The poverty-inequality relationship in Malawi: A multidimensional perspective

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The Poverty-Inequality Relationship in Malawi: A Multidimensional Perspective

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Abstract

This paper looks at the linkage between poverty and inequality by investigating the poverty impacts of changes in within and between inequalities in Malawi. We recognize the multidimensional nature of both poverty and inequality by focusing on monetary (consumption) and non monetary (health and education) dimensions of well being. Two questions are answered namely; what is the contribution of within-group inequalities (vertical inequalities) to total poverty? And what is the contribution of between-group inequalities (horizontal inequalities) to total poverty? The second integrated household survey (IHS2) is used, and the results differ considerably across the three dimensions of well being. The elasticity of poverty with respect to within-region consumption inequalities is positive and higher than that of between-region inequalities, suggesting that reductions in vertical inequalities in consumption would have a higher poverty reducing effect. Between-region inequalities in health have a larger and positive effect on the health poverty headcount; on the other hand within-region inequalities in health have a larger and positive relationship with the health poverty gap and severity. We also find that an increase in both within and between region education inequalities reduce the education poverty headcount, but increase the education poverty gap and severity.

Key words: Inequality; poverty; Malawi.

1. Introduction

It is widely recognized that the effectiveness of growth in reducing poverty is strongly linked to inequality. Holding other things constant, higher inequality may dampen the effectiveness of economic growth in reducing poverty. A number of studies (e.g. Fosu, 2008, 2009; Ravallion, 2001) find a negative relationship between the impact of income growth on poverty and initial inequality. This represents an indirect link between poverty and inequality which works through

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growth. Poverty and inequality may also be directly related. For instance, Bigsten et al. (2002) observe that the decline in poverty between 1994 and 1997 in Ethiopia is to a large extent due to increased real per capita income (a growth effect) but this is offset by worsening income distribution (a redistribution effect).

One important form of inequality which may have a negative impact either directly or indirectly on poverty is spatial inequality. High spatial inequality may be bad not just for the poverty reducing impact of growth but also for the growth rate itself as it may heighten risks of conflict (Østby, 2008). As pointed out by Araar and Duclos (2010), widening spatial disparities (e.g., urban versus rural areas) or increasing inequality within space (e.g., skilled versus unskilled workers, formal versus informal workers) may increase poverty, or at least reduce the impact of growth on poverty.

Traditionally, most studies on poverty and inequality, including spatial studies have tended to use a unidimensional approach. This approach is based on money-metric indicators such as income or consumption as a proxy of welfare. Following the pioneering work of Sen (1985, 1987), there have been calls for the measurement of poverty and inequality to go beyond income or consumption to other dimensions of well being such as health, education, empowerment, freedom of association among others. The multidimensional approach is at the heart of the Millennium Development Goals (MDGs) since the MDGs focus on deprivation in multiple dimensions such as monetary poverty, literacy, health, gender equality, and the environment. The rationale of the multidimensional approach is that the money-metric indicators 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. The other dimensions are equally if not more important and deserve recognition and measurement in their own right (Sahn and Younger, 2006).

Despite its growing popularity, the analysis of spatial multidimensional poverty and inequality in Malawi has received scant attention. Mussa (2010) is the only study to have looked at both poverty and inequality multidimensionally. The study focuses on both monetary (consumption) and non monetary (health and education) dimensions of well being. It however does not look at the possible relationship between poverty and inequality. Poverty and inequality in the three dimensions are treated separately; the possible interaction between the two is

ignored. As pointed out earlier, poverty and inequality are directly and indirectly related. This is where this paper comes in.

We recognize the multidimensional nature of both poverty and inequality by focusing on consumption, health and education. For all the three dimensions, we explore the direct link between poverty and inequality which runs from inequality to poverty. The objectives of this paper are twofold. The first is to examine the impact of within-group inequalities (vertical inequalities) in consumption, health, and education on total consumption, health, and education poverty. The second objective is to determine the effect of between-group inequalities (horizontal inequalities) in consumption, health, and education on total consumption, health, and education poverty. The focus of this paper is on spatial inequalities, and the groups are the three regions of Malawi. Additionally, we also do a rural-urban disaggregation. This paper not only contributes to the scarce literature on multidimensional poverty and inequality in Malawi, it also has significant policy relevance. The analysis provides information on whether policy interventions should focus more on disparities between areas (horizontal inequalities) or on disparities within areas (vertical inequalities) in order to reduce overall poverty in Malawi.

The outline of the paper is as follows. Section 2 focuses on the methods of analysis and the data used in the study. Results are presented section 3. Concluding remarks are made in section 4.

2. Methodology

2.1. Welfare Indicators

We use a monetary dimension (consumption) and two non-monetary dimensions of well being namely; health and education. We capture these three dimensions by using respectively the following three indicators; per capita consumption expenditure, the height-for-age z-score (HAZ), and the years of schooling of the most educated household member. As is usually the case with most poverty and inequality studies in Africa, per capita household consumption expenditure is adopted as an indicator of poverty and inequality. The per capita household consumption expenditure in this study is annualized.

To measure health, the height-for-age z-score (HAZ) for children aged between 6 to 60 months is used. These are pre-school children. We choose the HAZ over other anthropometric measures such as the weight-for-age z-score (WAZ) or weight-for-height z-score (WHZ)

because it is a long-term indicator of child nutritional well being or health. It is unaffected by acute episodes of stress occurring at or around the time of measurement (Sahn and Stifel, 2002). The HAZ measures how a child's height compares to the median of the World Health Organization (WHO) reference sample of healthy children. Until 2006, the WHO recommended the US National Centre for Health Statistics (NCHS) as the standard reference population. In this study, we follow the WHO's current recommendation of using growth standards based on the Multi-Centre Growth Reference Study (MGRS). The z-scores standardize a child's height by age and gender, and are given as

$$z\text{-score} = \frac{x_j - x_{\text{median}}}{\sigma_x} \tag{1}$$

Where; x_j is height for child j, x_{median} is the median height for a healthy and well-nourished child from a reference population of the same age and gender, and σ_x is the standard deviation from the mean of the reference population. The z-scores follow the standard normal distribution, implying that a child who is below –2 z-scores has a 2.3 per cent probability of being of normal height. Conventionally, children whose HAZ is below -2 are considered malnourished or stunted (WHO, 1983). The measures of poverty and inequality used in the study are defined for nonnegative numbers only, and since z-scores can be negative we transform the z-scores into percentiles using the cumulative density function of the standard normal distribution. For instance, a z-score of +2 in percentile terms is 97.7 per cent, and a z-score of -2 in percentile terms is 2.3 per cent. This transformation is monotonic meaning that a child's ranking is maintained after the transformation.

Regarding education, we use the years of schooling of the most educated household member as an indicator of a household's education. This is motivated by the fact you would expect in a household where one person has some years of schooling to be relatively well off as compared to another household where everyone is illiterate. As argued by Basu and Foster (1998), there are positive externality effects - some kind of public good - to having a household member who is literate. The extent of the spillover benefits would arguably depend on the years of schooling of the most educated household member i.e. the maximum number of years of schooling in a household.

2.2. Poverty, Vertical and Horizontal Inequalities

This paper measures pure inequality in health and education also known as univariate inequality and not social economic inequality in health and education[1]. Social economic inequality sometimes referred to as gradient inequality makes comparisons in health or education outcomes across populations with different social economic characteristics (see for example Filmer and Pritchett (2001) and Wagstaff et al. (1991) for applications of this approach). In contrast, univariate inequality focuses on the dispersion of the health or education outcome without regard to how they are correlated with social economic characteristics (see for example Sahn and Stifel (2003) and Sahn and Younger (2006) for applications of this approach).

In order to look at the impact of vertical inequalities (within-group inequalities) and horizontal inequalities (between-group inequalities) on poverty, we use a methodology proposed by Araar and Duclos (2010). The methodology allows the examination of the link between poverty and inequality through an analysis of the poverty impact of changes in vertical and horizontal inequalities. The groups in this paper are; the three regions of Malawi (Centre, North, and South), and rural and urban areas.

2.2.1 Vertical Inequality

To examine the impact of within group inequality on poverty, let the population be subdivided into K mutually exclusive and exhaustive population sub groups, $k = 1...K$, and let $\phi(p;k)$ be the proportion of those individuals at percentile p that belong to group k. The overall share of group k in the population is $\phi(k) = \int \phi(p;k)dp$. The mean of the well being indicator of group k is then expressed as

$$\mu(k) = \phi(k)^{-1} \int_0^1 Q(p)\phi(p;k)dp \qquad (2)$$

and the overall mean is given as

$$\mu = \sum_{k=1}^K \int_0^1 Q(p)\phi(p;k)dp \qquad (3)$$

$Q(p)$ is the amount of the well being indicator below which we find a proportion p of the population; it is also the amount of the well being indicator at percentile p in the population.

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[1] This choice is motivated by the fact that, traditionally consumption inequality is measured by using the dispersion of consumption, and by measuring univariate inequality in health and education ensures that the measures are comparable to consumption inequality.

Within-group k bipolarisation[2] spreads $Q(p)$ away from $\mu(k)$ for those who belong to group k. If we let $\sigma(k)$ be a group-k-specific factor of bipolarization, and if we let $Q(p;k;\sigma(k))$ be the expected post-bipolarisation of the well being indicator of those in group k that were initially at percentile p in the overall distribution of the indicator, then

$$Q(p;k;\sigma(k)) = Q(p) + (\sigma(k) - 1)(Q(p) - \mu(k)) \tag{4}$$

The mean of the well being indicator of group k, $\mu(k)$ is the same for all groups, whatever the value of $\sigma(k)$. Formally;

$$\phi(k)^{-1} \int [Q(p) + (\sigma(k) - 1)(Q(p) - \mu(k))]\phi(p;k)dp = \mu(k) \tag{5}$$

Thus, between-group inequality is unaffected, and this allows the exclusive focus on within-group inequality.

Let the overall single-parameter Gini (S-Gini) coefficient[3] after the bipolarisation factor $\sigma(k)$ has been applied to the within-group k distribution of the well being indicator be given as

$$I(p;\sigma(k)) = \mu^{-1} \int [\mu - (Q(p) + (\sigma(k) - 1)(Q(p) - \mu(k)))\phi(p;k)]\omega(p;\rho)dp. \tag{6}$$

The effect on total inequality of an incremental increase in within-group k inequality is then derived as

$$
\left. \frac{\partial I(p;\sigma(k))}{\partial \sigma(k)} \right|_{\sigma(k) = 1}
\begin{aligned}
&= \mu^{-1} \int [\mu - (Q(p) + (\sigma(k) - 1)(Q(p) - \mu(k)))\phi(p;k)]\omega(p;\rho)dp \\
&= \frac{\phi(g)\mu(k)}{\mu} IC(p;k)
\end{aligned}
\tag{7}
$$

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[2] This can arise for example from changes in the dispersion of physical and human assets within a group as well as from changes in the returns to these assets (Araar and Duclos, 2010).

[3] The single-parameter Gini (S-Gini) coefficient introduced by Donaldson and Weymark (1980, 1983), and Yitxhaki (1983) is given as $I(p;) = \mu^{-1} \int_0^1 [\mu - (Q(p)]\omega(p;\rho)dp$, where $\omega(p;\rho)$ is an ethical weight. ρ is a parameter of inequality aversion that determines our ethical concern for the deviation of quantiles from the mean at various ranks in the population. The higher is ρ, the higher is aversion to inequality. When $\rho = 2$, the S-Gini coefficient reduces to the ordinary Gini coefficient.

Where

$$IC(p;g) = (\phi(g)\mu(g))^{-1} \int_0^1 (\mu(g) - Q(p))\omega(p;\rho)\phi(p;g)dp \qquad (8)$$

is known as the coefficient of concentration. It is a measure of within-group inequality since it depends only on the distances between $\mu(k)$ and the well being indicators of those in group k. These distances are also weighted by the proportion of those individuals at percentile p that belong to group k, $\phi(p;k)$. $IC(p;k)$ is called the coefficient of concentration because the ethical weight, $\omega(p;\rho)$, is based on ranks that are determined within the entire population. Equation 7 therefore captures the impact of inequality in each one of the three regions or in rural and urban areas on total inequality. To measure the joint impact of inequality in the three regions or in rural and urban areas on total inequality, the same $\sigma(k)$ is applied simultaneously to all groups.

Letting z be a poverty line, and α a poverty aversion parameter, the Foster et al. (1984) (FGT) class of poverty indices for group k denoted by $p(z;\alpha;k)$ is expressed as

$$p(z;\alpha;k) = \phi(k)^{-1} \int_0^1 \left(\frac{z - Q(p)}{z}\right)_+^\alpha \phi(p;k)dp. \qquad (9)$$

The total FGT after the bipolarisation factor $\sigma(k)$ has been applied is obtained from equation (9) by replacing $Q(p)$ with $Q(p;\sigma(k))$. Thus, the total FGT becomes

$$p(z;\alpha;\sigma(k)) = \sum_k \phi(k)P(z;\alpha;k;\sigma(k)), \qquad (10)$$

The impact on total poverty of a marginal increase in within-group k inequality is then given as

$$\frac{\partial P(z;\alpha;\sigma(k))}{\partial \sigma(k)} = \phi(k)\frac{\partial P(z;\alpha;\sigma(k))}{\partial \sigma(k)} \qquad (11)$$

Thus, equation 11 measures the marginal impact of inequality in each one of the three regions or in rural and urban areas on total poverty. To capture the joint impact of inequality in the three regions or in rural and urban areas on poverty, the same $\sigma(k)$ is applied jointly to all groups.

If we let $f(k;z)$ be the probability density function of group k at z, and

setting $\sigma(k) = 1$ equation 11 can be rewritten as follows

$$
\frac{\partial P(z;\alpha;\sigma(k))}{\partial \sigma(k)}\bigg|_{\sigma(k)=1}
= \begin{cases}
\alpha\phi(k)\left[P(z;\alpha;k) + \left(\frac{\mu(k)-z}{z}\right)P(z;\alpha-1;k)\right] & \text{if } \alpha > 0 \\
\\
\phi(g)f(z;k)(\mu(k)) - z) & \text{if } \alpha = 0
\end{cases}
\tag{12}
$$

Bringing the effect on total inequality of an incremental increase in within-group k inequality (equation 7) together with the impact on total poverty of a marginal increase in within-group k inequality (equation 12), the elasticity of total poverty with respect to within-group inequality is then given by

$$
\varepsilon_{\sigma(k)}(z;\alpha;\rho) = \frac{\partial P(z;\alpha;\sigma(k))/\partial\sigma(k)}{\partial I(\rho;\sigma(k))/\partial\sigma(k)} \frac{I(\rho;\sigma(k))}{P(z;\alpha;\sigma(k))}\bigg|_{\sigma(k)=1}.
\tag{13}
$$

the sign and the magnitude of $\varepsilon_{\sigma(k)}(z;\alpha;p)$ depend on $\alpha, \mu(k)$ and on the distribution of the well being indicator in group k. Equation 13 measures the elasticity of poverty with respect inequality in each one of the three regions or in rural and urban areas. Denoting by σ the case in which the same $\sigma(k)$ is applied simultaneously to all groups, we then have

$$
\varepsilon_{\sigma}(z;\alpha;\rho) = \frac{\partial P(z;\alpha;\sigma)/\partial\sigma}{\partial I(\rho;\sigma)/\partial\sigma} \frac{I(\rho;\sigma)}{P(z;\alpha;\sigma)}\bigg|_{\sigma=1}.
\tag{14}
$$

In the context of this paper, equation 14 measures the elasticity of poverty with respect inequality in the three regions or in the rural and urban areas jointly.

2.2.2 Horizontal Inequality

We next focus on how to measure the impact of a bipolarisation process on poverty that spreads groups apart from each other without affecting vertical inequality[4]. To examine the impact of

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[4] This change could arise from widening disparities across areas. It could also be due to changes in transfers, aimed at reducing disparities across areas (Araar and Duclos, 2010).

horizontal inequality on poverty, both within-group inequality and the overall mean of the well being indicator are held constant by setting a between-group bipolarisation factor $\gamma(k)$ as a function of a scalar γ:

$$\gamma(k) - 1 = 1 + (\gamma - 1)\left(1 - \frac{\mu}{\mu(k)}\right) \tag{15}$$

The expected post-bipolarisation of the well being indicator for those initially at p and in group k is then given by

$$\begin{aligned} Q(p;k;\gamma) &= Q(p)(\gamma(k) - 1) \\ &= Q(p)\left(1 + (\gamma - 1)\left(1 - \frac{\mu}{\mu(k)}\right)\right) \end{aligned} \tag{16}$$

The between-group bipolarization in equation 16 leaves within-group inequality unchanged because the well being indicators in each group are multiplied by the same scalar $(\gamma(k) - 1)$. The mean of the well being indicator of group k can consequently be expressed as

$$\begin{aligned} \mu(k;\gamma) &= \mu(k)\left(1 + (\gamma - 1)\left(1 - \frac{\mu}{\mu(k)}\right)\right) \\ &= \mu(k) + (\gamma - 1)(\mu(k) - \mu). \end{aligned} \tag{17}$$

Equation 17 shows that as γ increases between-group inequality also increases. The overall S-Gini coefficient after the between-group bipolarisation factor has been applied is then given by

$$I(p;\gamma) = \mu^{-1}\sum_{k=1}^{K} \int_{0}^{1} [\mu - Q(p;k;\gamma)]\phi(p;k)\omega(p;\rho)dp \tag{18}$$

The impact on total inequality of an incremental increase in between group inequality is then derived as

$$\frac{\partial I(\rho;\gamma)}{\partial \gamma}\bigg|_{\gamma=1} = \overline{IC}(\rho) + \sum_{k=1}^{K}\phi(k)\left(\frac{\mu(k)}{\mu} - 1\right)IC(\rho;k) \tag{19}$$

Where $IC(\rho;k)$ the coefficient of concentration as defined in equation 8, and $\overline{IC}(\rho)$ is the coefficient of concentration obtained when everyone is assigned the mean of his group's well being indicator:

$$\overline{IC}(\rho) = \mu^{-1} \sum_{k=1}^{K} \int_{0}^{1} (\mu - \mu(k))\omega(p;\rho)\phi(p;k)dp \qquad (20)$$

$\overline{IC}(\rho)$ is therefore an index of between-group inequality.

Thus, equation 19 takes into account both within and between group inequalities. If there is intra-group homogeneity, then the coefficient of concentration $IC(\rho;k)$, a measure of within group inequality is zero, and equation 19 reduces to equation 20. When within group inequality is taken into account, higher values of the well being indicator in a group are therefore affected absolutely more, and lower values of the well being indicator less, than what is captured by equation 19. Inequality is decreased if $\mu(k) < \mu$, and conversely inequality is increased if $\mu(k) > \mu$. The net effect of this is captured by $\sum_{k=1}^{K} \phi(k)\mu(k)/\mu - 1)IC(\rho;k)$.

The marginal impact of between-group inequality on poverty is given as

$$\frac{\partial P(z;\alpha;\gamma)}{\partial \gamma} = \begin{cases} \alpha \sum_{k=1}^{K} \phi(k)\left(\dfrac{\mu}{\mu(k)} - 1\right)\left[zP(z;\alpha-1;k) - P(z;\alpha;k)\right] & \text{if } \alpha > 0, \\ \sum_{k=1}^{K} \phi(k)\left(\dfrac{\mu}{\mu(k)} - 1\right)f(z;k) & \text{if } \alpha = 0 \end{cases} \qquad (21)$$

Putting everything together, the elasticity of total poverty with respect to between-group inequality is then is expressed as

$$\varepsilon_{\gamma}(z;\alpha;\rho) = \frac{\partial P(z;\alpha;\gamma)/\partial \gamma}{\partial I(\rho;\gamma)/\partial \gamma} \frac{I(\rho;\gamma)}{P(z;\alpha;\gamma)}\bigg|_{\gamma=1}. \qquad (22)$$

The sign and magnitude of the elasticity depends on $\dfrac{\mu}{\mu(k)}$, and on $P(z;\alpha;k)$. Equation 22 therefore captures the responsiveness of national poverty in Malawi to changes in inequalities between the three regions, and between rural and urban areas.

2.3. Data

The paper uses micro data taken from the second Malawi integrated household survey (IHS2). This is a nationally representative sample survey designed to provide information on the various aspects of household welfare in Malawi. Conducted by the National Statistical Office from March 2004-April 2005, the survey collected information from a nationally representative

sample of 11,280 households. Data on among other things; household consumption expenditure, education levels of household members, and anthropometrics for children aged between 6 to 60 months was collected.

3. Estimation Results

As shown earlier, the analysis requires the specification of a poverty line, z for each well being indicator. In the case of per capita consumption expenditure, we use the poor poverty line which is 16165 Malawi Kwacha (US$145.50) per year defined by the National Statistical Office of Malawi (NSO) for 2004/2005. With respect to our health indicator, we use 2.3 per cent as our health poverty line, implying that a child is considered to be suffering from health poverty if his/her transformed HAZ is below 2.3 per cent This poverty line corresponds to a HAZ of -2, and as per convention a child with HAZ of below -2 is considered malnourished or stunted. In the case of the education indicator, we use 12 years of schooling as our education poverty line. A household is thus defined as education poor if the maximum number of years of schooling in the household is less than 12. This poverty line corresponds to having a senior secondary school education in Malawi. The paper uses three FGT indices namely; the poverty headcount, $\alpha = 0$, the poverty gap index, $\alpha = 1$, and the poverty severity index, $\alpha = 2$ to measure poverty. In terms of inequality measurement, the paper uses the S-Gini coefficient where $\rho = 2$ (the ordinary Gini coefficient). Before presenting results of the relation between poverty and inequality in the three dimensions, we take a brief look at a poverty and inequality profile for Malawi.

3.1. A Poverty and Inequality Profile for Malawi

Table 1 presents a brief overview of the consumption, health, and education poverty and inequality situation in Malawi. This is done for the three regions of Malawi (North, Centre, and South) and as well as for rural and urban areas. The table shows that rural areas and the southern region have the most number of people. Across the three dimensions of welfare, the poverty headcount, gap, and severity indices are higher in rural areas than in urban areas. For instance, 55.9 per cent, 44.5 per cent, 89.9 per cent of the people are respectively consumption, health, and education poor in rural areas. In contrast, 25.4 per cent, 41.2 per cent, 67.2 per cent of the people are respectively consumption, health, and education poor in urban areas. The results also indicate that the percentage of people who are poor in terms of education is higher compared to those who are poor in terms of consumption and health. Looking at the three regions in Malawi, the

results show a mixed picture. The ranking of the regions depends on the living standard indicator used. In terms of consumption, all the three poverty indices show that the centre is the least poor and the south is the poorest. Using the health poverty headcount and the health poverty gap indices the ranking is reversed, in that the north is the least poor and the centre is the poorest. The results show a similar ranking for education poverty gap and poverty severity indices, with the north being the least poor and the centre the poorest.

In contrast to the poverty results, the inequality results show that the ranking of rural and urban areas depends on the dimension of well being used. The Gini coefficients for health inequality and education inequality are lower for urban areas, suggesting that urban areas are more equal than rural areas in terms of health and education. Interestingly, when one looks at consumption, rural areas are more equal than urban areas. At the regional level and for consumption and health, the results show that the north is the most equal, and the centre is the most unequal region in Malawi. In terms of education, the north is the most equal with the south the least equal[5]. Notably, the health and education Gini coefficients for the three regions as well as the rural and urban areas are higher than consumption Gini coefficients.

3.2. The Poverty and Inequality Relationship

The poverty and inequality profile shows that the ranking of the areas in terms of both poverty and inequality depends on the welfare indicator used. Looking at consumption only as is the tradition is not enough as this may not give a complete picture of the poverty and inequality situation in a country. As the profile shows, poverty and inequality in terms of consumption does not necessarily imply poverty and inequality in respect of health and education. This therefore justifies the need to go beyond consumption and look at other dimensions of well being. With this in mind, we now look at the results of the relationship between poverty and inequality.

As discussed earlier, the primary interest of this paper is to explore the direct relationship between poverty and inequality which runs from inequality to poverty. In addition, results for the relationship between overall inequality and within-region and between-region inequality are also presented. These relationships are measured in terms of marginal impacts and elasticities. We

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[5] These results in terms of the ordering of the areas are somewhat different from those by Mussa (2010) who used the Thiel L and Thiel T inequality coefficient instead of the Gini coefficient. For rural and urban areas, the Gini and Thiel coefficients give the same ordering for consumption and health, but contradictory rankings are obtained for education. For the regions, the only difference is in the ranking of the regions with respect to education inequality. The two Thiel inequality coefficients rank the north as the most equal but puts the south as the least equal.

first look at regional results. In Tables 2, 3, and 4, we report elasticities of poverty with respect to within-region and between-region consumption, health, and education inequality respectively. Marginal impacts of within-region and between-region inequality on poverty and inequality are also reported. Regardless of poverty index used, the signs of the marginal impacts of within-region inequality on overall inequality and poverty are all positive for consumption and health. As a result, the associated elasticities are all positive. For education, the signs of the marginal impacts of within-region inequality on overall inequality and poverty are all positive for the poverty gap and poverty severity indices only. Consequently, the associated elasticities are positive for the poverty gap and poverty severity indices but negative for the poverty headcount. The positive signs of the marginal impacts for the three dimensions of well being suggest that an increase in vertical inequalities increases overall consumption, health, and education poverty (the gap and the severity) and inequality in Malawi. The signs of the marginal impacts of between-region inequality on overall poverty and inequality are all positive for consumption and health, and as a result the elasticities are positive. For education, the signs of the marginal impacts are mixed as they vary with the poverty index used, with the result that the signs of the associated elasticities also vary with the poverty index used.

The magnitudes of the elasticities for within-region and between-region inequalities differ across the three poverty indices and the three welfare indicators. The results in Table 2 indicate that for the three poverty indices, the elasticity of poverty with respect to within-region consumption inequalities is positive and larger than that of between-region inequalities. This means that reducing vertical consumption inequalities leads to a larger reduction in overall consumption poverty as compared to reducing horizontal inequalities. In order to alleviate consumption poverty and inequality, policy interventions should therefore focus more on reducing consumption disparities within the regions rather between the regions. The results also show that a reduction in consumption inequality in the central region has the largest impact in reducing the national poverty headcount. Specifically, a 1 per cent decrease in consumption inequality in the central region leads to a 0.6 per cent reduction in national poverty. This responsiveness of national poverty to changes in inequality in the central region is almost twice that of the southern and northern regions.

The results for health in Table 3 show that for the poverty headcount the elasticity of poverty with respect to between-region inequalities in health is larger than the elasticity of

poverty with respect to within-region inequality in health. In contrast, the elasticity of poverty with respect to within-region inequalities in health is larger for the health poverty gap and poverty severity indices. This suggests, similar to consumption, that to effectively reduce the health poverty gap and the health poverty severity, interventions must focus more on reducing inequalities in health within the three regions rather than reducing disparities among the regions. Unlike the case of consumption discussed before, the results indicate that a reduction in health inequality in the northern region leads to the largest decrease in the national health poverty headcount, and on the other hand, a decrease in health inequality in the south has the smallest effect in reducing overall health poverty.

Results for education in Table 4 show some marked differences both in terms of sign and magnitude with those for consumption and health. Unlike the results for consumption and health, the results for health show a greater sensitivity to poverty index used. The signs of the elasticities for education indicate that an increase in within and between region education inequalities reduce the education poverty headcount but increase the education poverty gap and severity. This implies that a policy intervention aimed at reducing within-region education inequalities would increase the overall education poverty headcount, while concurrently reducing the overall education poverty gap and poverty severity. The results also show that an increase in education inequality in the southern region leads to the largest decrease in the national education poverty headcount, but also leads to the largest increase in the national poverty gap and poverty severity.

In order to examine possible rural-urban differences in the relationships between poverty and inequality, the above analysis is repeated with the country now partitioned into rural and urban areas. Tables 5, 6, and 7 contain marginal impacts and elasticities for consumption, health, and education inequality respectively. Across the three dimensions of well being the rural-urban results are qualitatively similar to the regional results. The elasticities of poverty with respect to within-area consumption and health inequalities are positive and larger than that of between-area consumption and health inequalities. This suggests that reducing vertical consumption and health inequalities leads to a larger reduction in the gaps and severity of overall consumption and health poverty as compared to reducing horizontal inequalities. The rural-urban results for education similar to the regional results seen earlier portray a mixed picture with results depending on the choice of poverty index. The elasticity of poverty with respect to within-area education

inequalities compared to between-area inequalities is negative and smaller for the poverty headcount, while it is positive and larger for the poverty gap. In addition, the elasticity of poverty with respect to within-area education inequalities is positive and larger for the poverty severity index than that of between-area education inequalities.

Focusing on the poverty gap and severity, the results indicate that a reduction in consumption and health inequality in rural areas generates a slightly larger decrease in overall consumption and health poverty. Looking at the poverty gap for instance, a 1 per cent decrease in consumption and health inequality in rural areas leads to a 2 per cent and 8 per cent fall in overall consumption and health poverty respectively. A similar decrease in urban areas leads to a 1.5 per cent and 7.9 per cent fall in overall consumption and health poverty respectively. Regarding education, the results show that the overall poverty gap is more responsive to a reduction in inequality in urban areas than in rural areas. Besides, the overall education poverty severity responds more to a decrease in rural inequality than urban inequality.

4. Concluding Remarks

Using data from the second integrated household survey (IHS2), the paper has looked at the linkage between poverty and inequality by investigating the poverty impacts of changes in within and between inequalities in Malawi. We have recognized the multidimensional nature of both poverty and inequality by focusing on monetary (consumption) and non monetary (health and education) dimensions of well being. Two questions have been answered namely; what is the contribution of within-group inequalities (vertical inequalities) to total poverty? And what is the contribution of between- group inequalities (horizontal inequalities) to total poverty? The groups are the three regions of Malawi; we have also partitioned the country into rural and urban areas. The results differ considerably across the three dimensions of well being. The results show that the elasticity of poverty with respect to within-region consumption inequalities is positive and higher than that of between-region inequalities, suggesting that reductions in vertical inequalities in consumption would have a higher poverty reducing effect. Between-region inequalities in health have a larger and positive effect on the health poverty headcount; on the other hand within-region inequalities in health have a larger and positive relationship with the health poverty gap and severity. We also find that an increase in both within and between region education inequalities reduce the education poverty headcount, but increase the education

poverty gap and severity. Rural and urban results across the three dimensions of well being are qualitatively similar to the regional results.

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Table 1: Consumption, health, and education poverty indices and Gini Coefficient

FGT Index/ Gini Coefficient	Malawi	Rural	Urban	North	Centre	South
Population Share (%)	100	88.66	11.34	11.26	43.02	45.72
Consumption						
Poverty Headcount Index	52.4	55.9	25.4	54.1	44.2	59.7
Poverty Gap Index	0.178	0.192	0.071	0.186	0.133	0.218
Poverty Severity Index	0.080	0.086	0.028	0.083	0.055	0.102
Gini Coefficient	0.390	0.339	0.484	0.350	0.394	0.384
Health						
Poverty Headcount Index	44.1	44.5	41.2	39.4	48.2	41.6
Poverty Gap Index	0.008	0.008	0.007	0.007	0.008	0.007
Poverty Severity Index	0.000	0.000	0.000	0.000	0.000	0.000
Gini Coefficient	0.720	0.721	0.702	0.696	0.748	0.696
Education						
Poverty Headcount Index	87.4	89.9	67.2	91.1	88.1	85.8
Poverty Gap Index	0.668	0.703	0.391	0.593	0.683	0.672
Poverty Severity Index	0.617	0.654	0.328	0.510	0.633	0.627
Gini Coefficient	0.634	0.663	0.371	0.492	0.649	0.659

Notes: The poverty headcount index has been multiplied by 100.

Table 2: Elasticity of poverty with respect to within- and between-group consumption inequality ($\rho = 2$) for regions

Region	$\alpha = 0$			$\alpha = 1$			$\alpha = 2$		
	MII	MIP	ELS	MII	MIP	ELS	MII	MIP	ELS
North	0.000359	0.000134	0.277584	0.000359	0.000328	2.001568	0.000359	0.000269	3.655833
Centre	0.001780	0.001464	0.611922	0.001780	0.001509	1.858867	0.001780	0.001042	2.859873
South	0.001634	0.000452	0.205750	0.001634	0.001434	1.923847	0.001634	0.001251	3.740604
Within	0.003774	0.002050	0.404200	0.003774	0.003270	1.900588	0.003774	0.002561	3.317047
Between	0.000107	0.000052	0.362349	0.000107	0.000092	1.885544	0.000107	0.000073	3.308212

Notes: MII is the marginal impact on inequality, $\dfrac{\partial I(\rho)}{\partial(.)}$; MIP, is the marginal impact on poverty, $\dfrac{\partial P(z;\alpha)}{\partial(.)}$; and ELS is the elasticity of poverty with respect to inequality, $\varepsilon_{(.)}(z;\alpha;\rho)$.

Table 3: Elasticity of poverty with respect to within- and between-group health inequality ($\rho = 2$) for regions

Region	$\alpha = 0$			$\alpha = 1$			$\alpha = 2$		
	MII	MIP	ELS	MII	MIP	ELS	MII	MIP	ELS
North	0.000754	0.001063	2.295506	0.000754	0.002845	7.836903	0.000754	0.004525	14.163859
Centre	0.002798	0.003761	2.188163	0.002798	0.011160	8.286830	0.002798	0.018124	15.288328
South	0.003578	0.004584	2.086066	0.003578	0.013706	7.959314	0.003578	0.021342	14.079654
Within	0.007131	0.009409	2.148268	0.007131	0.027711	8.074832	0.007131	0.043991	14.562767
Between	0.000018	0.000046	4.039778	0.000019	0.000015	1.632693	0.000018	0.000013	1.685273

Notes: MII is the marginal impact on inequality, $\dfrac{\partial I(\rho)}{\partial(.)}$; MIP, is the marginal impact on poverty, $\dfrac{\partial P(z;\alpha)}{\partial(.)}$; and ELS is the elasticity of poverty with respect to inequality, $\varepsilon_{(.)}(z;\alpha;\rho)$.

Table 4: Elasticity of poverty with respect to within- and between-group education inequality ($\rho = 2$) for regions

Region	$\alpha = 0$			$\alpha = 1$			$\alpha = 2$		
	MII	MIP	ELS	MII	MIP	ELS	MII	MIP	ELS
North	0.000756	-0.000437	-0.439579	0.000765	0.000057	0.074779	0.000767	0.000356	0.501416
Centre	0.002878	-0.001611	-0.426277	0.002888	0.000282	0.097372	0.002876	0.001334	0.500535
South	0.002957	-0.002067	-0.532216	0.002944	0.000289	0.097730	0.002939	0.001370	0.502865
Within	0.006604	-0.004115	-0.474428	0.006603	0.000628	0.094825	0.006603	0.003060	0.500081
Between	-0.000023	0.000062	-2.025594	-0.000019	-0.000012	0.616866	-0.000018	-0.000009	0.511344

Notes: MII is the marginal impact on inequality, $\dfrac{\partial I(\rho)}{\partial (.)}$; MIP, is the marginal impact on poverty, $\dfrac{\partial P(z;\alpha)}{\partial (.)}$; and ELS is the elasticity of poverty with respect to

inequality, $\varepsilon_{(.)}(z;\alpha;\rho)$.

Table 5: Elasticity of poverty with respect to within- and between-group consumption inequality ($\rho = 2$) rural/urban

Area	$\alpha = 0$			$\alpha = 1$			$\alpha = 2$		
	MII	MIP	ELS	MII	MIP	ELS	MII	MIP	ELS
Urban	0.000797	0.000860	0.802971	0.000797	0.000535	1.473846	0.000797	0.000317	1.947199
Rural	0.002605	0.000848	0.242311	0.002605	0.002412	2.030046	0.002605	0.002021	3.791142
Within	0.003402	0.001708	0.373618	0.003402	0.002947	1.899783	0.003402	0.002339	3.359287
Between	0.000520	0.000571	0.816172	0.000520	0.000361	1.521384	0.000520	0.000218	2.050123

Notes: MII is the marginal impact on inequality, $\frac{\partial I(\rho)}{\partial(.)}$; MIP, is the marginal impact on poverty, $\frac{\partial P(z;\alpha)}{\partial(.)}$; and ELS is the elasticity of poverty with respect to inequality, $\varepsilon_{(.)}(z;\alpha;\rho)$.

Table 6: Elasticity of poverty with respect to within- and between-group health inequality ($\rho = 2$) rural/urban

	$\alpha = 0$			$\alpha = 1$			$\alpha = 2$		
Area	MII	MIP	ELS	MII	MIP	ELS	MII	MIP	ELS
Urban	0.000667	0.000948	2.314495	0.000667	0.002547	7.935930	0.000667	0.003915	13.858459
Rural	0.006523	0.008858	2.210831	0.006523	0.025399	8.090816	0.006523	0.040545	14.672379
Within	0.007190	0.009805	2.220460	0.007190	0.027946	8.076461	0.007190	0.044460	14.596908
Between	-0.00000	0.000000	-3.70615	-0.00000	-0.00000	2.142899	-0.00000	0.000000	-3.189857

Notes: MII is the marginal impact on inequality, $\dfrac{\partial I(\rho)}{\partial(.)}$; MIP, is the marginal impact on poverty, $\dfrac{\partial P(z;\alpha)}{\partial(.)}$; and ELS is the elasticity of poverty

with respect to inequality, $\varepsilon_{(.)}(z;\alpha;\rho)$.

Table 7: Elasticity of poverty with respect to within- and between-group education inequality ($\rho = 2$) rural/urban

| | $\alpha = 0$ | | | $\alpha = 1$ | | | $\alpha = 2$ | | |
Area	MII	MIP	ELS	MII	MIP	ELS	MII	MIP	ELS
Urban	0.000981	-0.000703	-0.545679	0.000972	0.000177	0.181150	0.000978	0.000436	0.483165
Rural	0.005095	-0.002881	-0.430612	0.005091	0.000348	0.068159	0.005092	0.002384	0.505192
Within	0.006066	-0.003585	-0.449917	0.006073	0.000525	0.086129	0.006073	0.002820	0.501010
Between	0.000190	-0.000368	-1.476917	0.000187	0.000135	0.717157	0.000191	0.000078	0.440536

Notes: MII is the marginal impact on inequality, $\dfrac{\partial I(\rho)}{\partial(.)}$; MIP, is the marginal impact on poverty, $\dfrac{\partial P(z;\alpha)}{\partial(.)}$; and ELS is the elasticity of poverty with respect to inequality, $\varepsilon_{(.)}(z;\alpha;\rho)$.