}, and a vector of quality demand shifters W^q_{ig} as follows

$$\ln m_{ig} = \delta' W^q_{ig} + \alpha \ln x_{ig} + \varepsilon_{ig} \tag{10}$$

where δ is a vector of parameters for the quality demand shifters, α is an expenditure elasticity of quality, and $\varepsilon_{ig} \sim N\left(0, \sigma^2_{\varepsilon_g}\right)$ is a well behaved error term. I use sex, age, and schooling of the household head as quality of demand shifters. Substituting the quality equation (10) into the unit value identity (equation (9)) gives

$$\ln \nu_{ig} = \delta' W^q_{ig} + \alpha \ln x_{ig} + \zeta_{ig} \tag{11}$$

where $\zeta_{ig} = N\left(0, \sigma^2_{\zeta_g}\right)$. This means that $\omega_{ig} = \exp\left(\zeta_{ig}\right)$ captures the unit value component which is not explained by quality. I therefore estimate equation (11), and then use the residuals $\hat{\omega}_{ig}$ as a proxy for prices. Inequality measures based on these new unit values are presented in Table 8.

Similar to the previous results, the new results show that all the concentration indices are negative; which suggests that purging quality effects does not change the conclusion that regardless of location and survey period, poor households pay more for food in Malawi. Further to this, a look at the new concentration indices, reveals that they are marginally higher (i.e. more negative) than the old ones. More specifically, the national pre and post quality adjusted concentration indices for IHS2 are -0.0276 and -0.0279 respectively, while for IHS3 they are -0.0104 and -0.0111 respectively. However, these national level differences are quantitatively insubstantial, and statistically insignificant; the z-statistics (p-values) of the differences are 0.1 (0.54) and 0.3 (0.38) for IHS2 and IHS3 respectively. Thus, these results imply that the poverty penalty in the food market is no worse when quality is taken into account than when it is ignored.

A comparison with the previous results also indicates that controlling for quality does not qualitatively alter the earlier conclusions that inequality is still underestimated by official inequality figures. It can also be observed that for rural and urban areas, netting out quality effects leads to higher values of the Gini coefficient, Thiel L, and the Thiel T for IHS2 and IHS3. For instance, before and after adjusting for quality, the national Gini coefficients for IHS2 are 0.4654 and 0.473 respectively, while the national Gini coefficients for IHS3 are 0.5139 and 0.5164 respectively. These differences are not only economically insignificant, but they are also statistically insignificant with the z-statistics (p-values) of the differences given as -0.3(0.40) and -0.1 (0.46) for IHS2 and IHS3 respectively. What all this means is that the conclusion that official inequality figures understate the extent of inequality nationally and for rural and urban areas, is insensitive to whether quality is accounted for or not.

6 Concluding Comments

The paper has used data from the Second and the Third Integrated Household Surveys (IHS2 and IHS3) to examine two things namely; whether the poor pay more for food in

Malawi, and the consequences of the poverty penalty on inequality measurement. A new set of conversion factors which removes inconsistencies and errors is used to generate unit values which are then used to generate a new annualized consumption aggregate for each household. The results show that regardless of location and year, poor households pay more for food compared to nonpoor households. The Gini coefficient, the Thiel L, and the Thiel T are used to assess the impact of the poverty penalty on measured inequality. It is found that measured inequality based on the new consumption aggregate is much higher than official inequality figures.

The paper has also found that nominal inequality underestimates "real" inequality, with the underestimation ranging from 3.9% to 7.1% for the Gini coefficient, 8.4% to 16.2% for the Thiel L, and 0.11% to 24.5% for the Thiel T. The paper therefore finds that official inequality figures understate the inequality problem in Malawi. These conclusions are found to be robust to purging the unit values of quality effects. The high inequality levels may partly explain the puzzle of high economic growth which has led to marginal poverty reduction in Malawi as these high levels of inequality could be impeding the poverty reducing effect of economic growth.

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Table 1: Trends and levels of economic growth, poverty, and inequality, 2005-2011

Area	2005	2011
GDP growth	6.2[a]	7.5[b]
Poverty headcount		
National	52.4	50.7
Rural	55.9	56.6
Urban	25.4	17.3
Gini Coefficient		
National	0.390	0.452
Rural	0.339	0.375
Urban	0.484	0.491

[a] Average GDP growth for 2004-2007, [b] average GDP growth for 2008-2011.
Source: NSO (2005, 2012a, 2012b)

Table 2: Percentage share of food consumed by source

Food Source	IHS2			IHS3		
	National	Rural	Urban	National	Rural	Urban
Purchased	40.0	34.1	82.9	45.6	38.7	83.0
Own	49.3	54.3	12.7	44.6	50.7	11.8
Gifts	10.7	11.6	4.4	9.8	10.6	5.2
Observations	11280	9840	1440	12271	10038	2233

Source: Author's estimation using IHS2 and IHS3

Table 3: Means of price indices and consumption expenditure

Variable	IHS2			IHS3		
	National	Rural	Urban	National	Rural	Urban
Price indices						
Official	0.99	0.98	1.13	0.93	0.92	1.00
New	1.83	1.82	1.94	1.89	1.87	1.99
Official per capita expenditure						
Nominal	25104.62	21034.76	55065.75	59695.75	45378.70	137128.5
Real	25040.68	21759.39	49196.68	63301.07	49630.29	137238.5
Change (%)	-0.25	3.44	-10.66	6.04	9.37	0.08
New per capita expenditure						
Nominal	27928.21	23967.25	57087.69	69239.44	54667.51	148050.7
Real (official index)	27925.32	24783.16	51057.08	73601.07	59845.38	147997.7
Change (%)	-0.01	3.40	-10.56	6.30	9.47	-0.04
Real (new index)	22846.84	19691.45	45860.07	52281.67	41161.08	112004.1
Change (%)	-18.19	-17.84	-19.67	-24.49	-24.71	-24.35
Observations	11280	9840	1440	12271	10038	2233

Note: The new index refers to the household-specific Laspeyres price index; new expenditure refers to tł new consumption aggregate which is based on revised conversion factors. Change (%) captures tł percentage change in consumption following deflation.

Table 4: Concentration indices of the household specific Laspeyres index

Price Index	IHS2			IHS3		
	National	Rural	Urban	National	Rural	Urban
Laspeyres	-0.0276***	-0.034***	-0.0098***	-0.0104***	-0.0166***	-0.0004***
	(0.0024)	(0.0028)	(0.0032)	(0.0017)	(0.0021)	(0.0001)
	[-2.07]	[-2.55]	[-0.74]	[-0.78]	[-1.25]	[-0.03]

Notes: The hypothesis that a concentration index is negative is tested. This amounts to testing for evidence that the poor pay more for food i.e. there is a poverty penalty in the food market. In parenthesis are standard errors. *** indicates significant at 1%; ** at 5%; and, * at 10%. In square brackets are the percentage of the price index that would need to be (linearly) redistributed from the poorer half to the richer half of the population to achieve a distribution where there is no poverty penalty in food purchases.

Table 5: Percentile-specific average consumption

Variable	Percentiles				
	1%	5%	50%	95%	99%
			IHS2		
Official per capita expenditure					
Nominal	4998.8	6879.4	17509.6	61813.5	153485.9
Real	5109.9	7006.502	17934.94	61517.5	143998.7
Change (%)	2.22	1.85	2.43	-0.48	-6.18
New per capita expenditure					
Nominal	4884.1	6939.3	18201.4	68455.9	177335.3
Real (official index)	4950.4	6985.9	18487.6	68023.3	171124.5
Change (%)	1.36	0.67	1.57	-0.63	-3.50
Real (new index)	3524.9	5047.2	13563.8	55222.8	161473.5
Change (%)	-27.83	-27.27	-25.48	-19.33	-8.94
			IHS3		
Official per capita expenditure					
Nominal	8256.0	12657.8	38424.4	166314.7	404382.0
Real	9018.3	13555.3	41420.8	172744.5	414515.0
Change (%)	9.23	7.09	7.80	3.87	2.51
New per capita expenditure					
Nominal	8689.4	13157.7	42816.9	193304.8	494216.8
Real (official index)	9447.9	14331.8	46465.9	199778.6	507410.7
Change (%)	8.73	8.92	8.52	3.35	2.67
Real (new index)	6237.8	9302.4	29733.1	151011.7	402042.4
Change (%)	-28.21	-29.30	-30.56	-21.88	-18.65

Note: The new index refers to the household-specific Laspeyres price index; new expenditure refers to the new consumption aggregate which is based on revised conversion factors. Change (%) captures the percentage change in consumption following deflation.

Table 6: Inequality measures using the official consumption aggregate

Per capita consumption	IHS2			IHS3		
	National	Rural	Urban	National	Rural	Urban
			Gini coefficient			
Nominal	0.3988	0.3341	0.4785	0.4592	0.3727	0.4905
	(0.0151)	(0.0048)	(0.0264)	(0.0145)	(0.0068)	(0.0011)
Real	0.3900	0.3392	0.4839	0.4498	0.3747	0.4884
	(0.0140)	(0.0049)	(0.0279)	(0.0135)	(0.0066)	(0.0027)
			Theil's L			
Nominal	0.2638	0.1823	0.3811	0.356	0.2314	0.4095
	(0.0208)	(0.0054)	(0.0448)	(0.0237)	(0.0085)	(0.0015)
Real	0.2518	0.1879	0.3911	0.3411	0.2339	0.4061
	(0.0187)	(0.0056)	(0.0480)	(0.0214)	(0.0084)	(0.0019)
			Theil's T			
Nominal	0.3302	0.1996	0.4314	0.4455	0.2512	0.4719
	(0.0344)	(0.0070)	(0.0408)	(0.0456)	(0.0120)	(0.0010)
Real	0.3073	0.2049	0.4430	0.4196	0.2535	0.4646
	(0.0304)	(0.0073)	(0.0441)	(0.0402)	(0.0117)	(0.0015)

Notes: Nominal is the annualised official per capita nominal consumption aggregate, Real is the annualised official per capita real consumption aggregate with official CPI series used as deflators. In parenthesis are standard errors.

Table 7: Inequality measures using the new consumption aggregate

Price Index used	IHS2			IHS3		
	National	Rural	Urban	National	Rural	Urban
			Gini coefficient			
None	0.4403	0.3957	0.4894	0.4852	0.4166	0.5233
	(0.0216)	(0.0244)	(0.0274)	(0.018)	(0.0151)	(0.0216)
Official CPI	0.434	0.400	0.4952	0.4776	0.4189	0.5208
	(0.0215)	(0.0242)	(0.0288)	(0.0173)	(0.0156)	(0.0215)
Laspeyres	0.4654	0.4182	0.5239	0.5139	0.4464	0.5438
	(0.0192)	(0.0198)	(0.0253)	(0.0163)	(0.0133)	(0.0027)
			Theil's L			
None	0.328	0.2675	0.3995	0.4035	0.2952	0.4734
	(0.0348)	(0.0381)	(0.0481)	(0.0321)	(0.0229)	(0.0211)
Official CPI	0.3189	0.2731	0.4103	0.3907	0.2987	0.4688
	(0.0345)	(0.038)	(0.0515)	(0.0302)	(0.0238)	(0.0270)
Laspeyres	0.3671	0.2986	0.4643	0.4527	0.3394	0.5131
	(0.0324)	(0.0323)	(0.051)	(0.0308)	(0.0215)	(0.0114)
			Theil's T			
None	0.4785	0.4145	0.4539	0.5566	0.3709	0.6401
	(0.0889)	(0.1183)	(0.0428)	(0.0824)	(0.0521)	(0.0211)
Official CPI	0.4623	0.4165	0.4666	0.5327	0.3769	0.6278
	(0.0913)	(0.1174)	(0.0462)	(0.0762)	(0.0554)	(0.0232)
Laspeyres	0.573	0.5084	0.5269	0.6279	0.4651	0.6408
	(0.0989)	(0.1308)	(0.0412)	(0.0642)	(0.0483)	(0.0303)

Notes: In parenthesis are standard errors.

Table 8: Inequality measures with quality effects netted out

Price Index used	IHS2			IHS3		
	National	Rural	Urban	National	Rural	Urban
	Concentration index					
Laspeyres	-0.0279	-0.0352	-0.0155	-0.0111	-0.0167	-0.0005
	(0.0021)	(0.0025)	(0.0016)	(0.0016)	(0.0019)	(0.0001)
	Gini coefficient					
Laspeyres	0.473	0.4297	0.5218	0.5164	0.4488	0.5441
	(0.022)	(0.025)	(0.0269)	(0.0173)	(0.0167)	(0.0113)
	Theil's L					
Laspeyres	0.3813	0.3181	0.4603	0.4583	0.3445	0.5137
	(0.0384)	(0.0420)	(0.0533)	(0.0329)	(0.0278)	(0.0422)
	Theil's T					
Laspeyres	0.6303	0.5882	0.5254	0.6436	0.4859	0.6414
	(0.1302)	(0.1738)	(0.0441)	(0.0712)	(0.0729)	(0.0413)

Notes: The Laspeyres index is based on unit values where quality effects have been purged. In parenthesis are standard errors.