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# Did rapid smallholder-led agricultural growth fail to reduce rural poverty?

## Making sense of Malawi's poverty puzzle

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**Abstract:** Disappointment was widespread when rapid economic growth since 2005, coupled with a smallholder-targeted fertilizer subsidy program, failed to significantly reduce poverty in Malawi. Official estimates for 2011 showed a 1.7 percentage point decline in national poverty between 2005 and 2011, while rural poverty increased marginally. In this study we estimate an alternative set of regional poverty lines using a cost of basic needs method that allows the consumption bundle to vary spatially and temporally while ensuring utility consistency. Our poverty figures suggest a substantial 7.3 percentage point decrease in national poverty over the analysis period, driven largely by a sharp reduction in rural poverty. These results are more consistent with the observed level of economic growth and improvements in several non-monetary dimensions of well-being. However, we find that extreme poverty did increase, suggesting that the most vulnerable people continue to be excluded from the benefits of economic policy and growth.

**Keywords:** poverty measurement, inequality, cost of basic needs; Malawi
**JEL classification:** I32, 055

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# 1 Introduction

Poverty reduction is a primary development goal in Malawi. The country is committed to the Millennium Development Goals (MDGs), which seek, among other things, to eradicate extreme poverty and hunger. Over the years, 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 (2002–05); and, more recently, the Malawi Growth and Development Strategy (MGDS) (2006–11 and 2011–16). Perhaps the most significant policy intervention in recent years has been the Farm Input Subsidy Program (FISP), which provides heavily subsidized fertilizer and other inputs to between 1.5 and 2 million poor smallholders at a cost of around 3 per cent or more of annual gross domestic product (GDP). A variety of public and donor-initiated cash transfers and public works programs are also implemented, many with expansion plans in place (MoEPD 2012).

National accounts data reveal strong growth across all Malawi's economic sectors during 2005–11, with per capita GDP growth averaging 3.5 per cent per annum (NSO 2012b). Growth was particularly robust in the agricultural sector, which many analysts have attributed to FISP. Since many of the poor are engaged in farming as smallholders, and since about half of smallholders were targeted by the subsidy program, the expectation was always that Malawi's growth trajectory during this period would be highly pro-poor, even if poverty reduction was not necessarily a primarily goal of the subsidy program. However, official evidence suggests that growth has not been accompanied by rapid poverty reduction: using the latest two rounds of Integrated Household Surveys (IHSs), the National Statistics Office (NSO 2012a) reports that the poverty headcount rate declined only marginally from 52.4 per cent in 2004/05 (IHS2) to 50.7 per cent in 2010/11 (IHS3). Even more disconcerting was the fact that rural poverty had *increased* marginally over the period despite FISP benefiting about half of the rural farm population.

The objective of this study is to undertake our own consumption-based poverty analysis using the same datasets as in the official poverty analysis conducted by Malawi's National Statistical Office (NSO). We introduce several key methodological advances which distinguish our approach from that of the NSO: first, we allow the consumption bundles from which poverty lines are derived to change over time, to account for changes in preferences due to evolving tastes and/or consumer responses to relative price changes. Second, rather than relying on a national poverty line only, we construct regional poverty lines that account for variations in consumption preferences and prices across regions. In doing so we return to the tradition of using regional poverty lines in Malawi as was the case in the late 1990s (see Mukherjee and Benson 2003).

Third, while both the NSO and our study adopt the cost of basic needs approach for estimating poverty—this essentially involves estimating the cost of a minimum amount of calories required by an representative individual, which then serves as the food poverty line—we implement a more refined and careful approach to estimating average caloric needs within a region by considering the age and gender composition, pregnancy rates, and demographic changes over time. Fourth, following Ravallion (1998), we adopt an iterative procedure to devise consumption bundles and poverty lines that more closely represent actual consumption by the poor. Finally, following Arndt and Simler (2010) we use an entropy-based approach to ensure that our poverty lines are reflective of consumption bundles that are utility-consistent across space and over time, i.e., although contents of bundles may differ across space and time, they still represent the same level of utility to their respective consumers.

Fourth, we use a new set of conversion factors for converting non-standard food consumption into standard units. The NSO publishes accompanying sets of conversion factors for IHS2 and IHS3 consumption quantities. However, in carefully analysing IHS2 and IHS3 conversion factors, Verduzco-Gallo and Ecker (2013) highlight several disconcerting problems. Particular concerns exist around the plausibility of specific conversion factors or comparability of conversion factors over time and across space for seemingly similar food items. As a result Verduzco-Gallo and Ecker (2013), in conjunction with this research team, conducted an extensive analysis of product-specific conversion factors in the IHS2 and IHS3. The process involved making adjustments to conversion factors, where deemed necessary, using a method involving analysis of implicit prices, following an approach also used by Ecker and Qaim (2011). A technical document by Verduzco-Gallo and Ecker (2013) describes the method in detail. In contrast to the official poverty estimate, our analysis reveals large and often statistically significant declines in regional and national poverty in Malawi between 2004/05 and 2010/11. Poverty declined by 6.8 percentage points in rural areas, with a particularly large decline in the rural south. Urban poverty also declined (by 11.3 percentage points), causing overall poverty in Malawi to drop by 8.1 percentage points. These results are consistent with the economic growth trajectory reported by the Malawian national accounts office, as well as our complementary finding that various non-monetary dimensions of welfare have shown significant improvements in recent years.

The paper is structured as follows. Section 2 summarizes the recent evidence on growth and official poverty trends in Malawi. Section 3 provides a technical description of the process followed to construct utility-consistent regional poverty lines for Malawi, and compares and contrasts this against the NSO method. Section 4 presents our main consumption-based poverty results and also reports trends in non-monetary poverty dimensions. Section 5 concludes and highlights areas for further research.

## 2 Recent evidence of growth and poverty trends in Malawi

### 2.1 Growth and production trends

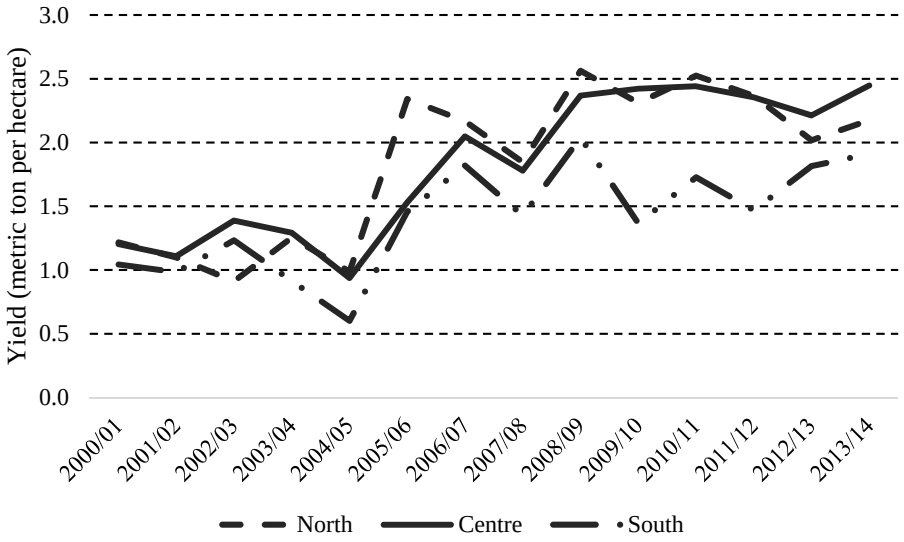
Rain-fed smallholder maize production accounts for around one quarter of agricultural GDP. The agricultural sector, in turn, accounts for about 30 per cent of the economy (Benin et al. 2012). This high dependence on a single, large agricultural sub-sector is a major cause of Malawi's highly erratic economic growth path. Since 2005/06, however, favourable weather combined with the introduction of FISP, a large fertilizer subsidy program targeting roughly half of Malawian smallholders, has led to strong and consistent agricultural growth led by rapidly rising maize yields.[1] The success of Malawi's FISP created renewed interest globally in fertilizer subsidies as a tool for promoting growth while at the same time ensuring food security and reducing poverty.

Figure 1, based on official crop estimates, shows the remarkable improvement in maize yields in 2005/06 when FISP was first implemented and again in 2006/07 when the program was expanded further. While the southern region of Malawi still lags behind in terms of yield performance—

[1] Implemented as a response to low input use generally and severe food supply shortages during the 2004/05 growing season in particular, FISP primarily aimed to provide low-cost maize and tobacco fertilizer and improved maize seeds to poor smallholders. Another reason for undertaking the FISP was the argument that if farmers are credit-constrained, low yields can result in a poverty trap where farmers are unable to undertake investments in fertilizer or equipment required to improve their yields (Dorward et al. 2008). Various additional components have been added to FISP, with a legume seed component being the most significant one, but the focus has remained on the staple, maize, throughout.

mostly due to more frequent floods and periods of deficit rain in this region (see Pauw et al. 2011)—yields generally have almost doubled from around one metric ton per hectare during the pre-FISP years to around two metric tons per hectare thereafter.

Figure 1: Average maize yields by region (2000/01–2011/12 smallholder summer harvest)




Source: Authors' calculations using data from MoAFS (2013b).

Increased yields led to a significant increase in maize production. Despite the significant supply shock, price declines were found to be relatively small (Ricker-Gilbert et al. 2013). As a result maize production expansion became a strong driver of agricultural GDP growth. The first three columns of Table 1 report average sectoral and national GDP growth rates for different FISP sub-periods (i.e., 2005–07, 2007–11, and 2005–11). Following the 2004/05 season, which was characterized by relatively low maize yields due to widespread drought conditions, agricultural GDP grew very rapidly (15.9 per cent) during the early FISP period (2005–07). Since the maize yield growth effect was essentially a one-off effect (i.e., yields increase to a higher plateau but then no further growth occurs), growth subsequently slowed down but remained above 7 per cent during 2007–11. The years 2010 and 2011 happened to be exceptionally troublesome years for the tobacco sector, another major agricultural sub-sector, following large declines in international prices and domestic sales volumes (see Pauw et al. 2013). However, despite these setbacks, the average agricultural growth rate over the whole FISP period remained above 10 per cent per annum. Agriculture was not the only strong performer in Malawi; growth during this six-year period can certainly be characterized as 'broad-based', with equally strong growth across all sectors. Relative to the average national GDP growth rate of 7.1 per cent per annum during 2005–11, the mining, industry, and construction sectors and the private services sector grew rapidly, with the latter even outstripping the growth of the agriculture sector (10.3 per cent).

Table 1: Sectoral GDP growth rates and contributions to change in GDP (2005–11)

| | Average growth rates (%) | | | Value added share 2005–11 (%) | Contribution to change (%) | | |
|---|---|---|---|---|---|---|---|
| | 2005–07 | 2007–11 | 2005–11 | | 2005–07 | 2007–11 | 2005–11 |
| Agriculture | 15.9 | 7.3 | 10.1 | 30.0 | 54.7 | 26.4 | 34.2 |
| Mining, industry and construction | 3.0 | 11.4 | 8.5 | 16.7 | 6.3 | 22.7 | 18.2 |
| Trade and transport | 5.5 | 6.1 | 5.9 | 21.2 | 15.3 | 15.2 | 15.2 |
| Private services | 7.6 | 11.7 | 10.3 | 18.8 | 16.6 | 25.8 | 23.3 |
| Government services | 4.1 | 6.4 | 5.6 | 13.3 | 7.2 | 9.9 | 9.2 |
| National GDP growth/Total | 6.2 | 7.5 | 7.1 | 100.0 | 100.0 | 100.0 | 100.0 |

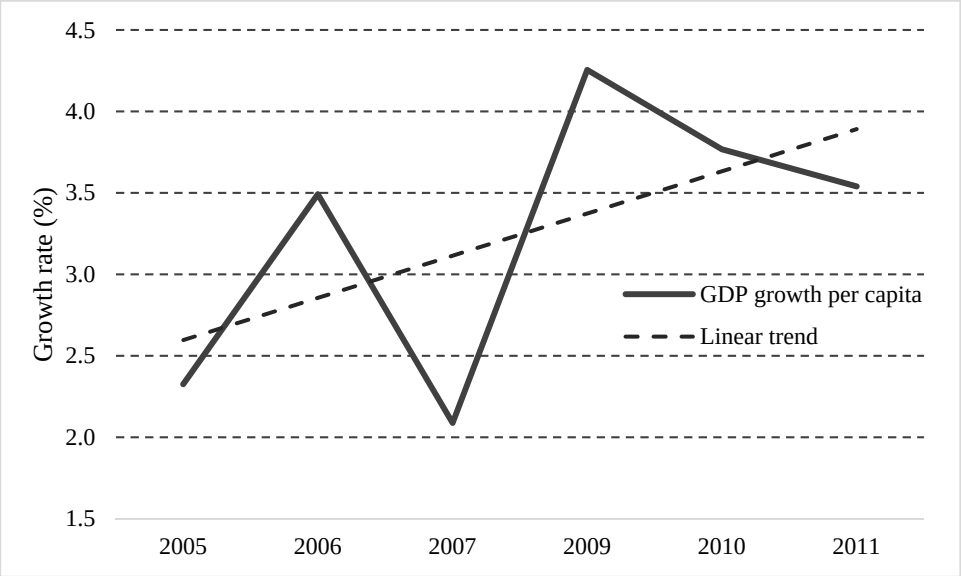
Source: Authors' calculations based on data from NSO (2012b).

In order to better understand each sector's absolute contribution to national growth it is necessary to consider the relative size of a sector (e.g., a small but rapidly expanding sector may have a limited impact on overall economic growth and vice versa). The fourth column in Table 1 shows the average contribution of each sector to national GDP (or value added). Agriculture and trade and transport are the two largest sectors, followed by private services. The final three columns show contributions to national growth; these shares take into account the growth rate of a sector but its contribution to national GDP growth is weighted according to the size of the sector. As expected, agriculture was indeed a major driver of growth during the early FISP period, contributing 54.7 per cent to national GDP expansion. The strong performance of the relatively large private services sector during 2007–11 meant this sector became an important contributor to growth during this time, with both agriculture and private services contributing just over one quarter to national GDP. Over the whole period, however, agriculture remained Malawi's most important sector, with a contribution of 34.2 per cent to overall GDP expansion.[2]

From a poverty perspective, this is a very significant outcome. Around 90 per cent of Malawians live in farm households, meaning they derive some or all of their income from farming activities (Benin et al. 2012). The vast majority of these households live in rural areas where poverty is widespread. A very legitimate expectation is therefore that the kind of agricultural growth experienced in Malawi over the past 5–10 years—i.e., growth led by production expansion on smallholder farms—should have had a significant impact on (rural) poverty. Economic growth far outstripped population growth (population growth averages around 3.3 per cent per annum in Malawi), leading to per capita GDP growth levels of 3 per cent or above over the entire period (Figure 2).

[2] This analysis is based on unpublished national accounts data for 2002–11 obtained from the NSO (National Statistics Office) in Lilongwe. The most recent NSO Statistical Yearbook (2011) only reports GDP estimates up to 2010, while growth rates are different from those shown here. The 'older' series in the yearbook also suggests very different contributions to national growth during 2004–10, with agriculture only contributing about 16 per cent, and trade and transport contributing more than one third. It is evident that users of national accounts data should be circumspect.

Figure 2: Per capita GDP growth and linear trend (2005–11)




Source: Authors' calculations based on data from NSO (2012b).

Unfortunately the reliability of crop production estimates produced annually by the Ministry of Agricultural and Food Security—through the Agricultural Production Estimates Survey (APES)—has been questioned from several angles (Figure 1 is based on APES data). These data form an important input into the agricultural GDP estimate, which, as discussed, is itself an important component of national GDP (see Table 1). Three distinct lines of critique are offered. First, Jayne et al. (2008) argue that crop production statistics are not consistent with maize price behaviour during 2007–09; one particular example is the maize price spike during October to December 2007 that was inconsistent with reported exports and production levels. Second, yields computed using the IHS2 differ significantly from those based on official crop estimates (Dorward et al. 2008).

Finally, simple arithmetic casts doubt on the increment in maize production between 2004/05 and 2006/07 that materialized with the introduction of FISP. Assuming a relatively high marginal return to fertilizer use, of 15 kilograms of grain per additional kilogram of nitrogen, each 50,000 metric tons of maize fertilizer supplied under FISP would yield around 247,500 metric tons of additional grain.[3] Yet, during the first implementation year (2005/06) in which 100,000 metric tons of fertilizer was supplied, production purportedly increased by 800,000 metric tons relative to 2003/04 rather than the expected 495,000 metric tons. The increase was even more profound for 2006/07 when 150,000 metric tons of fertilizer were distributed and official production estimates suggested a 1.5 million metric ton increase relative to 2003/04 production levels rather than the expected 742,500 metric tons. The calculations here do not even consider displacement of commercial fertilizer, estimated to have been in the region of 20–30 per cent, which would cause the net increase in fertilizer use to be less than the amount of subsidized fertilizer supplied (see Dorward et al. 2008; Ricker-Gilbert et al. 2011). Data from the National Census of Agriculture

[3] This back-of-the-envelope calculation is based on the assumption that each FISP 'benefits package' includes one 50ºkg bag of NPK fertilizer with a nitrogen content of 23 per cent, and one 50 kg bag of urea with a nitrogen content of 46 per cent. The average nitrogen content is therefore roughly one third, which means 50,000 metric tons of maize fertilizer translates to 16,500 metric tons of nitrogen. Multiplying this by a factor of 15 yields a maize grain response of 247,500 metric tons per 50,000 metric tons of fertilizer.

and Livestock (NACAL) conducted in 2006/07 (NSO 2010a) suggests incremental production of around 761,000 metric tons, which seems more plausible and in line with expectations.[4]

## 2.2 Official poverty trends in Malawi

Official poverty estimates in Malawi are based on the comparison of per capita consumption welfare aggregates against the national poverty line. Although various non-monetary indicators are also tracked as part of the monitoring and evaluation of the Malawi Growth and Development Strategy (MGDS), no official non-monetary poverty analysis is done on a regular basis. The official monetary poverty line for 2004/05 (IHS2) was based on the cost of basic needs methodology (see Deaton and Grosh 2000; Deaton and Zaidi 2002), which yielded a national poverty line of Malawi Kwacha MWK 16,165 per person per annum. This is equivalent to about US$0.42 per person per day at the official exchange rate, or US$0.82 at the purchasing power parity (PPP) rate.[5] For the new estimates in 2010/11 (IHS3), the NSO argued that 'estimating new poverty lines with the IHS3 does not guarantee that the standard of living implied by these poverty lines is the same as that from the IHS2' (NSO 2012a, p.207); hence, they opted to inflate the 2004/05 national poverty line using an inflation estimate of 128.9 per cent thought to be representative of the inflation faced by the poor. This yielded a 2010/11 national poverty line of MWK 37,002 per person per annum, which is equivalent to about US$0.68 per person per day at the official exchange rate, or US$1.25 at the PPP rate.

During the early FISP implementation years there was optimism about the positive effect that sustained growth would have on poverty in Malawi after a disappointingly small decline in poverty between 1997/98 (IHS1) and 2004/05 (IHS2) (see Figure 3).[6] In the interim years between IHS2 and IHS3 the statistics office conducted a series of Welfare Monitoring Surveys (WMSs) to monitor progress in poverty reduction.[7] These small-scale surveys did not collect data on consumption expenditure—typically a very costly exercise—but instead imputed consumption based on household asset ownership and other indicators. The trend from these WMSs showed a sharp decline in poverty over the years, especially between 2005 and 2007 when FISP was first introduced. By 2009 poverty had dropped to 39 per cent.

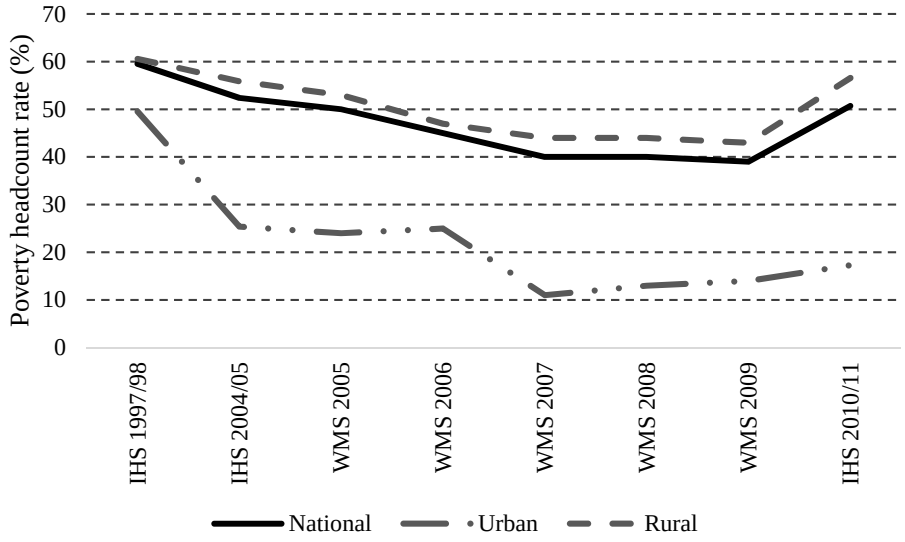
[4] Although MoAFS has long since conducted the APES, NSO was tasked with estimating crop production in 2003/04, in what turned out to be a one-off arrangement before the task was handed back to MoAFS in 2004/05. Some analysts believe that the comparison of the 2003/04 APES data and 2006/07 NACAL data present a more realistic picture of the 'FISP-effect'. The figure of 761,000 metric tons is from email correspondence with Stephen Carr in January 2014 (also see Carr 2014), assuming pre-FISP production of 1.35 metric tons and the reported NACAL production estimate of 2.11 metric tons in 2006/07.

[5] Exchange rates and PPP conversion rates from World Bank (2013).

[6] There are some concerns over comparability between Integrated Household Survey IHS1 and IHS2 poverty estimates. The IHS1 poverty analysis was based on a subsample of households in the IHS1 for which credible expenditure data was available (approximately 40 percent of observations were dropped) (NSO 2001). Also, NSO estimated four regional poverty lines, similar to those in this study, rather than a single national poverty lines.

[7] The WMS 2009 report (NSO 2010b) included poverty estimates for 2005–09.

Figure 3: Official poverty headcount rates: 1997/98 to 2010/11




Source: Authors' calculations based on NSO (2001, 2005, 2010b, 2012a).

The implied poverty trend up to 2009 seemed entirely consistent with national accounts data available at the time. For example, prior to the release of the IHS3 data, Pauw et al. (2011) used a general equilibrium model to assess the expected impact of reported economic growth trends during 2005–10 on poverty reduction. Their ex ante estimated poverty rate for 2009 was 42 per cent, and thus largely consistent with the WMS 2009 estimate of 39 per cent. Similarly, their estimates of rural (45 per cent) and urban poverty (21 per cent) were very much in line with those of the WMS 2009 (i.e., 43 and 14 per cent, respectively). As a result, Pauw et al. (2011) concluded that there is a great deal of consistency between crop statistics (maize production trends in particular) and the official agricultural growth figures, as well as between the level and structure of economic growth and reported poverty figures up until 2009.

After finally being released in 2012, the official poverty figures for 2010/11 were a disappointment, with the biggest concern being the small *increase* in rural poverty from 55.9 to 56.6 per cent. By contrast, urban poverty declined sharply (i.e., from 25.4 to 17.3 per cent), which at least ensured a small but statistically insignificant decline in national poverty from 52.4 to 50.7 per cent. Although per capita incomes grew quite rapidly over the period (Figure 2), growth seemingly did not trickle down to the poor, or at least not to the rural poor. In keeping with these findings, NSO (2012a) also reported a significant shift in the Malawian income distribution, particularly between rural and urban areas, but also between the poor and non-poor, with the latter exemplified by a rise in the Gini coefficient of income inequality from 0.39 to 0.45 between the two survey periods.

The fact that there was no rural poverty reduction remained surprising to many. The puzzling growth–poverty trajectory justifies further analysis of the reliability of national and sector level GDP growth estimates, as well as of poverty estimates themselves. This study addresses the latter, thus being the first study to challenge the conventional notion that rural poverty has increased in Malawi since 2004/05. Specifically, we estimate a new set of poverty lines for Malawi that are utility-consistent over space and time, something that is not guaranteed by existing approaches in Malawi. We explain the method in the next section, and report these results in Section 4. The consumption-based poverty results are complemented by non-monetary poverty results, which paint a similar picture of improved welfare outcomes across the board.

# 3 Constructing regional poverty lines for Malawi

## 3.1 Poverty and prices

In its official assessment of poverty in 2004/05 the NSO followed a cost of basic needs approach to estimate national food and non-food poverty lines. However, in coming up with a new set of poverty lines for 2010/11, they opted not to follow this approach, arguing that the standard of living implied by any newly estimated consumption bundle would not necessarily be utility-consistent with the IHS2 bundle (NSO 2012a). This may be true, but as we explain in this section there are approaches in the literature that allow us to overcome this problem. NSO's approach was to estimate an inflation rate they believed to be representative of price changes faced by the poor. The 2004/05 national poverty line was then adjusted by this rate. Essentially, therefore, the 2004/05 poverty consumption bundle, which represents revealed preferences at 2004/05 relative prices, was maintained in 2010/11, but its cost was adjusted to account for price changes. It is our contention that this approach does not guarantee the same standard of living because of changes in preferences.

Before explaining the poverty measurement method adopted in this study, it is useful to reflect on the NSO's inflation adjustment. Rather than using the implicit prices contained in the two household surveys, the NSO used an external data source, namely a consumer price index (CPI). NSO publishes an official CPI which is used to monitor inflation.[8] However, the NSO poverty estimation team believed this series underestimated the true extent of price increases between the two survey periods; hence a revised CPI series was constructed with technical assistance from South Africa's statistics agency and the World Bank.[9] Table 2 compares the official and revised CPI values.[10] At national level and for all items combined the official inflation rate over the 2004/05–10/11 period is 77.3 per cent, compared to the revised rate of 128.9 per cent. The third part of the table shows the 'adjustment factors'. Essentially the revision led to an inflation rate that was now 1.7 times (or 70 per cent higher than) the official inflation rate.

One particular oddity is the fact that although the revised CPI suggests significantly higher inflation for food products compared to non-food products, both the food poverty line (representing 'ultra-poverty') and the overall (food and non-food) poverty line were adjusted by the same poverty line inflation in the official assessment (i.e., by 128.9 per cent). Somewhat conveniently, considering the use of a single national poverty line, the same adjustment factor applies to the weighted rural and urban overall price indexes. This seems contrary to the available data that point to large differences in rural and urban food and non-food inflation rates. Most of the poor in Malawi reside in rural areas and allocate a significant portion of their income to food consumption. Considering these factors, perhaps the most significant difference between the official and revised CPI estimates is in the rural food category (adjustment factor of 2.2), which gives rise to a substantial

[8] Periodical IHS data is used to calculate weights for the combined price index, but the price data itself is sourced on a monthly basis.

[9] NSO was unable to provide any technical documentation or product level data related to the revised series. It is therefore not clear how the revised estimates were derived, or why it was felt that official estimates understated inflation. The revised series made available to us also only included CPI estimates for the months during which the respective surveys were carried out in the field in 2004/05 and 2010/11, but not for the months in between.

[10] Both the official and revised CPI series use IHS2 consumption weights to aggregate food and non-food components into a single national estimate of price changes. Since 2013 NSO started publishing a new CPI series using consumption weights from the IHS3. To our knowledge there was never any attempt to splice this series onto the old 'official' or 'revised' series.

difference in the official and revised rural food inflation rate (i.e., 55.6 per cent compared to 141.7 per cent).

Table 2: Official and revised CPI and inflation estimates

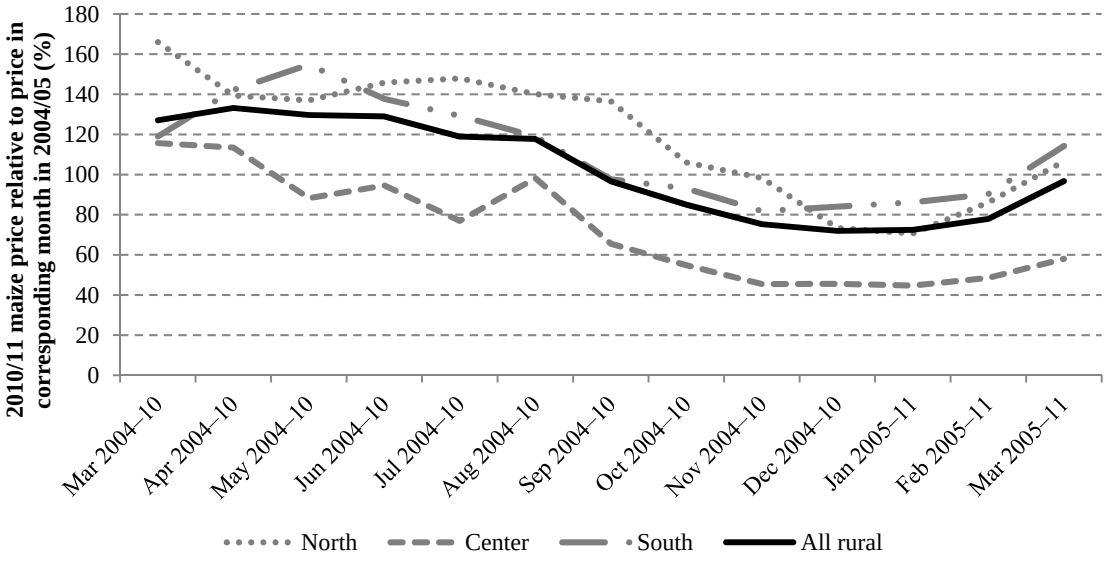
| | National | | | Urban | | | Rural | | |
|---|---|---|---|---|---|---|---|---|---|
| | All items | Food | Non-food | All items | Food | Non-food | All items | Food | Non-food |
| (a) Official estimates | | | | | | | | | |
| CPI 2004/05 | 178.0 | 161.1 | 201.3 | 192.1 | 183.9 | 196.6 | 171.8 | 155.9 | 205.4 |
| CPI 2010/11 | 315.6 | 276.3 | 370.0 | 379.7 | 425.9 | 354.7 | 287.8 | 242.7 | 383.5 |
| Inflation (%) | 77.3 | 71.5 | 83.8 | 97.6 | 131.6 | 80.4 | 67.5 | 55.6 | 86.7 |
| (b) Revised estimates | | | | | | | | | |
| CPI 2004/05 | 212.7 | 220.5 | 201.9 | 199.5 | 202.5 | 197.9 | 218.4 | 224.5 | 205.3 |
| CPI 2010/11 | 488.1 | 543.8 | 411.0 | 457.9 | 549.6 | 408.1 | 501.4 | 542.5 | 413.7 |
| Inflation (%) | 128.9 | 146.7 | 103.6 | 128.9 | 171.4 | 106.2 | 128.9 | 141.7 | 101.5 |
| (c) Adjustment factors [revised/official] | | | | | | | | | |
| CPI 2004/05 | 1.2 | 1.4 | 1.0 | 1.0 | 1.1 | 1.0 | 1.3 | 1.4 | 1.0 |
| CPI 2010/11 | 1.5 | 2.0 | 1.1 | 1.2 | 1.3 | 1.2 | 1.7 | 2.2 | 1.1 |
| Inflation (%) | 1.7 | 2.1 | 1.2 | 1.3 | 1.3 | 1.3 | 1.9 | 2.5 | 1.2 |

Notes: CPI 2004/05 represents the average index value for the period March 2004–March 2005, which is the period during which the IHS2 was conducted. Similarly, CPI 2010/11 represents the average index value for March 2010–March 2011.

Source: Data from NSO Statistical Yearbooks (2005, 2011) and NSO-supplied spreadsheets and authors' calculations.

Although an exhaustive assessment is beyond the scope of our analysis, it is useful to compare these price changes with another independent assessment of price changes. Maize is the dominant staple in Malawi and accounts for more than two thirds of caloric availability (Ecker and Qaim 2011). It is fair to assume, therefore, that maize price changes would dominate any estimate of rural food price inflation. The Ministry of Agriculture, Food and Security (MoAFS) through its Agricultural Market Information System (AMIS) collects regular price data from around 72 markets in Malawi. Figure 4 shows the month-to-month six-year change in rural maize prices between the two IHS surveys in 2004/05 and 2010/11. Initially, between March and September 2010, nominal maize prices were more than double the levels of the corresponding months six years earlier, in 2004. However, from October onwards maize prices were roughly 70–80 per cent higher, such that over the entire analysis period rural maize prices were 101 per cent higher during the 13-month period in which the IHS3 data were collected compared to the corresponding months during the IHS2 fieldwork.

Figure 4: Rural maize price inflation by region, 2004/05 to 2010/11




Source: Authors' calculations based on data from MoAFS (2013a).

We therefore have three estimates of rural food price inflation: an official CPI-based estimate of 55.6 per cent; a revised CPI-based estimate of 141.7 per cent; and an estimate based on maize prices of 101.0 per cent. Our approach to poverty measurement in this study will attempt to use commodity prices derived directly from the two expenditure surveys, and hence offers yet another estimate of price inflation. Importantly, whereas the above estimates provide an estimate of average price changes, the use of household survey data allows us to identify price changes faced specifically by the poor, taking into account their chosen consumption bundles and the markets where they acquire goods and services. While no data source is without error, the extreme variance across these price estimates from different sources underscores the challenge of getting the poverty number right.

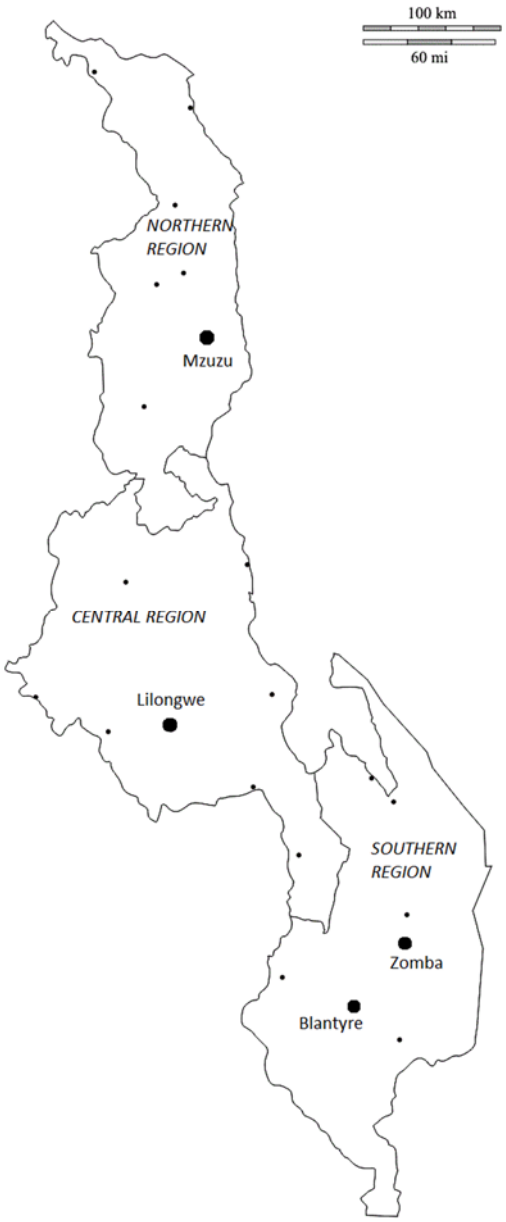
### 3.2 Regions, preferences, and utility consistency

Similar to the official poverty estimation method, this study adopts a cost of basic needs approach in estimating poverty lines for Malawi, with some refinements. Our first deviation from the official poverty methodology is to construct regional poverty lines rather than having only a single national poverty line. Second, as explained below, we apply an entropy-based method to ensure that the regional consumption bundles underlying each poverty line are utility-consistent across space and time.

We include four regions of Malawi, namely 'south rural', 'centre rural', 'north rural', and 'urban'. The three rural areas correspond to the three administrative regions of Malawi (see Figure 5) and include households that do not live in one of four metropolitan cities. Urban areas comprise the four metropolitan cities of Mzuzu in the north, Lilongwe in the centre, and Blantyre and Zomba in the south. Differences in preferences may be due to several factors, including cultural preferences, differences in demographic make-up that affect caloric needs, and supply and demand conditions that influence relative prices. Although official poverty estimates have always been reported at a regional level in Malawi, region-specific poverty lines were last constructed using the first IHS1 of 1997/98 (NSO 2010b; also see Mukherjee and Benson 2003). Taking account of

regional and temporal differences in prices and preferences, as we do in this study, is likely to alter estimated poverty lines significantly (Tarp et al. 2002).

Figure 5: Malawi administrative regions




Source: Generated by IFPRI GIS analysts using data from Global Administrative Areas (2012).

As is common in the literature we use consumption expenditure rather than income in our poverty estimation, mainly because consumption expenditure provides a smoother, less lumpy measure of welfare through time. The consumption aggregate used in the official poverty assessment is publically available and consists of food and non-food components, with the latter consisting of expenditure on non-durable goods; estimated use value of durable consumer goods; and rental value of housing. Whereas we adopt the same non-food consumption measure for our own analysis, we construct a new food consumption component.

Total quantity of food consumed in a household is the sum of purchased food, own production, and gifts. Food consumption is based on a seven-day recall period. Quantity units of measurement,

which include standard (metric) and non-standard units, are converted into grams using conversion factors. These conversion factors are typically supplied with household expenditure survey data, but rather than using the set of conversion factors used in the official poverty analysis, we use a revised set of conversion factors from which inconsistencies and errors have been systematically removed (see Section 3.3 for details).

Since respondents provide estimates of both the cost and quantity of purchased food, this data can be used to estimate unit values for different food items. The valuation is carried out in the same way as the NSO describe their valuation: If a household reports to have consumed a food item not purchased in the last week (e.g., gifts, own production, or food purchased earlier), the median unit value from its cluster is used to value that consumption. If no other household in that cluster consumed the same item, or if there were not enough observations to obtain a reliable unit value, the median unit value from the next geographical level within which the household resides was used to estimate the value of that consumption. Total food expenditure for each household is calculated by multiplying the unit values by the quantity consumed. Theoretically the use of revised conversion factors should be the only factor that may cause our food consumption estimate to differ from the official one.

Once a consumption aggregate has been estimated, it is necessary to construct a poverty line, or in our case, several regional poverty lines. The total poverty line for each region is the sum of the food and non-food poverty lines. The poverty line and its subcomponents reflect value judgments about basic food and non-food needs, and are set in terms of a level of per capita consumption expenditure that is deemed consistent with meeting those basic needs at prevailing prices. The level at which the food poverty line is set is crucial to our understanding of poverty since poor households allocate such a significant proportion of their spending to food. The non-food poverty line, on the other hand, recognizes that the poor also allocate a non-trivial proportion of their total consumption to non-food items.

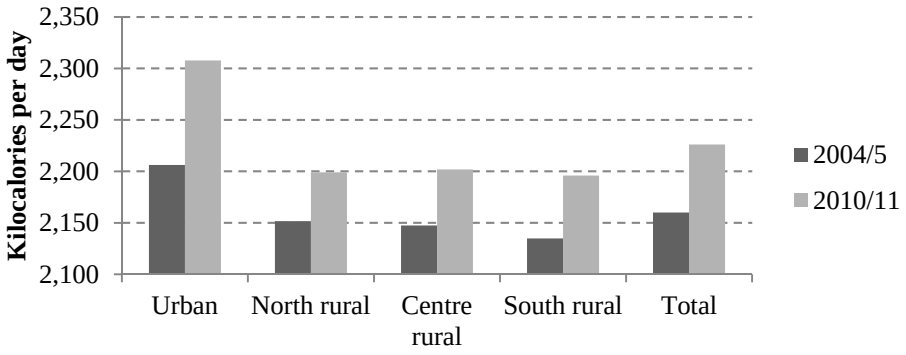
For each of the four regions a food poverty line is constructed by determining the food energy (caloric) availability for the reference population (i.e., the poor), the caloric content of the typical diet of the poor in that region, and the average cost (at local prices) of calories when consuming that diet. Thus, the food poverty line, expressed in MWK per person per day, is the area-specific cost of meeting the minimum caloric requirements when consuming a food bundle comprised of goods that the poor in a particular area typically consume. We use a reference individual caloric requirement that is similar to that of the NSO (2005, 2012a). However, whereas the NSO adjusts caloric needs only for age, we account for regional difference in both the age and gender compositions (see Table 3). We further adjust caloric requirements according to pregnancy rates, i.e., regions with a higher prevalence of pregnant women will have a higher average caloric requirement. As expected, we therefore have some variation in average caloric needs across the four regions, and these average needs may change as the age and gender composition of the region shifts over time (see Figure 6).

Table 3: Daily caloric needs adjustments

| A. Caloric needs by age and gender (kilocalories per day) | | | B. Pregnancy rates (%) | | |
|---|---|---|---|---|---|
| | Females | Males | | Urban | Rural |
| Aged 0–1 | 820 | 820 | Aged 12–14 | 0.3 | 0.3 |
| Aged 1–2 | 1,150 | 1,150 | Aged 15–19 | 7.9 | 11.8 |
| Aged 2–3 | 1,350 | 1,350 | Aged 20–24 | 19.1 | 26.3 |
| Aged 3–5 | 1,550 | 1,550 | Aged 25–29 | 18.4 | 24.1 |
| Aged 5–7 | 1,750 | 1,850 | Aged 30–34 | 14.9 | 20.5 |
| Aged 7–10 | 1,800 | 2,100 | Aged 35–39 | 9.7 | 15.5 |
| Aged 10–12 | 1,950 | 2,200 | Aged 40–44 | 4.3 | 7.7 |
| Aged 12–14 | 2,100 | 2,400 | Aged 45–49 | 1.9 | 3.4 |
| Aged 14–16 | 2,150 | 2,650 | | | |
| Aged 16–18 | 2,150 | 2,850 | | | |
| Aged 18–30 | 2,100 | 3,000 | | | |
| Aged 30–60 | 2,150 | 2,900 | | | |
| Aged 60+ | 1,950 | 2,450 | | | |

Source: Caloric needs are adapted from WHO (1985). Pregnancy rates are calculated by the authors using data from the 2008 Census.

Figure 6: Final adjusted average caloric needs (kilocalories per day)




Note: Adjusted caloric requirements take into account age, gender, pregnancy probability, as well as location (rural or urban).

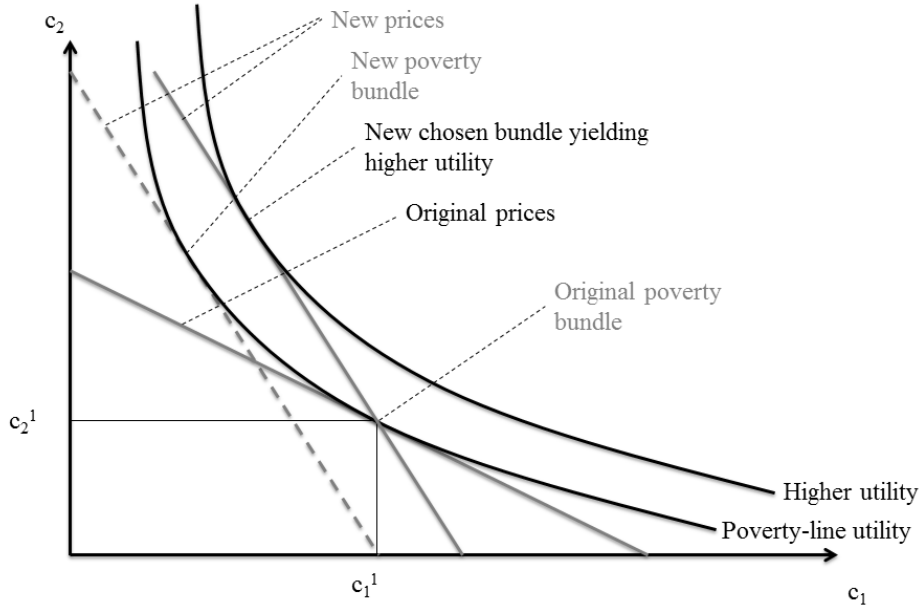
Source: Author's calculations based on data from IHS2 and IHS3.

Since our approach allows food baskets to vary across regions, the cost per calorie will differ across regions. This is because households in different regions may source their calories from different food types with unique caloric contents and prices, or because prices for similar goods differ across regions due to supply and demand conditions. The establishment of regional poverty lines is precisely motivated by the fact that consumers face different prices and/or have different preferences across regions.

In practice, poverty lines measure the cost of a consumption bundle. When compared over time and space, the idea is that these consumption bundles must yield a consistent level of utility to consumers. Consider, for example, an economy as depicted in Figure 7 where there are only two food items, $c_1$ and $c_2$. A representative consumer has preferences over these two goods represented by indifference curves. Suppose in time period 1 a food consumption bundle ($c_1^1$, $c_2^1$) is selected as the food poverty bundle. The related food poverty line is obtained by multiplying consumption quantities in the bundle by the relevant prices. This poverty line is represented as the budget line

in the figure which has a slope equal to the relative price of $c_1$ and $c_2$ (original prices). The maximum utility that can be attained with a budget equal to the food poverty line is represented by the indifference curve which is tangential to the food poverty line (poverty-line utility).

Figure 7: Poverty lines with the fixed and flexible bundle approaches




Source: Authors' adaptation from a similar figure in Arndt and Simler (2010).

Suppose in time period 2 the price of $c_1$ decreases. This relative price change is represented by the steeper-sloped budget lines (new prices). Although the original bundle is still achievable with the same budget, the rational consumer would be able to attain a higher level of utility at the point where the new budget line is tangential to a higher indifference curve (new chosen bundle yielding higher utility). However, poverty lines are meant to represent the minimum cost of attaining a constant level of utility. The new poverty line for period 2 should therefore equal the lowest cost of attaining a preferred bundle that lies on the original indifference curve, which is the point where the new budget line is tangential to the original indifference curve (new poverty bundle).

The first step in our poverty line estimation is to establish reasonable cost estimates of food commodities. Following Arndt and Simler (2010) we first identify the most common food items consumed by the poor, specifically those that account for 90 per cent of food expenditure among poor households. On average we find that these bundles represent about 95 per cent of caloric availability. The values of these area-specific food bundles are then scaled to equal 100 per cent of calorie requirements. Each household's food consumption bundle therefore essentially excludes less common (and often more expensive) sources of calories. A set of household-specific prices is then calculated (i.e., amount spent divided by quantity in grams). The median unit values of these price distributions will eventually be used in valuing regional bundles.

In order to ensure that our poverty lines reflect preferences and prices faced by poor people, we adopt an iterative process described by Ravallion (1998) whereby households are ranked by nominal consumption per capita. The bottom $x_1 = 60$ per cent of households is now arbitrarily identified as the relatively poor, i.e., $x_1$ may be regarded as a preliminary estimate of the poverty headcount rate. We evaluate these 'poor' households' food quantities and prices to estimate the cost of the calories they obtain. Preliminary poverty-line calculations are made, using the minimum

caloric requirement as the basis, and the nominal consumption values are converted into real terms by taking into account region-specific differences in the cost of acquiring the basic needs bundle. This gives us a preliminary poverty headcount ratio $x_2$. Households are then re-ranked using this first approximation of consumption per capita in real terms, and the bottom $x_2$ per cent of this ranking identified as the relatively poor. Observed consumption patterns and prices in this sub-sample are calculated, producing a second estimate of poverty lines. This gives us another preliminary poverty headcount ratio $x_3$. We again re-rank households according to real expenditure. The iterative process continues until the poverty line converges, meaning that the same, or nearly the same, subsample of households are identified as the poor. In the case of Malawi five iterations ensure convergence for both survey periods.

The above procedure should reduce poverty rate bias; however, there is no guarantee that the estimated poverty lines are consistent across time and space. Arndt and Simler (2010) found that in both Mozambique and Egypt poverty lines based on such traditional iterative methods produced biased poverty estimates. This study therefore adopts the methodological advancement first proposed by Arndt and Simler (2010) to ensure that poverty lines are utility-consistent. The method is not described in detail here, but in essence it consists of an entropy-based approach to making small adjustments to budget shares until imposed constraints—in this instance utility consistency—are satisfied. The method ensures that the information content in the original budget shares is preserved to the greatest degree possible. Utility consistency is ensured across time and space if bundles satisfy spatial and inter-temporal revealed preference conditions. This means that the 2010/11 bundle of domain A is not manifestly of higher quality than the 2010/11 bundle of domain B (and vice versa); similarly, the 2004/5 bundle of domain A is not manifestly of higher quality than the 2010/11 bundle of domain A (and vice versa).

The next step is to estimate a non-food poverty line. This is taken as a weighted average of non-food expenditure for people with total expenditure at between 80 and 120 per cent of the food poverty line. A triangular weighting scheme is used where the closer a household's total expenditure is to the poverty line, the higher the weights. The sum of the non-food and food poverty lines is the total poverty line, which is the basis for calculating initial poverty rates. The approach of analysing non-food expenditures of those whose *total* expenditure is close to the food poverty line is consistent with the methodology used by Arndt and Simler (2010), but differs slightly from the approach used by the NSO. The NSO poverty assessment (and many others) would typically evaluate non-food spending among those with food expenditure close to the food poverty line. Both approaches are acceptable. The rationale for our adopted approach is that it ensures we capture non-food expenditures of people who can barely cover their basic food needs, i.e., for these households expenditures on non-food items are absolutely necessary, so much so that they are willing to forego food to obtain these non-food items.

Having derived the poverty lines, the next step is to estimate poverty rates. Since expenditure data are collected at the household level, we assume a uniform intra-household distribution such that each household member has the same per capita expenditure level. In keeping with the popular poverty literature, we use poverty measures proposed by Foster et al. (1984)

$$P(z,\alpha) = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{z-y_i}{z}\right)^{\alpha} I(y_i < z) \tag{1}$$

In this formulation, $y_i$ is per capita consumption expenditure of person $i$ drawn from a sample of size $N$, $z$ is a poverty line, $\alpha$ is a measure of poverty aversion, and $I(.)$ is an indicator function equal

to one if the condition $y_i < z$ holds, and zero otherwise. The parameter $\alpha$ takes on values of 0, 1 or 2 to measure the poverty headcount rate, poverty gap, and squared poverty gap respectively. Specifically, when $\alpha = 0$, we have the poverty headcount index. This gives the percentage of the population who are, based on consumption, poor. The headcount is easy to interpret; however, it has some limitations. It neither takes into account how close or far the consumption levels of the poor are to the poverty line nor the distribution among the poor. When $\alpha = 1$, we have the poverty gap index. It measures the extent of the difference between the poverty line and the average consumption of poor households. This measure captures changes in poverty that the poverty headcount index does not detect. For instance, if the consumption of the poor increases without necessarily crossing the poverty line, the headcount will not detect this change, while the poverty gap will. For $\alpha = 2$, we have the squared poverty gap index. It measures the severity of poverty, and also takes into account inequality changes among the poor. A transfer from a poor person to somebody less poor may leave unaffected the headcount or the poverty gap but will increase this measure. Our analysis focuses on the poverty headcount rate ($\alpha = 0$).

### 3.3 A note on conversion factors

Since food quantities can be reported in either standard (metric) or non-standard units of measurement (e.g., plates, cups, pails, or even oxcarts), household expenditure surveys are usually accompanied by a set of conversion factors used to convert quantities to a standard metric measurement unit (e.g., grams). Conversion factors take into account the volume of the measurement unit but also the weight density of the particular food product. The quality of conversion factors is crucial for determining unit costs of food consumption baskets. This in turn is central to analyses of poverty or household food and nutrition security. Using the consumption factors of Verduzco-Gallo and Ecker (2013) in order to construct both consumption aggregate and poverty lines is therefore an important deviation from the official approach.

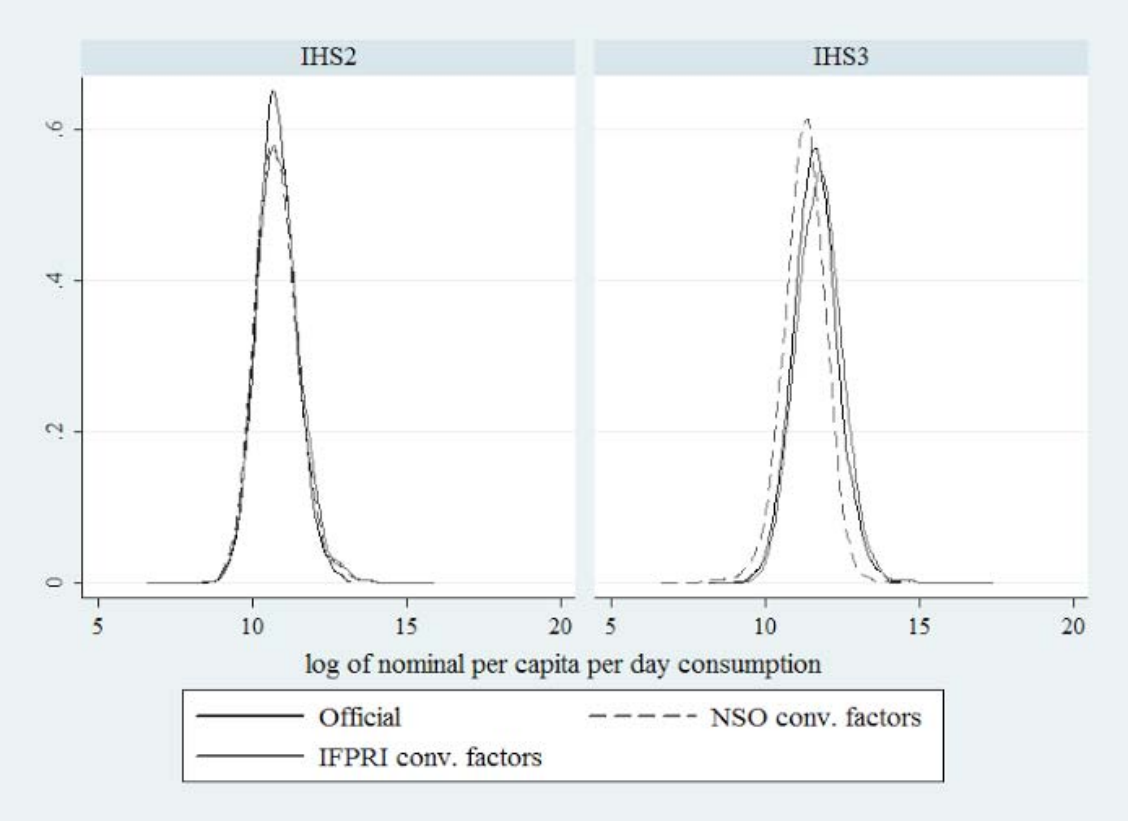
Two examples of the type of adjustments made are worth highlighting here. The first concerns conversion factors for households reporting cooking oil purchases in sachets. Since cooking oil is relatively expensive, it is common for households to buy cooking oil decanted into small sachets (e.g., in 2004/05 about 13 per cent of all households report cooking oil purchases using this unit of measurement). No cooking oil sachet conversion factors were published for the IHS3, but based on implicit prices these ranged from 0.03–0.07 kilograms for small, medium, and large sachets. This corresponds to the sachet sizes in the visual aid that supplements the survey. However, the IHS2 conversion factor for seemingly the same unit of measurement was 0.456 kilograms. Average implicit prices for cooking oil purchased in sachets were found to be only about 10 per cent of the price paid for cooking oil in other containers. This clearly suggests that the conversion factor was miscoded. We therefore adjust the relevant conversion factors to 0.05 kilograms. This causes changes in both the consumption aggregate (i.e., in instances where implicit prices were used to value consumption) and the poverty line (i.e., the significant adjustment to the unit price of oil leads to an increase in the cost of calories).

The second issue concerns regional differences in IHS3 conversion factors. Whereas the conversion factors for the central and southern regions are exactly the same, the northern region has a unique set of conversion factors. While for most products the conversion factors in the north are comparable with other regions, this is not true for fish and cassava. The fact that these two products account for 38 per cent of calories in the rural north compared to only 3–6 per cent in the other regions dramatically raises the importance of getting these particular conversion factors right. On average, cassava conversion factors are about 5.5 times higher in the north, while factors for dried and fresh fish are 21 and 7.4 times higher, respectively. This has a tremendous effect on

unit prices; for example, the price of cassava in the north is only 16 per cent of the price in other regions. Similarly, dried and fresh fish prices in the north are only 2 and 18 per cent of the price of the same product elsewhere. As this seems highly implausible, we rectify this by applying the same conversion factors throughout the country. This is consistent with the way the official IHS2 conversion factors are set up.

The re-creation of the food consumption aggregate using the new set of conversion factors explains the difference between our consumption aggregate and the one used in the official poverty assessment. The different food consumption aggregates are illustrated in Figure 8. The differences will also affect poverty lines through the composition and cost of the poverty line food bundle, although since we use regional poverty lines as opposed to a single national one, regional differences in prices and consumption patterns also influence the final results. We note that while the set of conversion factors does matter, we were unable to reconstruct the official consumption aggregate based on the method used by the NSO and by using the officially supplied set of consumption factors. In the case of IHS2, this explains the differences in consumption aggregates while the conversion factor adjustments do not change the consumption aggregate much. In the case of IHS 3, both the reconstruction of the consumption aggregate and the use of the alternative, more consistent set of conversion facts are important —the reconstructed consumption aggregate is lower than the officially supplied one. Using the more consistent set of conversion factors, the new consumption aggregate increases and is larger than both the reconstructed and the officially supplied consumption aggregate. We next turn to our poverty results.

Figure 8: Food consumption aggregates




Source: Authors' elaboration using data from IHS2, IHS3 and NSO (2005, 2012a).

# 4 Results and analysis

## 4.1 Monetary poverty estimates

In this section we present our estimates of changes in monetary (or consumption-based) poverty in Malawi between 2004/05 and 2010/11. Throughout we compare our estimates with the official poverty estimates of the NSO. Differences between our poverty results and those of the NSO reflect differences in poverty lines as well as differences in the distribution of the consumption aggregates used in the respective poverty analyses.

Our estimated poverty lines are reported in Table 4 and compared with the official food, non-food, and overall poverty lines used by NSO. All poverty lines are converted to MWK per person per day. In order to facilitate the comparison we present, in addition to our regional poverty lines, population-weighted national average poverty lines, which can be compared against the NSO's national poverty lines. We also estimate an average rural poverty line in the same manner. Given the approach adopted here our poverty lines may vary by region, while, more importantly, the implied inflation rate faced by the poor—we refer to it here as the 'poverty line inflation rate'—may also vary by region and for food or non-food items. By contrast, NSO applied a uniform rate of 128.9 per cent to inflate their 2004/05 national food and non-food poverty lines to 2010/11 levels, even though their own inflation estimates suggested significant differences in food and non-food inflation across urban and rural areas. The estimates from Table 2 are replicated here in Table 4 for ease of comparison. However, we recalculate the total inflation rate using actual food/non-food consumption shares in the IHS2 and IHS3, respectively. This method yields inflation rates that differ by region and are quite different from the 128.9 per cent used in the official poverty analysis.

Table 4: Food, non-food, and overall poverty lines for 2004/05 and 2010/11

| | Poverty lines (MWK/person/day) | | | | Poverty line inflation 2004/05 to 2010/11 | | Actual inflation (NSO CPI revision; see Table **2**Table 2) |
|---|---|---|---|---|---|---|---|
| | 2004/05 (IHS2) | | 2010/11 (IHS3) | | | | |
| | Regional poverty line estimates | Compare official poverty line (NSO) | Regional poverty line estimates | Compare official poverty line (NSO) | Regional poverty line inflation estimate | Compare official poverty line inflation (NSO) | |
| Food | | | | | | | |
| National | 30.0 | 27.5 | 70.3 | 62.9 | 134.3 | 128.9 | 146.7 |
| Urban | 28.6 | - | 72.3 | - | 152.8 | - | 171.4 |
| Rural | 30.2 | - | 69.9 | - | 131.5 | - | 141.6 |
| North rural | 34.7 | - | 77.4 | - | 123.1 | - | - |
| Central rural | 30.6 | - | 73.2 | - | 139.2 | - | - |
| South rural | 28.6 | - | 64.6 | - | 125.9 | - | - |
| Non-food | | | | | | | |
| National | 19.0 | 16.8 | 38.4 | 38.5 | 102.1 | 128.9 | 103.6 |
| Urban | 26.3 | - | 66.7 | - | 153.6 | - | 106.2 |
| Rural | 18.0 | - | 33.4 | - | 85.6 | - | 101.5 |
| North rural | 17.7 | - | 35.5 | - | 100.6 | - | - |
| Central rural | 19.4 | - | 35.3 | - | 82.0 | - | - |
| South rural | 16.8 | - | 30.9 | - | 83.9 | - | - |
| Total | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| National | 50.0 | 44.3 | 108.8 | 101.4 | 117.6 | 128.9 | 133.9 |
| Urban | 54.9 | - | 139.0 | - | 153.2 | - | 146.6 |
| Rural | 48.2 | - | 103.3 | - | 114.3 | - | 130.0 |
| North rural | 52.4 | - | 112.9 | - | 115.5 | - | - |
| Central rural | 50.0 | - | 108.5 | - | 117.0 | - | - |
| South rural | 45.5 | - | 95.5 | - | 109.9 | - | - |

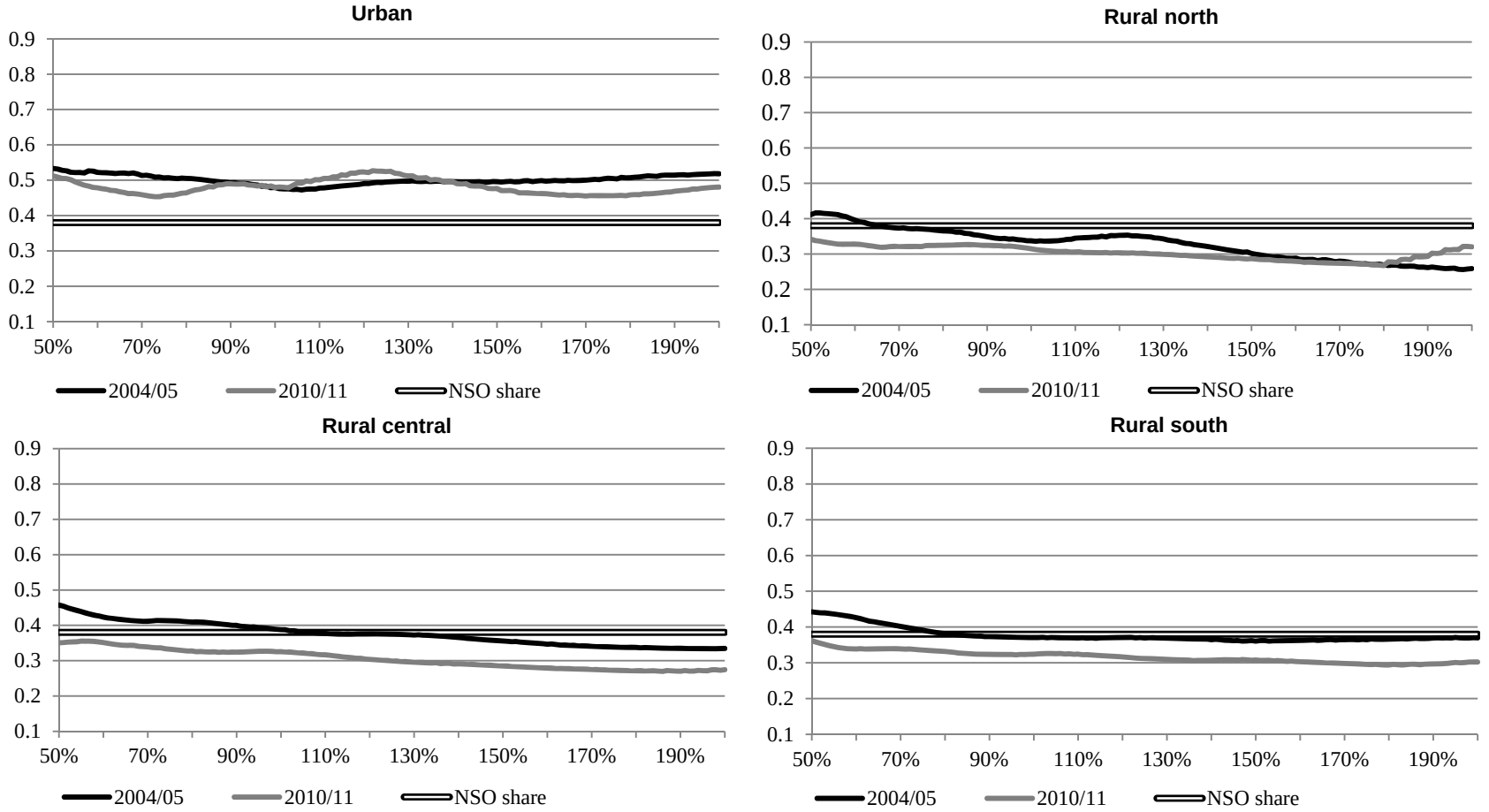
Note: Poverty lines are estimated for each region. Our 'national' and 'rural' poverty line estimates are population-weighted averages of the region-specific poverty lines. The final column shows the revised inflation rates from Table 2, with the exception of the totals, which are calculated by the authors using actual consumption weights from 2004/05 and 2010/11.

Source: NSO (2012a) and authors' estimates based on IHS2 and IHS3.

Both our food and non-food poverty lines for 2004/05 are above the official estimates and yield a total poverty line of MWK 50.0 per person per day, which is about 12.9 per cent above the official estimate. The same cost of basic needs approach is used to estimate our 2010/11 poverty lines from first principles as opposed to applying a uniform inflation adjustment to the poverty lines. Once again both our food and non-food poverty lines are higher than the official estimates, while the overall poverty line of MWK 108.8 per person per day is about 7.3 per cent higher than the official poverty line. Our estimated poverty line inflation rate is 117.6 per cent, which is close to the 128.9 per cent used by the NSO. This result supports the notion that inflation as measured by the NSO's official CPI (77.3 per cent) understates actual inflation faced by the poor. However, we question whether the uniform increase of 128.9 per cent for both food and non-food consumption is reasonable, as our results suggest substantial regional variation as well as variation between food and non-food poverty line inflation. There is some regional variation; for example, at 153.6 per cent, urban poverty line inflation is significantly above the rural poverty line inflation (114.3 per cent). Among the three rural regions, poverty line inflation varies between 109.9 per cent (south rural) to 117.0 per cent (central rural).

Perhaps the most important methodological difference between our approach and that of the NSO is that our inflation rate is based on flexible consumption bundles. This means that we account for observed changes in the non-food share of expenditure. Since the non-food poverty line is estimated on the basis of non-food expenditures of households close to the food poverty line, different choices of food poverty lines will mean that non-food poverty lines are estimated on the basis of the observed expenditures of different subsets of the population; hence, the level and share of non-food expenditures may be sensitive to the choice of poverty line. Figure 9 plots estimated non-food expenditure shares (vertical axis) for urban and rural households for different chosen food poverty lines (e.g., a value of 80 per cent means '80 per cent of the actual food poverty line' as per Table 4). The double horizontal line represents the 38 per cent non-food expenditure share estimated by the NSO in its 2004/05 poverty assessment and subsequently maintained in its estimation of the 2010/11 poverty line.

Figure 9: Estimated non-food share of total expenditure for different food poverty lines




Note: In all panels the horizontal axis represents the share of the estimated food poverty lines as per Table 4, i.e., 100 per cent is the actual selected food poverty line.

Source: Authors' elaboration based on data from IHS2 and IHS3.

The figure is interesting in several respects. First, if Engel's Law holds, the estimates of non-food expenditure shares would rise as we move to higher poverty lines, simply because given the estimation procedure we would then be evaluating non-food expenditures of slightly wealthier households. It appears this only holds for urban households in 2004/05. In all other instances the non-food share declines or is constant as we move to higher food poverty lines, which suggests extra income earned by the poor is initially spent on more (or better quality) food rather than non-food expenditures. This is reasonable considering that most of the households with total expenditure at or below the food poverty line are not satisfying their caloric needs since at least some of their income is used to purchase essential non-foods; hence, it is quite plausible to think that additional income will be spent on food until they reach a desired level of food intake. Non-food shares therefore only start to rise at relatively high food poverty lines (e.g., see the figure for north rural in 2010/11).

Second, while NSO assumed a constant non-food expenditure share of 38 per cent, we find this rate to only be reasonably close to our own non-food shares in 2004/05 in central and southern rural areas. The rural north has a lower non-food share, while in urban areas the share is well above 38 per cent. This is consistent with the literature where urban households are often found to consume fewer and more expensive calories (Tarp et al. 2002). This finding should therefore also be reflected in the estimated poverty line for the urban areas. Also of note is the finding that the non-food shares increased across all the entire range of possible poverty lines in the rural south and rural central, and for a wide range of possible poverty lines in the rural north. In summation, the regional and time-specific approach to poverty line estimation appears to be important in the present setting: consumption patterns, even the crude non-food shares shown here, differ substantially across regions.

Table 5 reports our estimated poverty headcounts and compares them with official numbers. Our estimated urban poverty rate (36.2 per cent) is initially 10.8 percentage points above the official estimate for 2004/05. This is a reflection of the higher non-food share of urban residents—as seen from Table 4, our re-estimated urban food poverty line is almost identical to the official national food poverty line in 2004/05. In contrast to the official estimated decline in urban poverty (8.1 percentage points), our urban poverty rate declines somewhat less, by 3.9 percentage points between 2004/05 and 2010/11, although the decline is not statistically significant (see reported confidence interval). This means our 2010/11 poverty rate (32.3 per cent) remains well above the official estimate of 17.3 per cent. These results reflect the initially higher non-food costs of living in urban areas as well as the further increase in the urban non-food share from 2004/05 to 2010/11. These systematic differences between rural and urban consumption bundles are accounted for using our approach, but are swept under the rug when a single national poverty line is used.

Rural poverty declines by 6.9 percentage points, compared to a 0.7 percentage point increase according to official statistics. This decline is statistically significant. All rural regions experience large declines in poverty. The largest decrease is in the rural south, where we estimate a decline of 10 percentage points. The poverty picture painted by our results stands in sharp contrast to official results. Rather than rising rural poverty, we measure a rather sharp decline in rural poverty; in contrast, we find a more moderate decline in urban poverty compared to the NSO's estimate of a sharp decline.

Table 5: Poverty headcount rates and changes in poverty between 2004/05 and 2010/11

| | Poverty headcount rate (%) | | | | Percentage point change (2004/05 to 2010/11) and 95% confidence intervals | | | | Change in regional poverty (fixed non-food share) |
|---|---|---|---|---|---|---|---|---|---|
| | 2004/05 (IHS2) | | 2010/11 (IHS3) | | | | | | |
| | Regional poverty estimates | Compare official poverty estimate (NSO) | Regional poverty estimates | Compare official poverty estimate (NSO) | Change in regional poverty | | Compare official change in poverty (NSO) | | |
| Normal poverty | | | | | | | | | |
| National | 55.6 | 52.4 | 48.3 | 50.7 | -7.3 | ± 2.7 | -1.7 | ± 2.4 | -3.7 |
| Urban | 36.2 | 25.4 | 32.3 | 17.3 | -3.9 | ± 9.3 | -8.1 | ± 6.8 | -4.0 |
| Rural | 58.1 | 55.9 | 51.2 | 56.6 | -6.9 | ± 2.8 | 0.7 | ± 1.4 | -2.6 |
| -North rural | 66.6 | 56.3 | 60.9 | 59.9 | -5.6 | ± 6.0 | 3.6 | ± 6.5 | -4.3 |
| -Centre rural | 49.5 | 46.7 | 45.2 | 48.7 | -4.2 | ± 4.4 | 2 | ± 4.2 | 0.8 |
| -South rural | 64.1 | 64.4 | 54.0 | 63.3 | -10.0 | ± 4.3 | -1.1 | ± 3.7 | -5.7 |
| Extreme poverty | | | | | | | | | |
| National | 25.5 | 22.3 | 26.1 | 24.5 | 0.6 | ± 2.3 | 2.1 | ± 2.2 | - |
| Urban | 7.7 | 7.5 | 7.9 | 4.3 | 0.2 | ± 3.9 | -3.2 | ± 3.4 | - |
| Rural | 27.8 | 24.2 | 29.4 | 28.1 | 1.5 | ± 2.6 | 3.9 | ± 2.4 | - |
| -North rural | 40.5 | 25.9 | 36.6 | 29 | -3.9 | ± 6.9 | 3.0 | ± 6.4 | - |
| -Centre rural | 19.3 | 16.1 | 24.5 | 21.5 | 5.1 | ± 3.5 | 5.4 | ± 3.2 | - |
| -South rural | 32.6 | 31.5 | 31.9 | 34.2 | -0.7 | ± 4.2 | 2.7 | ± 4.0 | - |

Notes: The confidence interval is used to determine the statistical significance of the difference in the poverty rate between 2004/5 and 2010/11. Since the distribution of the poverty rate is unknown we follow Simler and Arndt (2007) in defining the confidence interval as plus or minus twice the standard error. The change in the poverty headcount rate is considered statistically insignificant if zero is within the confidence interval around the estimate.

Source: NSO (2012a) and authors' estimates based on IHS2 and IHS3.

Table 5 also presents results for changes in extreme poverty. Households are deemed extremely poor or 'ultra-poor' when their total per capita consumption falls below the estimated food poverty lines in Table 4. Once again our results are somewhat at odds with official results. We find a small but statistically insignificant rise in extreme urban poverty compared to a relatively large decline estimated by the NSO. Somewhat consistent with the NSO is our estimate of a rise in extreme rural poverty—by 1.6 percentage points according to our estimates—although the regional pattern is very distinct from that of the NSO (e.g., declines in extreme poverty in the northern and southern regions are overshadowed by a relatively large increase in extreme poverty in the central region). At the national level, extreme poverty increases marginally by 0.6 percentage points compared to the official estimate of 2.1 percentage points. These results are consistent with the notion that Malawi's economic policies may have disadvantaged the ultra-poor, but have had a favourable impact on households closer to the 'normal' poverty line.

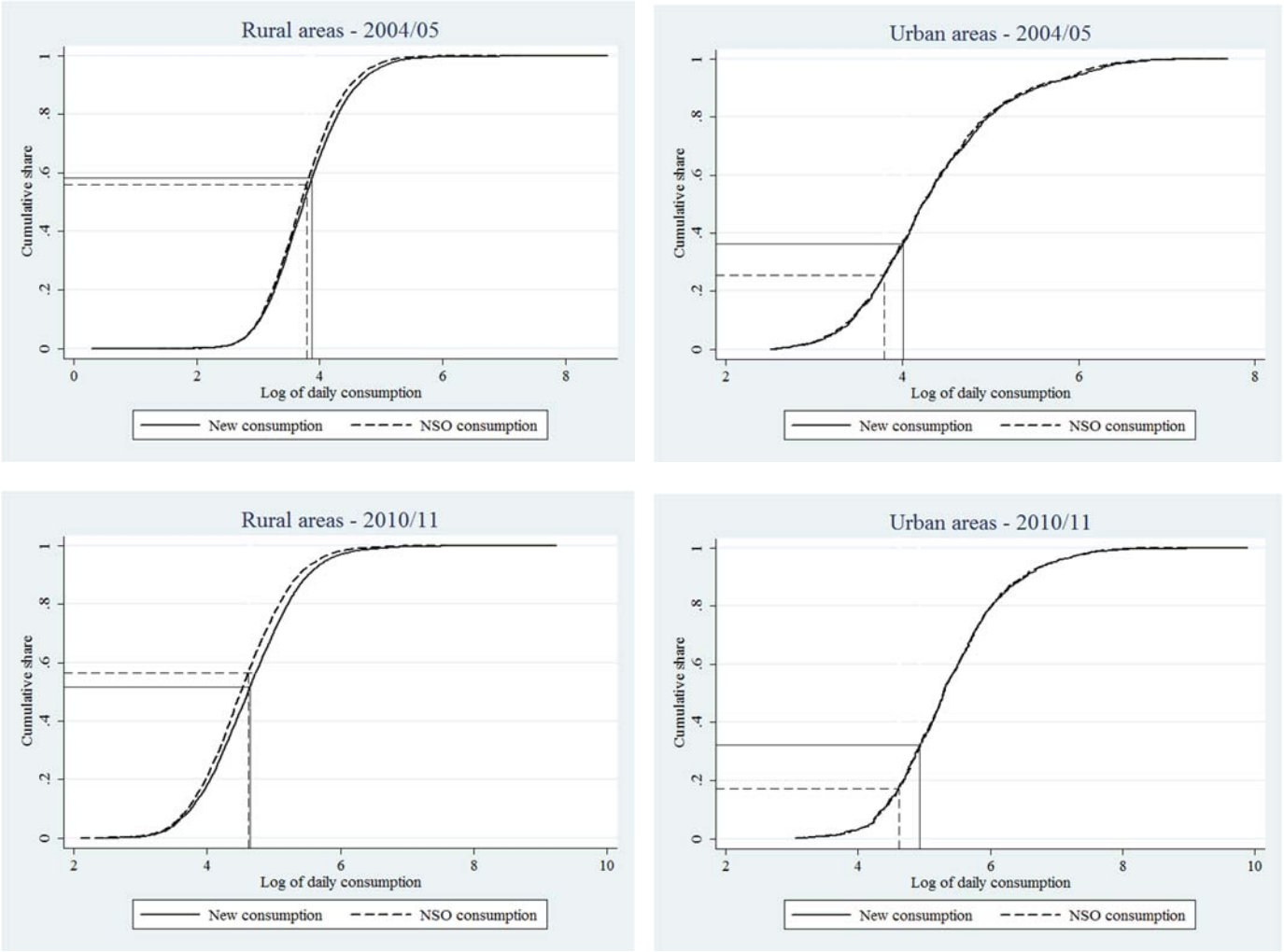
Figure 10 provides a visual picture of how the cumulative distribution functions of our consumption aggregates compare with the official welfare aggregates. The various poverty lines are indicated by vertical lines (these are dashed or solid to match the cumulative distribution function). The point at which a poverty line intersects the relevant cumulative distribution function indicates the associated poverty level; these are comparable with those reported in Table 5. While our consumption aggregates for urban households are quite similar to those of the NSO, the urban

poverty lines are higher, which is mainly a reflection of the urban-specific non-food consumption share in the urban poverty line. Our estimated poverty lines of rural areas are only slightly higher than those of the NSO. However, our consumption aggregate is again substantially higher, especially in 2010/2011. As explained earlier these differences can be attributed mainly to the adjustments to the conversion factors. The main important difference here is that our analysis suggests a statistically significant decline in poverty—we can now visually see the importance of our significantly higher poverty line in urban areas compared to the NSO's national poverty line, and of the conversion factor adjustments which primarily affect consumption aggregates in rural areas.

At least one important methodological question raised earlier is whether an assumption of fixed non-food consumption shares is reasonable. To investigate how such an assumption would affect our poverty estimates, we estimate regional food poverty lines as before, but then assume that essential non-food spending in 2010/11 is simply a fixed share of food spending, with the share determined by the 2004/05 non-food shares. The final column of Table 5 reports the resulting change in poverty. Interestingly, these results now show a reduction in urban poverty, partly because we have now eliminated the effect of rising non-food expenditure. It is clear that the choice between flexible and fixed non-food shares is important for poverty analyses in Malawi.

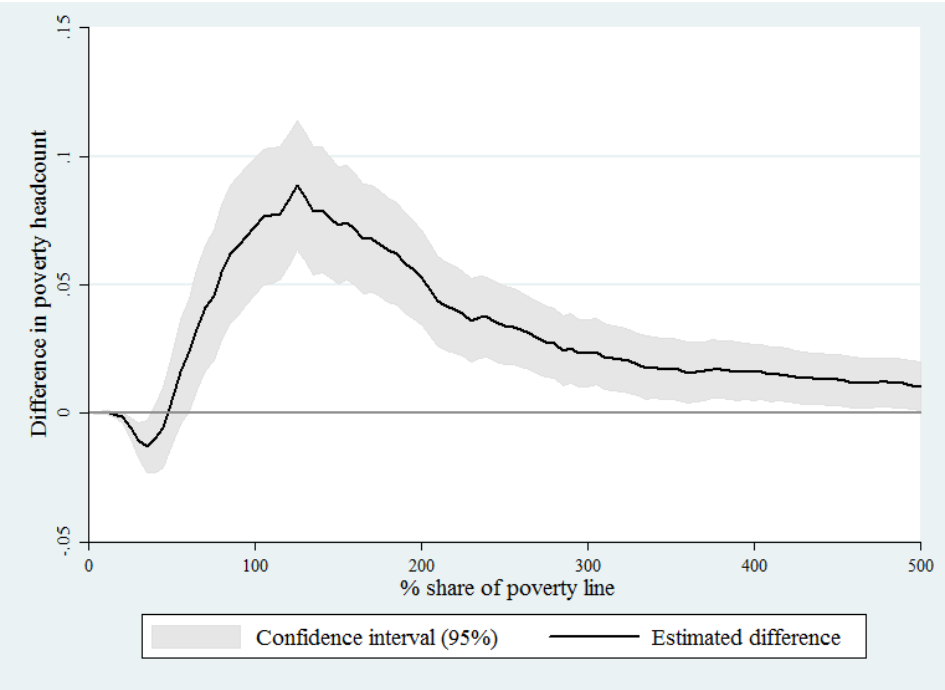
We finally consider the robustness of our results by estimating poverty changes at different poverty lines. Figure 11 has on its horizontal axis a notional poverty line expressed as a percentage of the estimated national poverty line. In essence we perform an exercise whereby both the 2004/05 and 2010/11 poverty lines are scaled up or down by the same percentage and then evaluate what impact this would have on the observed change in the poverty headcount. On the vertical axis we have the inverted change in poverty (i.e., a decline in poverty is plotted on the positive side of the axis). We find that for all poverty lines greater than roughly 40 per cent of the actual chosen poverty line, national poverty still declines. At very low poverty lines, however, poverty increases. The largest declines in poverty are for poverty lines around 100–140 per cent of the actual estimated poverty line, suggesting that significant income gains did in fact accrue to households in the vicinity of our estimated poverty lines.

Figure 10: Consumption distribution functions and poverty estimates




Source: Authors' estimates based on data from IHS2 and IHS3.

Figure 11: Poverty changes at different poverty lines




Source: Authors' estimates based on data from IHS2 and IHS3.

## 4.2 Non-monetary poverty

The preceding discussion has focused on estimates of monetary poverty whereby consumption expenditure is used as an indicator of welfare. The rationale for a consumption-based approach to identifying the poor is that there is a strong correlation between 'means' (i.e., income or consumption levels) and 'ends' such as adequate levels of health, education, or freedom. An individual above the monetary poverty line is thought to possess sufficient purchasing power to acquire the bundle of attributes yielding a level of well-being sufficient to function in society, thus providing a rationale for a simpler consumption-based approach to poverty analysis.

However, given the often weak relationship between income and welfare—this may be due to incomplete markets, presence of externalities, or provision of public goods—money-metric measures are not always good indicators of welfare. Besides, there is no guarantee that households with incomes at or above a poverty threshold would use their incomes to purchase those 'basic needs' considered necessary for achieving an acceptable level of well-being. Decision-makers in the household may, for example, instead choose to satisfy wants for, say, alcohol and tobacco at the expense of satisfying the minimum caloric requirements of their children. In the money-metric approach such households would be classified as non-poor when in reality at least some of their members are deprived of some basic needs (Thorbecke 2005).

Consequently, Sen (1985) argues that the measurement of poverty should, where possible, go beyond income or consumption and look at other dimensions of well-being such as health, education, empowerment, and freedom of association, among others. Income and consumption expenditure are instrumentally important as a means of achieving the other dimensions of well-being, but the other dimensions of well-being are in and of themselves intrinsically significant. Thus, these dimensions are equally important and deserve recognition and measurement in their

own right. Moreover, trends in non-monetary dimensions of well-being can be used to validate or challenge observed trends in monetary poverty.

This section looks at levels and trends of non-monetary dimensions of well-being in Malawi between 2004/5 and 2010/11. We specifically focus on two dimensions of non-monetary poverty namely: (a) access to or ownership of private and public goods and services; and (b) anthropometric measures of child well-being. In addition to the above, we also provide a very brief overview of households' subjective assessment of well-being vis-à-vis adequacy of food consumption, housing, clothing, and health care. All data is obtained from the same household surveys used for our monetary poverty assessment (IHS2 and IHS3).

*Access to or ownership of both private and public goods and services*

*Housing quality*: In order to make housing investments, households will typically need to save or access credit. This suggests that such investments reflect a temporal dimension of material well-being. These investments can therefore be viewed as a reasonable proxy of permanent income, which is a household's long-run wealth as opposed to its temporary capacity to consume. Table 6 shows results on the levels and trends of housing quality by area. Housing quality is measured by the percentage of households that have: durable walls, defined as walls made from unfired bricks, burnt bricks, or concrete; durable roofs, defined as a roof made from iron sheets, tiles, or concrete; electricity for lighting; and a toilet, specifically a flush toilet or pit latrine. Overall, the results show that there have been statistically significant improvements in the quality of housing, although significant regional variation remains.

*Ownership of consumer durables*: Table 7 reports the percentage of households that own consumer durables such as beds, television sets, radios, fridges, bicycles, motorbikes, and cars. These durables represent lumpy investments that require a minimum level of income to purchase and sustain. They therefore capture a temporal dimension to material well-being that may not be fully reflected in the consumption poverty measures, which typically exclude such expenditures. Nationally, the results show that with the exception of radios, the percentage of households that own consumer durables increased between the two survey periods. The decline in radio ownership probably reflects changing preferences (e.g., increased demand for televisions or cellular phones with radio functionality). Generally, however, ownership of consumer durables remains low and improvements vary across regions.

Access to education: Increasing access to primary and secondary education is one of the main priority areas identified in the first and second Malawi Growth and Development Strategy (MGDS). To assess whether there have been improvements in schooling in Malawi between 2004/5 and 2010/11, we look at the levels and trends in: (a) net enrolment rates in primary and secondary school for children aged five and above; and (b) the years of schooling and qualifications acquired by individuals. The net enrolment rate is defined as the share of all children of official school age who are enrolled in a school whose official age range corresponds to the child's age. Table 8 reveals a statistically significant increase in the share of the population enrolled, i.e., from 46.9 per cent in 2004/5 to 48.7 per cent in 2010/11. Only in the central region is the increase not statistically significant. Significant progress has also been made towards increasing primary and secondary net enrolment rates. Considering the speed of progress, two things stand out. First, the absolute changes in primary net enrolment rates are smaller than the changes in secondary net enrolment rates. This may suggest a possible convergence between the high levels of primary net enrolment rates and the low secondary school enrolment rates. Second, the extent of progress in secondary enrolment rates is differentiated across the areas. The fastest progress in secondary enrolment rates is registered in northern rural areas where the enrolment rate increased by about

20 percentage points. With an increase of about five percentage points, urban areas experienced the slowest progress in secondary enrolment rates.

A kernel density plot of years of schooling, omitted here to save space, reveals a slight rightward shift in years of schooling in Malawi. This shift is more noticeable from about five years of schooling onwards, suggesting that Malawians are staying in school for longer. A Kolmogorov–Smirnov test confirms a statistically significant improvement in years of schooling. Table 9 provides a further look at the apparent shift in years of schooling by considering qualifications acquired. At the national level we note increases across all qualification categories, including primary, junior, secondary and tertiary qualification. However, qualification rates are still extremely low in Malawi, while, surprisingly, there is also an increase in the share of people without any qualification.

*Health and access to clean water*: Finally, we assess progress made in terms of access to clean drinking water and the reduction of malaria prevalence. Table 10 reveals an increase in the share of households with access to clean drinking water from 67.5 to 92.9 per cent over the analysis period. Similar trends are observed at regional level. Malaria prevalence dropped from 8.1 to 7.8 per cent. This decline, though economically insignificant, is statistically significant.

*Anthropometric measures of well-being*

To assess child nutritional status we evaluate three anthropometric indicators: height-for-age-z-scores (HAZ); weight-for-age-z-scores (WAZ); and weight-for-height-z-scores (WHZ). Following World Health Organization (WHO) recommendations, these indicators are calculated for children aged between six and 60 months. They measure different dimensions of child nutrition status; specifically, HAZ, WAZ, and WHZ values below -2 or -3 indicate moderate or severe levels of stunting, underweight, and wasting respectively.

Table 11 reports the percentages of moderately and severely malnourished children between 2004/5 and 2010/11. Prevalence rates for stunting are generally much higher than those of underweight and wasting. However, the trends in prevalence of malnutrition are not consistent: whereas the percentage of moderately stunted and underweight children decreased by about six and three percentage points respectively, the percentage of moderate wasting rose by two percentage points. Similar inconsistent trends are observed for severe malnutrition. Regional level results also reveal a mixed pattern.

In conclusion, while we see declines in the prevalence of stunting (HAZ) and underweight children (WAZ), there has been an increase in the prevalence of wasting (WHZ) among children. The picture is therefore somewhat mixed. Similar findings are reported by Ecker et al. (2012). However, they note some concerns about the child anthropometric records from the IHS2 and IHS3, arguing that the purported decline in stunting in particular would equate to a near-record decline in global terms. The rates of decline also far exceed those obtained from other data collected at about the same time (e.g., the Demographic and Health Survey of 2010). Further analysis is therefore required.

Table 6: Housing quality, 2004/05 to 2010/11

| Indicator: share of households | Malawi | | Urban | | North rural | | Centre rural | | South rural | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 |
| Durable walls | 66.28 | 78.77*** | 91.53 | 97.40*** | 51. 25 | 65.19*** | 46.43 | 62.87*** | 79.76 | 86.63*** |
| Durable roof | 25.87 | 35.70*** | 73.75 | 80.65*** | 17.71 | 29.58*** | 15.89 | 20.46*** | 21.73 | 28.09*** |
| Electricity | 5.67 | 9.01*** | 31.60 | 37.35*** | 1.25 | 2.28*** | 1.74 | 2.47*** | 2.19 | 3.04*** |
| Toilet | 83.54 | 90.75*** | 97.08 | 98.61*** | 90.07 | 93.12*** | 79.61 | 92.45*** | 80.50 | 84.98*** |

Notes: We conduct a one-tail test of the hypothesis that the difference in proportions between two years is statistically significant. The significance asterisks are defined as *p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' computation using data from IHS2 and IHS3.

Table 7: Ownership of consumer durables, 2004/05 to 2010/11

| Indicator: share of households | Malawi | | Urban | | North rural | | Centre rural | | South rural | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 |
| Bed | 32.15 | 37.98*** | 66.81 | 75.32*** | 56.18 | 58.36 | 20.63 | 23.59*** | 23.33 | 23.57 |
| Radio | 54.89 | 47.62*** | 51.60 | 61.53*** | 57.71 | 47.38 | 53.28 | 43.27 | 56.40 | 44.38 |
| TV | 3.89 | 9.93*** | 18.26 | 35.74*** | 1.18 | 4.44*** | 1.90 | 4.79*** | 1.89 | 3.67*** |
| Fridge | 2.01 | 4.19*** | 11.25 | 18.90*** | 0.49 | 0.34 | 0.65 | 1.12** | 0.72 | 0.98* |
| Bicycle | 36.22 | 38.82*** | 21.25 | 30.45*** | 30.14 | 34.64*** | 38.75 | 43.36*** | 40.75 | 40.96 |
| Motorbike | 0.36 | 0.60*** | 0.63 | 0.81 | 0.28 | 0.40 | 0.44 | 0.57 | 0.24 | 0.60*** |
| Car | 1.21 | 1.74*** | 5.76 | 7.57** | 0.56 | 0.23 | 0.76 | 0.60 | 0.37 | 0.42 |

Notes: We conduct a one-tail test of the hypothesis that the difference in proportions between two years is statistically significant. The significance asterisks are defined as *p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' computation using data from IHS2 and IHS3.

Table 8: School enrolment, 2004/5 to 2010/11

| Indicator: share of individuals | Malawi | | Urban | | North rural | | Centre rural | | South rural | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 |
| Overall enrolment | 46.93 | 48.73*** | 42.67 | 44.35** | 45.71 | 49.84*** | 48.18 | 48.95 | 48.00 | 50.68*** |
| Net primary enrolment | 96.61 | 98.46*** | 98.22 | 98.90* | 99.08 | 99.46* | 96.42 | 97.61*** | 95.36 | 98.50*** |
| Net secondary enrolment | 36.65 | 48.72*** | 63.38 | 68.57* | 38.58 | 59.79*** | 28.99 | 33.51* | 29.76 | 40.45*** |

Notes: We conduct a one-tail test of the hypothesis that the difference in proportions between two years is statistically significant. The significance asterisks are defined as *p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' computation using data from IHS2 and IHS3.

Table 9: Qualifications acquired, 2004/5 to 2010/11

| Indicator: share of individuals | Malawi | | Urban | | North rural | | Centre rural | | South rural | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 |
| None | 49.69 | 52.74*** | 42.98 | 42.97 | 55.83 | 57.75*** | 50.56 | 56.85*** | 48.88 | 52.10*** |
| PLSC | 5.78 | 6.46*** | 10.22 | 9.93 | 8.62 | 8.62 | 4.75 | 5.41*** | 4.29 | 4.77*** |
| JCE | 4.19 | 5.09*** | 10.85 | 11.69** | 4.58 | 5.38** | 3.13 | 3.37 | 2.89 | 3.20** |
| MSCE | 1.77 | 3.18*** | 7.41 | 10.25*** | 1.01 | 2.19*** | 0.94 | 1.54*** | 0.99 | 1.50*** |
| Tertiary | 0.44 | 1.06*** | 2.44 | 4.55*** | 0.17 | 0.43*** | 0.15 | 0.29*** | 0.16 | 0.26*** |

Notes: We conduct a one-tail test of the hypothesis that the difference in proportions between two years is statistically significant. The significance asterisks are defined as *p<0.10, ** p<0.05, *** p<0.01. PLSC = primary leavers school certificate; JCE = junior certificate of education; MSCE = Malawi secondary certificate of education.

Source: Authors' computation using data from IHS2 and IHS3.

Table 10: Access to clean drinking water and malaria prevalence, 2004/5 to 2010/11

| Indicators: share of households/ individuals | Malawi | | Urban | | North rural | | Centre rural | | South rural | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 |
| Clean water (households) | 67.52 | 92.88*** | 86.32 | 98.39*** | 65.49 | 86.29*** | 54.61 | 94.95*** | 73.09 | 91.22*** |
| Malaria prevalence (individuals) | 8.07 | 7.80** | 6.81 | 5.90*** | 6.40 | 5.76** | 9.39 | 9.39 | 7.84 | 8.25 |

Notes: We conduct a one-tail test of the hypothesis that the difference in proportions between two years is statistically significant. The significance asterisks are defined as *p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' computation using data from IHS2 and IHS3.

Table 11: Trends in prevalence of malnutrition, 2004/5 to 2010/11 (% individuals)

| Indicator: share of children under five | Malawi | | Urban | | North rural | | Centre rural | | South rural | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 | 2004/5 | 2010/11 |
| Moderate malnutrition (z-score ≤ -2) | | | | | | | | | | |
| Stunting (HAZ) | 41.53 | 34.51*** | 35.38 | 33.44 | 41.41 | 17.14*** | 44.76 | 41.96*** | 40.26 | 35.68*** |
| Underweight (WAZ) | 10.43 | 6.85*** | 8.37 | 4.40*** | 9.62 | 1.76*** | 11.66 | 9.47*** | 10.15 | 7.72*** |
| Wasting (WHZ) | 2.34 | 3.63*** | 2.36 | 1.76 | 2.45 | 1.76 | 2.29 | 4.47*** | 2.35 | 4.43*** |
| Severe malnutrition (z-score ≤ -3) | | | | | | | | | | |
| Stunting (HAZ) | 19.95 | 15.94*** | 15.57 | 15.84 | 19.82 | 2.44*** | 22.92 | 20.84** | 18.43 | 17.28 |
| Underweight (WAZ) | 2.68 | 1.92*** | 2.36 | 1.20** | 2.26 | 0.25*** | 3.29 | 2.18*** | 2.35 | 2.66 |
| Wasting (WHZ) | 0.93 | 1.14* | 1.06 | 0.64 | 1.08 | 0.25*** | 0.86 | 1.29* | 0.92 | 1.58** |

Notes: We conduct a one-tail test of the hypothesis that the difference in proportions between two years is statistically significant. The significance asterisks are defined as *p<0.10, ** p<0.05, *** p<0.01. HAZ = height for age z-score; WAZ = weight for age z-score; WHZ = weight for height z-score.

Source: Authors' computation using data from IHS2 and IHS3.

*Subjective assessment of well-being*

The Malawian household surveys include several questions related to subjective well-being vis-à-vis adequacy of food consumption over the past month, adequacy of housing, adequacy of clothing, and adequacy of the standard of health care accessed. We treat households that report 'less than adequate' as being deprived, whereas households that report 'just adequate' or 'more than adequate' are considered not deprived. The prevalence rates in Table 12 show the percentages of the population that are deprived in each self-assessment dimension.

Table 12: Changes in subjective well-being, 2004/05–2010/11

| | Prevalence of food inadequacy | | | Prevalence of housing inadequacy | | |
|---|---|---|---|---|---|---|
| | 2004/05 (IHS2) (%) | 2010/11 (IHS3) (%) | Percentage point change (%) | 2004/05 (IHS2) (%) | 2010/11 (IHS3) (%) | Percentage point change (%) |
| Urban | 48.1 | 26.7 | -21.5 | 44.2 | 31.5 | -12.6 |
| Rural | 58.5 | 40.4 | -18.1 | 56.8 | 44.5 | -12.3 |
| -North | 35.3 | 29.8 | -5.5 | 36.4 | 39.0 | 2.6 |
| -Centre | 59.1 | 33.8 | -25.3 | 60.3 | 40.4 | -19.9 |
| -South | 63.8 | 49.2 | -14.6 | 58.7 | 49.9 | -8.8 |
| *Total* | *57.3* | *38.5* | *-18.9* | *55.4* | *42.8* | *-12.5* |
| | Prevalence of clothing inadequacy | | | Prevalence of healthcare inadequacy | | |
| | 2004/05 (IHS2) (%) | 2010/11 (IHS3) (%) | Percentage point change (%) | 2004/05 (IHS2) (%) | 2010/11 (IHS3) (%) | Percentage point change (%) |
| Urban | 54.5 | 49.3 | -5.2 | 51.8 | 28.1 | -23.7 |
| Rural | 74.9 | 58.5 | -16.4 | 62.0 | 34.5 | -27.5 |
| -North | 52.3 | 55.3 | 3.0 | 43.1 | 27.8 | -15.3 |
| -Centre | 84.2 | 54.7 | -29.5 | 65.4 | 39.3 | -26.1 |
| -South | 71.8 | 62.1 | -9.7 | 63.6 | 31.1 | -32.5 |
| *Total* | *72.6* | *57.0* | *-15.5* | *60.9* | *33.4* | *-27.5* |

Source: Authors' computation using IHS2 and IHS3.

At the national level we note significant declines in the prevalence of deficiencies, especially in urban areas and in the rural centre. Declines are smaller in the rural north or even increase marginally for the housing and clothing dimensions, which stand somewhat in contrast to the decline in consumption-based poverty we estimate in this study (see Table 5). Similarly, whereas we note relatively small declines in consumption-based poverty in the rural centre, improvements have apparently been more dramatic judging by households' own assessment of well-being. Overall, there are very large improvements in rural areas as a whole, which stands in contrast to official poverty estimates but corroborate our own findings.

In conclusion, this section has revealed significant improvements in several non-monetary welfare dimensions. We note significant improvements in housing quality, access to clean water, and ownership of consumer durables, which is consistent with the finding of rising incomes and declining poverty. School enrolment has increased, while Malawians appear to have become better educated over time in terms of academic qualifications achieved. Nutritional outcomes reveal a somewhat mixed picture, with declines in stunting and underweight children, but an increase in wasting. Malawians also generally regard themselves as being better off as far as food, housing, clothing and health are concerned. Mazunda et al.'s (2012) multidimensional poverty assessment provides further evidence of improvements across a range of welfare dimensions. These outcomes seem to support our finding of a decline in consumption-based poverty across both urban and rural areas in Malawi.

## 5 Conclusion

Malawi experienced rapid economic growth during the period 2005–11. Although growth was broad-based and originated from several sectors, the most important contribution came from the large and rapidly growing agricultural sector, which enjoyed significant support in the form of fertilizer input subsidies during the period. On average, and somewhat remarkably, this sector purportedly grew at an average annual rate of 10.1 per cent per year, while overall GDP expanded at a rate of 7.1 per cent per year, far exceeding population growth, and thus allowing per capita GDP to grow at roughly 3.5 per cent per year on average during the period.

The expectation was that rapid smallholder-led agricultural growth would have a significant impact on poverty. However, the official poverty estimates based on the IHS3, which were released in 2012, suggested national poverty had only declined marginally by 1.7 percentage points between 2004/05 and 2010/11, while rural poverty increased by 0.7 percentage points. This raised several questions, including whether reported maize production and agricultural GDP growth estimates were in fact accurate. Others speculated about whether or not the poor were excluded from the benefits of rapid growth. The sharp rise in inequality measured by the Gini coefficient (0.39 to 0.45) supported the 'no trickle-down effect' theory to some extent, but the puzzling question remained: how could Malawi have had no reduction in rural poverty after investing so heavily in poor smallholder agriculture and seemingly reaping rewards from that program in terms of economic growth?

While recognizing that poverty measurement is challenging and poverty results are extremely sensitive to the assumptions made, this study notes two concerns about the official poverty analysis conducted by the NSO. The first relates to the revision of the official consumer price index. Our analysis concurs that the official 2004–11 inflation rate (77.3 per cent) is indeed an underestimation, and that revision was justified. Moreover, our own estimate of the national average poverty line inflation rate (117.6 per cent) is in close proximity to the NSO's estimate of 128.9 per cent. However, we cannot support the finding that that same inflation rate could be applied both in urban and rural areas. Instead, our analysis suggests that urban poverty line inflation was significantly higher (153.2 per cent) and rural poverty line inflation somewhat lower (114.3 per cent) than the national average. This, coupled with significant shifts in consumption patterns, makes an approach that adopts regional poverty lines and flexible but utility-consistent consumption bundles more appropriate.

Second, as pointed out by Verduzco-Gallo and Ecker (2013) and in this paper, there are several inconsistencies contained in the official sets of consumption conversion factors. Even minor adjustments to conversion factors, especially for important food commodities, may significantly alter estimates of poverty. There is the need for a consultative process to agree on a final set of conversion factors that can be used in all ongoing and future poverty or nutrition analyses.

In contrast to the official poverty estimate, our own analysis, which adopts a cost of basic needs approach for constructing regional poverty lines that are utility-consistent over time and space, reveals large and, in most regions, statistically significant declines in poverty between 2004/05 and 2010/11. The poverty rate declines by 6.9 percentage points in rural areas, with a particularly large decline in the rural south. Urban poverty also declines, although by only 3.9 percentage points, which is only about half the official estimate. At national level, we find that poverty dropped by 7.3 percentage points. These results are consistent with the purported economic growth trajectory of Malawi, as well as our results showing significant improvements across a range of non-monetary dimensions of welfare in recent years.

Importantly, however, economic policies in Malawi appear to have neglected the ultra-poor. We find small, albeit statistically insignificant, increases in both urban and rural extreme poverty rates. These are likely landless or labour-constrained households in rural or urban areas that have failed to reap the direct benefits of FISP or rapid growth in labour-intensive sectors such as the construction industry. These households are ideal candidates for other forms of interventions such as cash transfers that are currently being scaled up in Malawi.

There are some areas that require further analysis. We concur that the official CPI series understates inflation in Malawi. The implication is that the GDP deflator currently used to estimate real GDP levels may also be understated, leading to economic growth estimates that are too optimistic. At present GDP estimates are available up until 2012, but all estimates beyond 2007 are subject to revision. In order to truly understand the growth–poverty puzzle, more up-to-date national accounts data is needed. A more realistic growth–poverty narrative for Malawi is probably that growth was more likely lower than what official estimates suggest, while the results presented here suggest that the poverty outcome was significantly more optimistic than what official estimates suggest, particularly in rural areas. Extreme poverty, however, may have increased slightly, suggesting that the most vulnerable in Malawi's society have been excluded from the benefits of economic policy and growth.

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