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Child deprivation and income poverty in Ghana

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Abstract: This study assesses temporal and spatial distribution of child deprivation and income poverty using the fifth and sixth rounds of the Ghana Living Standards Survey. The first-order dominance methodology was used to examine five dimensions of deprivation of children aged 7 to 17 years, and the outcomes were compared to the incidence of income poverty. The analyses reveal the following: reduction in child deprivation across all five dimensions over time; wide disparities across geographical areas; and differences in regional rankings of deprivation and income poverty. Distinct policies for child deprivation and income poverty are imperative for different locations in Ghana.

Keywords: deprivation, income, poverty, first-order dominance, children, Ghana
JEL classification: I00, I30, I32, I38

Tables: provided at the end of the paper.

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1 Introduction

In spite of the evidence that global poverty is on the decline, disparities in rates of reduction across countries as well as large disparities in levels of living standards continue to cause concern among policy makers, development partners, and researchers. In sub-Saharan Africa, 47.5 per cent of its population, representing approximately 386 million people, lived below the poverty line of USD1.25 a day in 2008, down from 51.5 per cent in 1981 (World Bank 2012). On the African continent, there are wide disparities in poverty over time as countries such as Ghana, Ethiopia, Cameroon, Senegal, Gambia, and Morocco have made significant strides towards poverty reduction, whereas the same cannot be said of others such as Côte d'Ivoire and Nigeria (Ajakaiye et al. 2014).

In Ghana, consumption expenditure poverty from the perspectives of incidence and depth has experienced a significant reduction in terms of absolute and extreme poverty. Even though the methods for estimating consumption expenditure poverty have differed slightly, making comparisons over time less robust, available evidence suggests a significant decrease of absolute poverty from about 52 per cent in 1991–92 to about 24 per cent in 2012–13. Over the same period, extreme poverty declined by 31 percentage points. With these reductions, Ghana surpassed the first Millennium Development Goal (MDG) of halving extreme poverty by 2015 (GSS 2014).

Poverty has many dimensions, and as such the measurement of poverty significantly influences the understanding, analyses, and policies needed to target its reduction. From the seminal work of Sen (1976) until now, the measurement of poverty can be divided broadly into unidimensional and multidimensional approaches (Alkire and Foster 2011). Consumption expenditure and income poverty are typically presented as unidimensional measures. The multidimensional approach seeks to incorporate additional dimensions such as malnutrition, ill-health, illiteracy, and insecurity. According to Gordon et al. (2003) and UNICEF (2007), the use of a unidimensional measurement of poverty using income or consumption expenditure is biased towards adults, with limited attention paid to children. In addition, Minujin et al. (2014) argue that conventional poverty measurements in monetary values do not capture how poverty affects children in physical, emotional, and social ways. It also fails to recognize that children experience poverty differently from adults due to specific and different needs.

While an adult may fall into poverty temporarily, the implications of falling into poverty in childhood can last a lifetime because short periods of deprivation can impact children's long-term development (Ortiz et al. 2012). UNICEF (2000) argues that poverty reduction must begin with children and this warrants methodologies that adequately evaluate the living conditions of children. However, the most widely used methods to measure poverty are based on income or consumption levels. While such measures engender a broad understanding of populations living in poverty, they provide a potentially blurred or even misleading picture of the multidimensional and the interrelated nature of poverty as experienced by children.

Not surprisingly, most of the studies on poverty in Ghana (Annim et al. 2012; Boateng et al. 1992; Coulombe and Wodon 2007) are adult-oriented, with limited attention paid to children. As argued by UNICEF (2007), these approaches can show a significant increase in the welfare of a given household yet child deprivation(s) may persist in such households, since one may erroneously assume households prioritize children in the intra-household distribution of resources. It is worth noting that the few studies on child poverty in Ghana (Mba and Badasu 2010; Mba et al. 2009)

employed the Bristol (headcount) approach to measure the spatial distribution of child poverty across the country at a point in time.

Methodology-wise, the Bristol approach belongs to the 'counting' tradition of poverty measures. It involves an identification stage where the poor are identified according to the total number of dimensions in which they are deprived. Then, there is an aggregation stage where the 'headcount' or percentage of children who have been identified as poor is reported as the final measure (Roelen and Gassmann 2008). According to Alkire and Roche (2012), even though the headcount measure is theoretically relevant, and easy and clear to compute and interpret, it provides no incentive for policy makers to prioritize the poorest children. This is because the headcount approach does not consider the intensity of poverty that poor children may suffer.

In addition, the literature on multidimensional wellbeing has long advocated the comparison of populations with welfare functions that aggregate separate dimensions of wellbeing into a headcount ratio like the Bristol method or single indices like the Multidimensional Poverty Index (MPI) and Multiple Overlapping Deprivation Analysis (MODA). The aggregation of separate dimensions into a single composite index typically requires imposition of weighting schemes, which could affect the consistency of ranking.

One way to ensure consistent ranking of populations is provided by multidimensional stochastic dominance conditions, under which a broad class of welfare functions consistently rank multivariate distributions of groups or societies (Yalonetzky 2013). The methodology of first-order dominance (FOD) is in the family of multidimensional stochastic dominance and ensures consistent ranking of populations when the FOD conditions are satisfied. The FOD approach was operationalized by Arndt et al. (2012) to enable welfare comparisons between two or more populations with multidimensional discrete wellbeing indicators observed at the micro level. With this approach, each welfare indicator can be ranked ordinally from worse to better without recourse to an arbitrary weighting scheme and complementarity/substitutability relationships between dimensions. The method uses a standard linear programming algorithm for determining dominance, allowing the implementation of a bootstrap procedure that facilitates rankings of populations.

This study assesses the temporal and spatial distribution of child poverty and wellbeing for four sets of geographical groupings in Ghana, namely national, rural/urban, ecological zones, and administrative regions. It uses the Ghana Living Standards Survey (GLSS) rounds five and six. The study employs the FOD methodology in five deprivation indicators—water, sanitation, shelter, education, and information—to measure the poverty and wellbeing of children aged 7 to 17 years old. In addition, the study employs a monetary approach in income to measure the incidence of children living in low-income households. Finally, the study compares the distribution of child poverty from a multidimensional deprivation-based analysis using FOD with that of income poverty.

This study contributes by employing a robust methodology (the FOD approach) and by considering the evolution of child poverty over time. This information could help to evaluate the effectiveness of existing policies in improving the living conditions of children. Importantly, in applying two approaches, the study seeks to provide comprehensive findings concerning the living conditions of children in the country, thereby aiding social intervention.

The rest of the paper is presented as follows: Section 2 reviews related literature on child poverty. Methods of study and discussion of the results are presented in Sections 3 and 4 respectively. The final section highlights the main findings and policy recommendations.

2 Review of related literature

2.1 Empirical literature review

The last decade has seen a proliferation of empirical studies on child poverty across the globe: Alkire and Roche (2012), Arndt et al. (2012), Gordon et al. (2003), Minujin (2011), Minujin et al. (2014), Minujin and Nandy (2012), and Roche (2013). This may be attributed to the development of the child deprivation model (Gordon et al. 2003), coupled with the launching of the Global Study on Child Poverty and Disparity by UNICEF in 2007.

In the context of Ghana, Mba et al. (2009) conducted a study on child poverty and disparity in Ghana. Several datasets were used for the study: Population Censuses (1960, 1984, and 2000), Multiple Indicator Survey (MICS) 2006, GLSS5, and the Ghana Demography Health Survey (GDHS) 2003. Another study was conducted by Mba and Badasu (2010) on the deprivations among children in Ghana using the 2006 MICS. Both studies employed the deprivation model of Gordon et al. (2003) in dimensions of water, sanitation, shelter, education, health, nutrition, and information for children between 0 and 17 years. In both studies, absolute poverty was defined as children having two or more severe deprivations in any of the mentioned deprivations.

Their main findings reveal the Northern region as the poorest region in Ghana. Upper East and Upper West follow while the Greater Accra region is the least poor region in terms of child poverty. In addition, their findings indicate that children are more deprived in sanitation than any other indicator of child deprivation. Furthermore, they identified correlates of child poverty such as household size, households in the poorest wealth quintile, and female headed households.

3 Methods and data

3.1 Multidimensional FOD approach

Arndt et al. (2012) developed the FOD methodology for evaluating multidimensional welfare comparisons among populations. The approach makes minimal assumptions, and at the same time allows welfare comparisons between two populations on the basis of a series of discrete ordinal welfare indicators without recourse to arbitrary weighting schemes or conditions on the social welfare function. The method uses an efficient algorithm for determining dominance and employs a bootstrap approach that permits cardinal rankings of populations.

The FOD approach is well-established in the theory of both unidimensional and multidimensional FOD. However, for this study, we focus on the latter. Hence, in the multidimensional case, suppose that f and g are multidimensional probability mass functions of some population over a finite subset X of R^n. Then, *f* FOD *g* if one of the following conditions holds:

A. *g* can be obtained from *f* by a finite number of shifts of density from one outcome to another worse outcome;

B. Social welfare is at least as high for *f* as for *g* for any non-decreasing additively separable social welfare function such that $\sum_{x\in X} f(x)\, w(x) \geq \sum_{x\in X} g(x)\, w(x)$ for any non-decreasing real function *w;*

C. $\sum_{x\in Y} g(x) \geq \sum_{x\in Y} f(x)$ for any comprehensive set $Y \subseteq X$.

From the three equivalent FOD conditions, the most intuitive condition is A. The implication is that if condition A is observed between two population distributions, the dominating distribution is unambiguously better off.

The FOD approach makes the very minimum assumption that it is better not to be deprived than deprived. Coupled with its general strict nature, the approach has two major flaws. The first is the possibility that FOD criteria cannot determine whether one population dominates or is dominated by another population. The second is that the extent to which one population dominates another cannot be identified.

The two flaws can be mitigated through bootstrap sampling. Consequently, this study compares repeated bootstrap sampling over 100 iterations. This enables us to obtain the empirical probability of domination, which gives the extent to which one population dominates another. More important is the probability of net dominance (ND), which is the probability that a population dominates all other populations less the probability that a population is dominated by all other populations, interpreted as the cardinal measure of child welfare which provides the basis to rank populations.

This study chooses five main indicators of welfare for children aged 7 to 17 years by following closely the severe deprivation model of Gordon et al. (2003) and taking into cognisance the availability of data.

Water: A child is not severely deprived in water if the child's main water source for drinking is piped water, borehole, protected well water, or rainwater.

Sanitation: A child is not severely deprived in sanitation if the child has access to a flush toilet, an improved ventilated pit latrine, or a composting toilet.

Education: A child is not severely deprived in education if the child is attending school.

Shelter: A child is not severely deprived in shelter if the child's shelter floor material is made of a material other than earth/mud.

Information: A child is not severely deprived in information if the child belongs to a household that owns either a television or a radio.

These indicators constitute a set of five binary child welfare indicators. The binary variables were created for each child in each of the five welfare indicators, where '1' is the good outcome corresponding to non-deprived and '0' is the bad outcome corresponding to deprived. Hence, there are 2^5=32 possible combinations of welfare outcomes for each child. For example, welfare combination (1,1,1,1,1) means non-deprivation in all of the five dimensions, while welfare combination (0,0,0,0,0) indicates deprivation in the five indicators of wellbeing.

As noted, FOD can be checked using a linear program that has a feasible solution in General Algebraic Modelling Systems (GAMS). For this study, bootstrap sampling in 100 iterations was carried out in order to mitigate the possibility of indeterminate outcomes of dominance. Therefore, the final result can be interpreted as the empirical probability that population A dominates population B or vice versa. Furthermore, temporal FOD outcomes allow comparison between populations over time. For this study, the temporal FOD analysis measures domination of the recent year (2013) over the last year (2006), and vice versa, in each of the four sets of geographical groups: national, rural/urban, ecological zones, and administrative regions. The results will provide information on three probabilities of temporal domination of child welfare in the mentioned geographical areas: positive probabilities indicating gains over time; negative probabilities indicating regression over time; and a blank cell indicating neither gains nor regression over time.

3.2 An income-based approach

The income approach for measuring child poverty conceptualizes child poverty as children living in low-income households. This monetary poverty approach takes the household as the unit of analysis. The poor are identified by setting a poverty line corresponding to a given threshold of household income (Roelen and Gassmann 2008). Children in households beneath a given threshold are taken to be poor. According to Ravallion (1994), an absolute poverty line and a relative poverty line are the two main forms of poverty lines used to set the dividing line between poor and non-poor. The former is based on the ability to purchase a certain quantity of goods and services whereas the latter is relative to the income level in the specific country (UNICEF 2005). This study employs the latter poverty line to estimate the incidence of children living in low-income households. Specifically, children living in households beneath 50 per cent of median household income are taken to be poor.

3.3 Data sources and processing

For both approaches, the study employs the GLSS as its main data source. The GLSS is a nationwide survey carried out by the Ghana Statistical Service (GSS). The first round of the GLSS was conducted in 1987–88. Six rounds in total have been conducted, with the second, third, fourth, fifth, and sixth rounds conducted in 1988–99, 1991–92, 1998–99, 2005–06, and 2012–13 respectively. The two central objectives of the GLSS, among many, are to monitor the living conditions of Ghanaians and to provide information for updating the country's national accounts. Consequently, it focuses on the household as the socioeconomic unit, but collects information on individuals within the household, including children, and on the communities in which the households are identified. The GLSS captures information on thematic issues such as demographic characteristics, education, health, economic activity, migration, and tourism.

This study focuses on the last two rounds of the GLSS (5 and 6), and the population in focus for the FOD methodology is children aged 7 to 17 years. The fifth round contains information on 8,687 households, and in these households there were 10,515 children aged 7 to 17 years. The sixth round contains information on 16,772 households, and in these households there were 20,082 children between the ages of 7 and 17.

For the FOD analysis, after managing the data and accounting for missing values in each of the welfare indicators, the number of children used for the analysis in 2006 dropped to 10,150, registering an attrition rate of 3 per cent, whereas that for 2013 dropped to 19,927, registering an attrition rate of one per cent. For the income analysis, out of the 8,687 households in 2006, there are 10,515 children (7 to 17 years) living in 4,783 households, whereas for the GLSS6 in 2013, out of the 16,722 households in 2013, there were 20,082 children (7 to 17 years) living in 9,278 households.

4 Results and discussion

The analyses were conducted in four geographical areas: national, rural/urban, ecological zones, and the ten administrative regions in Ghana for children aged 7 to 17 years. Five binary welfare indicators were selected in water, sanitation, shelter, education, and information.

4.1 Children according to welfare indicators

Table 1 presents the proportion and percentage change of Ghanaian children not deprived in each dimension, over time and across space. Nationally, Table 1 indicates positive percentage change in all five welfare indicators at the national level, which is very impressive. The rural and urban areas registered a negative change in information and sanitation of 3.6 and 3.7 percentage points respectively. All three ecological zones recorded positive change in the five welfare indicators, except the Savannah zone. Regionally, all ten administrative regions had at least one negative percentage change in one of the five welfare indicators, except the Eastern and the Brong Ahafo regions. Overall, children have higher welfare in education and shelter and, the worst welfare in sanitation over the two periods. Children having the worst welfare in sanitation is consistent with other studies in the same domain by Mba et al. (2009) and Mba and Badasu (2010).

4.2 Share of children in multidimensional welfare combinations

Five binary indicators were selected as mentioned above, and the number of possible welfare combinations we arrived at is $2^5=32$, giving us 32 welfare combinations. Table 2 presents the share of children at the national level that fall in each of the 32 welfare combinations and the percentage point change over time. The first row of the table shows the share of the children characterized by deprivation in all dimensions (0,0,0,0,0). The children in this group are worse off. The bottom row illustrates non-deprivation in any dimension (1,1,1,1,1). These children are better off. The discussion focuses on these two extremes solely: worse-off and better-off children.

From Table 2, the proportion of worse-off children is 0.31 per cent in 2006 and it decreases to 0.16 in 2013, registering a negative percentage point change of 0.16 per cent. The decrease in this proportion of children at the national level is good for the country, whereas the proportion of

better-off children increases from 29.01 per cent in 2006 to 41.65 per cent in 2013, registering an increase of 12.64 percentage points.

4.3 Children by number of deprivation

Table 3 shows children by number of deprivations, ranging from 0 to 5. Deprivation zero (0) corresponds to children not deprived in any welfare indicator (1,1,1,1,1), hence better off, whereas deprivation 5 corresponds to children deprived in all five welfare indicators (0,0,0,0,0), hence worse off. Table 3 concentrates only on the two extremes, better-off and worse-off children. From the table, the urban area (56.1 and 61.5 per cent) has a higher proportion of better-off children than the rural area (14.4 and 23.4 per cent) in 2006 and 2013 respectively, while in both cases the opposite is true for worse-off children. In terms of ecological zones, the Savanah zone has the lowest proportion of better-off children of 7.1 and 15.0 per cent in both periods respectively, while the opposite is the case for the proportion of worse-off children. At the regional level, Greater Accra and the Ashanti regions have the highest proportion of better-off children in both periods, whereas the Northern and the Volta regions recorded the highest proportion of worse-off children.

The implication of any geographical area having a relatively high percentage of better-off children is that the area is more likely to dominate other areas in terms of child welfare. For example, the urban area, the Coastal zone, Greater Accra, and the Ashanti regions are in such areas. On the other hand, the implication of areas with a relatively higher proportion of worse-off children is that such areas are likely to be dominated much more than other areas in terms of child welfare. Areas such as the rural area, the Savannah zone, Volta, and the Northern regions belong to this category,

4.4 Temporal FOD comparisons

Table 4 shows the temporal FOD comparisons between 2006 and 2013. From the table, one notes that a '1' in the static case indicates that the area's/region's recent (2013) year's welfare level dominates the earlier (2006) year's welfare level, while an empty cell indicates no domination. In the bootstrap case, a '1' indicates that all 100 bootstrap replications resulted in domination, while an empty cell indicates no domination.

From the table, the advance in the wellbeing of children over the period between 2006 and 2013 is registered at the national level, the Coastal zone, and the Eastern region using the static approach. However, bootstrapping at the national level, the Coastal zone, and the Eastern region results in fewer instances of 2013 dominating 2006 than instances of indeterminate outcomes, with probabilities of dominating of 0.41, 0.25, and 0.18, respectively. This implies that there is about a four out of ten probability of advance at the national level. At the Coastal zone, there is a one out of four probability of advance and the Eastern region recorded about a one out of five probability of advance in child welfare between the two periods.

Children in other areas such as the urban area, Forest zone, the Savannah zone, Brong Ahafo region, Northern region, and Western region recorded positive (empirical) probabilities of 2013 dominating 2006 of 0.01, 0.10, 0.01, 0.03, 0.05, and 0.11, respectively, albeit very low probabilities. The results from the table provide no evidence of regression in any area/region, as indicated by a blank column of cells in '2006 FOD 2013'.

These results provide no evidence of regression in child welfare over time. However, with the exception of the nation and the Coastal zone where the probabilities of dominating are relatively high, there is little to no evidence of advancement for most areas. For the remaining areas, the probabilities are too low to indicate advancement with much confidence. The lack of broad-based advancement is likely due to the declines for many areas in sanitation and information.

4.5 Spatial FOD comparisons

This section addresses the spatial FOD comparisons at a point in time, that is, 2006 and 2013, respectively. The section reports only the bootstrap results and where domination is also found in the static case this is shown in bold. (See appendices A and B for static results). Hence, Tables 5 and 6 report the results of the spatial bootstrap FOD comparisons for the four sets of geographical groupings in 2006 and 2013 respectively. The row average (RAV) dominance of the tables is the probability that an area dominates other areas, whereas the column average (CAV) dominance of the same tables is the probability that an area is dominated by other areas. Hence, we expect areas that are well off to have larger RAV, whereas the worse-off areas would have a larger CAV. More importantly, the welfare of the various areas is captured by the probability of ND in the bootstrap results, which is the difference between the row and column averages. Based on these probabilities of ND we can cardinally rank the various areas in terms of their relative welfare. Therefore, areas that are relatively better off will have relatively higher probability of ND and the reverse is true.

One must note the following: a '1' in the bootstrap comparison indicates that the row (column) area dominates (is dominated by) the column areas 100 per cent of the time, hence revealing a more detailed perspective of child welfare. An empty cell in the bootstrap indicates that the domination of the row (column) areas is always indeterminate. Also, a bold entry in the table shows domination in the static comparisons.

4.6 Bootstrap spatial FOD comparisons in 2006

Table 5 shows the bootstrap spatial FOD comparisons in 2006. From the table, the urban area (UA) dominates other areas of residence with a ND of 53 per cent, whereas the rural area (RA) has a negative ND of 53 per cent. In terms of the ecological zones, the Coastal zone (CZ) is relatively better off with a ND probability of 35 per cent. Regionally, the Greater Accra (GAR) and Ashanti regions (AR) are better off with average ND of 53 and 37 per cent respectively. Whereas, the two worse regions are the Volta region (VR) and Northern region (NR) with average negative ND of 21 and 44 per cent respectively.

4.7 Bootstrap spatial FOD comparisons in 2013

Table 6 reports the bootstrap spatial FOD results for 2013. From the table, the urban area (UA) dominates other areas of residence with an average ND of 58 per cent, whereas the rural area (RA) has a negative average ND of 58 per cent. In terms of the ecological zones, the Coastal zone (CZ) is better off with average ND of 41 per cent. In terms of administrative region, the Greater Accra (GAR) and Ashanti regions are better off among the ten regions with average ND of 70 and 45 per

cent respectively. Northern and Volta are the worst regions with negative average ND of 28 and 49 per cent respectively.

4.8 Net dominance and rank of deprivation child poverty across the ten regions over time

The average probability of ND is the difference between the average probability of dominating and of being dominated by all other areas, i.e. the RAV less the CAV. Table 7 shows the average ND and the rank of child welfare over time across the ten administrative regions. Regions with relatively lower ND and higher ranks correspond to poorer regions in terms of child poverty, whereas the opposite is true for better-off regions.

In 2006, Greater Accra has the best ranking, followed by the Ashanti region. The remaining rankings are shown in Table 7, column 'Rank1'. The two regions, with the worst rankings, are the Volta and the Northern regions: the likely reason is that the Volta and Northern regions had the highest proportion of worse-off children of 1.44 and 0.66 per cent respectively. As such, these two regions were dominated more than any other regions.

The three worst regions (Upper East, Volta, and Northern regions) in terms of child welfare using the FOD approach are fairly different from other studies of child poverty (Mba and Badasu 2010; Mba et al. 2009) where the three worst regions were the three northern regions (Upper East, Upper West, and Northern regions). The reason could lie in the different assumptions underlying the approaches used for the aforementioned studies. The headcount approach considers children with two or more deprivations as poor, whereas the FOD is a strict procedure which considers the better-ranked population as unambiguously better off.

From the 2013 results, the Greater Accra region is the best ranked region followed by the Ashanti region. The remaining rankings are provided in Table 7 column, 'Rank2'. Again, the two worst regions are the Northern and Volta regions: the likely reason is that the Volta and Northern regions had the two highest proportions of worse-off children of 0.62 and 0.66 per cent respectively. As such, these two regions were dominated more than any other region.

The three worst regions (Brong Ahafo, Northern, and Volta regions) in terms of child welfare using the FOD approach are reasonably different from other studies of child poverty (Mba and Badasu 2010; Mba et al. 2009), where the three worst regions were the three northern regions (Upper East, Upper West, and Northern regions). The last column, 'Differ', indicates the difference between the rankings of 2006 and 2013. Apparently, only two regions, Greater Accra and Ashanti, had the same rank in both periods.

4.9 Distribution of monetary (income) child poverty, and consumption expenditure poverty

The incidence of children living in low-income households across the ten regions of the country over time is presented in Table 8. For this study, children living in households beneath 50 per cent of the median household income are considered poor. From the table, in both survey periods, the distribution of the incidence and rankings of child income poverty is similar to that of consumption expenditure poverty by the GSS where the three Northern regions: Northern, Upper West, and Upper East regions registered the highest incidence in the two survey periods.

One must note that in Table 8, a relatively higher incidence and rank correspond to regions that have poorer children. From the table, the Greater Accra (11 and 18 per cent), the Western (20 and 16 per cent), and the Eastern (29 and 19 per cent) are the regions with the least incidence of income child poverty over the two-year periods, while the three northern regions—the Northern (41 and 42 per cent), the Upper East (70 and 54 per cent), and the Upper West (62 and 53 per cent)—are the worst regions with the incidence of poor children over the two periods. The columns, 'Differ1' and 'Differ2' indicate the difference between the rankings of child income poverty, and consumption expenditure poverty in the 2006 and 2013 periods respectively.

4.10 Comparison between the rankings of deprivation child poverty, income child poverty, and consumption expenditure poverty

Tables 9 and 10 compare the multidimensional FOD (deprivation analyses) rankings with the income and consumption expenditure approaches at the regional level in 2006 and 2013 respectively. One must note that the highest rank corresponds to the poorest region, whereas the lowest rank corresponds to the better-off region.

Table 9 compares child deprivation, child income, and consumption expenditure poverty in 2006. The column 'Differ1' indicates the differences in rankings between child deprivation and income poverty in 2006; only two regions, Greater Accra and Brong Ahafo, registered the same rank out of the ten regions in 2006. On the other hand, the column 'Differ2' indicates the differences in rankings between deprivation child poverty, and consumption expenditure poverty in 2006; only the Greater Accra region, the capital city, registered the same rank between both approaches.

Table 10 shows the comparison between the rankings of child deprivation, child income, and consumption expenditure poverty in 2013. The column 'Differ1' indicates the differences in rankings between child deprivation and income poverty in 2013; none of the regions registered the same rank using both approaches. This points to differences in regional distribution of child poverty using both approaches. On the other hand, the column 'Differ2' indicates the differences in rankings between child deprivation poverty, and consumption expenditure poverty in 2013; the Greater Accra, Ashanti, Eastern, and Northern regions maintained the same rank using both approaches.

5 Conclusion

This paper assesses the poverty of children aged 7 to 17 years across four geographical areas of Ghana, namely national, rural/urban, ecological zones, and administrative regions, and over time, between 2006 and 2013, using GLSS5 and GLSS6 respectively. The specific objectives addressed are: (1) determine the gains in wellbeing of children over time; (2) assess the spatial distribution of deprivation child poverty; and (3) compare the spatial distribution of deprivation and income child poverty across the administrative regions.

The findings indicate that children are worse off in sanitation than any other welfare indicator: for the two periods considered, no more than five out of ten children have access to improved sanitation at the national level. The temporal FOD comparisons robustly provide broad-based evidence of no regression over time. While there is moderate support for advancement at the

national level, this evidence is weak at best in all other areas of analysis. In addition, the spatial FOD comparisons indicate profound disparities in deprivation child poverty across the four sets of geographical groupings: (1) we observed that in both years the rural area and the Savannah zone were the worst ranked in terms of the area of residence and the ecological zone respectively; (2) regionally, the results from the spatial comparisons in 2013 reveal the Brong Ahafo, the Northern, and Volta regions as the three worst regions in the country respectively; and (3) the urban area, the Coastal zone, Greater Accra, and the Ashanti regions were the best performing areas, zones and regions in both years respectively. Finally, the comparison between deprivation and income child poverty across the ten regions reveals the following: in 2006, only two regions out of the ten maintained the same rank using both approaches, whereas no region maintained the same rank using both approaches in 2013.

The government should therefore focus more on children in the rural area, the Savannah zone, Brong Ahafo, the Northern, and the Volta regions through the provision of social amenities such as improved ventilated latrines, boreholes, and schools to reduce the number of children in these areas facing severe deprivation in all the five welfare indicators. In addition, the government should concentrate on reducing income poverty in the Upper West, Upper East, and Northern regions. Finally, the differences in ranks from the comparison between deprivation and income child poverty call for sustained efforts from the government to implement child-focused policies such as compulsory basic and senior high school education and enforcement of the rights of children.

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Table 1: Children not deprived by welfare indicator over time and across space (%), and percentage point change

	Water			Sanitation			Shelter			Education			Information		
	2006	2013	Change	2006	2013	Change	2006	2013	Change	2006	2013	Change	2006	2013	Change
National	76.1	84.9	8.8	41.5	54.7	13.3	85.9	91.2	5.2	84.2	95.1	10.9	80.6	81.0	0.5
Rural	69.1	74.5	5.3	23.0	38.8	15.8	79.5	85.5	6.0	79.4	92.4	13.0	77.9	74.3	-3.6
Urban	89.0	96.2	7.2	75.6	71.9	-3.7	97.8	97.3	-0.6	93.3	98.2	4.9	85.5	88.3	2.8
Coastal	77.7	89.4	11.6	56.5	68.0	11.5	92.1	95.4	3.3	92.1	98.3	6.1	85.6	87.2	1.6
Forest	76.5	83.1	6.6	43.7	57.9	14.2	87.1	90.1	3.0	89.7	97.2	7.5	79.8	80.6	0.9
Savannah	72.8	81.8	9.1	13.1	20.1	7.0	73.8	86.2	12.4	59.2	83.1	23.9	74.8	70.5	-4.3
Western	71.5	84.8	13.3	40.6	64.9	24.2	87.1	95.8	8.7	89.3	98.7	9.4	87.0	86.4	-0.6
Central	75.9	82.5	6.6	39.2	57.5	18.3	88.9	90.5	1.6	93.3	97.2	3.9	82.0	78.5	-3.5
Greater Accra	84.5	97.1	12.6	82.7	77.1	-5.6	98.8	98.3	-0.5	93.8	98.7	4.9	86.9	93.4	6.6
Volta	62.0	64.1	2.1	29.8	42.0	12.2	78.8	89.0	10.2	84.2	92.6	8.4	81.7	73.2	-8.5
Eastern	70.2	80.8	10.6	38.2	53.1	15.0	84.8	88.2	3.4	91.3	98.0	6.7	80.6	81.0	0.4
Ashanti	86.2	92.2	6.0	59.5	70.7	11.3	93.6	92.4	-1.2	94.0	98.9	4.9	80.7	84.9	4.2
Brong Ahafo	79.2	83.5	4.3	34.3	51.1	16.9	85.1	88.5	3.5	84.2	96.9	12.7	75.4	78.2	2.8
Northern	63.0	75.1	12.1	16.9	26.4	9.4	78.8	90.7	11.8	56.5	76.2	19.6	74.9	73.3	-1.6
Upper East	77.6	87.8	10.2	9.1	8.9	-0.2	70.2	87.4	17.3	62.3	93.7	31.5	77.1	67.8	-9.3
Upper West	98.3	95.2	-3.1	6.2	15.3	9.1	62.3	70.5	8.2	63.8	90.8	27.0	71.4	65.0	-6.4

Source: Authors' calculation based on GLSS5 (GSS 2007) and GLSS6 (GSS 2014).

Table 2: Children by combination of welfare indicators, national figures (%) and percentage point change

Water	Sanitation	Shelter	Education	Information	2006	2013	Change
0	0	0	0	0	0.31	0.16	-0.16
0	0	0	0	1	1.62	0.23	-1.39
0	0	0	1	0	0.58	0.44	-0.14
0	0	0	1	1	3.04	1.47	-1.57
0	0	1	0	0	0.58	0.44	-0.14
0	0	1	0	1	2.44	0.77	-1.66
0	0	1	1	0	1.91	1.74	-0.17
0	0	1	1	1	9.2	5.82	-3.38
0	1	0	0	0	0.02	0.03	0.02
0	1	0	0	1	0.12	0.01	-0.11
0	1	0	1	0	0.06	0.16	0.10
0	1	0	1	1	0.17	0.49	0.32
0	1	1	0	0	0.05	0.04	-0.02
0	1	1	0	1	0.23	0.12	-0.11
0	1	1	1	0	0.87	0.72	-0.15
0	1	1	1	1	2.70	2.46	-0.24
1	0	0	0	0	0.74	0.36	-0.38
1	0	0	0	1	1.55	0.31	-1.24
1	0	0	1	0	1.22	1.12	-0.10
1	0	0	1	1	3.40	1.90	-1.50
1	0	1	0	0	1.74	0.57	-1.17
1	0	1	0	1	4.15	1.05	-3.10
1	0	1	1	0	5.37	6.08	0.710
1	0	1	1	1	20.72	22.84	2.110
1	1	0	0	0	0.20	0.05	-0.16
1	1	0	0	1	0.11	0.02	-0.09
1	1	0	1	0	0.32	0.79	0.47
1	1	0	1	1	0.61	1.32	0.71
1	1	1	0	0	0.44	0.14	-0.30
1	1	1	0	1	1.49	0.58	-0.92
1	1	1	1	0	5.04	6.15	1.11
1	1	1	1	1	29.01	41.65	12.64

Source: Authors' calculation based on GLSS5 (GSS 2007) and GLSS6 (GSS 2014).

Table 3: Children by number of deprivations in welfare indicators (%), and percentage point change

Area		0	1	2	3	4	5
National	2006	29.0	30.6	24.3	12.3	3.5	0.3
	2013	41.7	33.3	17.1	6.2	1.5	0.2
	Change	12.6	2.8	-7.1	-6.1	-2.0	-0.2
Rural	2006	14.4	29.9	32.3	17.6	5.4	0.5
	2013	23.4	36.0	26.7	10.8	2.8	0.3
	Change	9.0	6.2	-5.6	-6.8	-2.6	-0.2
Urban	2006	56.1	31.8	9.4	2.5	0.1	0.1
	2013	61.5	30.4	6.8	1.2	0.1	0.0
	Change	5.3	-1.4	-2.6	-1.3	0.0	-0.1
Coastal	2006	41.3	31.5	18.6	7.2	1.4	0.0
	2013	54.0	33.2	10.0	2.4	0.4	0.0
	Change	12.8	1.7	-8.6	-4.9	-1.0	0.0
Forest	2006	30.3	32.9	23.3	10.3	3.0	0.2
	2013	42.7	32.7	17.1	6.0	1.4	0.2
	Change	12.4	-0.2	-6.3	-4.2	-1.6	-0.1
Savannah	2006	7.1	23.6	35.2	25.0	8.1	1.0
	2013	15.0	35.4	30.9	14.3	4.1	0.4
	Change	7.8	11.8	-4.3	-10.7	-4.1	-0.5
Western	2006	29.0	35.7	20.9	10.9	3.5	0.1
	2013	48.9	36.3	11.7	2.8	0.3	0.0
	Change	19.9	0.6	-9.2	-8.1	-3.2	-0.1
Central	2006	27.2	36.0	26.2	10.3	0.4	0.0
	2013	36.2	40.2	18.2	4.4	1.0	0.0
	Change	9.0	4.3	-8.0	-5.9	0.6	0.0
Greater Accra	2006	62.1	24.7	11.2	1.8	0.2	0.0
	2013	69.4	26.4	3.4	0.7	0.0	0.0
	Change	7.3	1.7	-7.7	-1.1	-0.2	0.0
Volta	2006	19.6	26.4	30.5	18.7	4.2	0.7
	2013	25.6	32.2	24.8	13.0	3.8	0.6
	Change	6.0	5.8	-5.7	-5.7	-0.4	-0.1
Eastern	2006	27.2	31.6	25.4	11.3	4.4	0.2
	2013	36.6	37.5	18.0	6.5	1.3	0.1
	Change	9.5	5.9	-7.4	-4.9	-3.1	-0.1
Ashanti	2006	42.9	34.9	16.1	5.4	0.6	0.0
	2013	55.8	30.2	11.6	2.3	0.2	0.0
	Change	12.9	-4.8	-4.5	-3.1	-0.5	0.0
Brong Ahafo	2006	20.8	36.5	27.5	10.7	4.2	0.3
	2013	37.9	33.3	20.1	6.9	1.7	0.2
	Change	17.1	-3.2	-7.4	-3.8	-2.5	-0.1
Northern	2006	7.9	22.2	33.9	25.5	9.0	1.4
	2013	19.6	29.5	30.2	14.9	5.1	0.7
	Change	11.7	7.3	-3.7	-10.6	-3.9	-0.8
Upper East	2006	7.0	21.4	39.2	25.9	6.3	0.2
	2013	7.4	46.5	32.5	11.5	1.9	0.1
	Change	0.4	25.1	-6.7	-14.3	-4.4	-0.2
Upper West	2006	4.8	30.9	34.0	22.2	7.8	0.3
	2013	10.4	39.2	30.9	15.8	3.6	0.0
	Change	5.5	8.4	-3.1	-6.4	-4.2	-0.3

Source: Authors' calculation based on GLSS5 (GSS 2007) and GLSS6 (GSS 2014).

Table 4: Temporal FOD comparisons between 2006 and 2013 (probabilities)

		Bootstrap			
		2013 FOD		2006 FOD	
	Static case	2006	Undecided	2013	Total
National	1.00	0.41	0.59		1.00
Rural			1.00		1.00
Urban		0.01	0.99		1.00
Coastal	1.00	0.25	0.75		1.00
Forest		0.10	0.90		1.00
Savannah		0.01	0.99		1.00
Ashanti		0.01	0.99		1.00
Brong Ahafo		0.03	0.97		1.00
Central			1,00		1.00
Eastern	1.00	0.18	0.82		1.00
Greater Accra			1.00		1.00
Northern		0.05	0.95		1.00
Upper East			1.00		1.00
Upper West			1,00		1.00
Volta			1.00		1.00
Western		0.11	0.89		1.00

Source: Authors' calculation based on GLSS5 (GSS 2007) and GLSS6 (GSS 2014).

Table 5: Bootstrap spatial FOD comparisons in 2006

Area	NAT	RA	UA	CZ	FZ	SZ	AR	BAR	CR	ER	GAR	NR	UER	UWR	VR	WR	RAV
NAT		**1.00**				**0.86**						**0.63**			0.01		0.17
RA												0.1					0.01
UA	**1.00**	**1.00**		0.12	**0.99**	**1.00**	0.02	**0.95**	0.01	0.19		**1.00**	**0.81**		**0.78**	0.12	0.53
CZ	**0.93**	**1.00**			**0.44**	**0.98**		0.08		0.09		**0.99**	0.25		**0.67**	0.04	0.36
FZ		**0.94**				**0.50**				**0.01**		**0.58**	0.01		0.08		0.14
SZ																	0.00
AR	**0.48**	**0.92**			**0.55**	**0.98**		**0.66**		0.08		**0.95**	0.70		0.22	0.01	0.37
BAR		0.04				**0.33**						0.29					0.04
CR		0.39				**0.51**		0.01		0.01		**0.48**	0.11		**0.26**		0.12
ER		0.02										0.13			0.06		0.01
GAR	**1.00**	**1.00**		0.06	**0.80**	**1.00**	0.02	**0.93**		0.25		**1.00**	**0.97**		**0.82**	0.10	0.53
NR																	0.00
UER																	0.00
UWR																	0.00
VR												0.01					0.00
WR		**0.30**				0.10						**0.51**			**0.20**		0.07
CAV	0.23	0.44	0.00	0.01	0.19	0.42	0.00	0.18	0.00	0.04	0.00	0.44	0.19	0.00	0.21	0.02	0.15
ND	-0.06	-0.43	0.53	0.35	-0.04	-0.42	0.37	-0.13	0.12	-0.03	0.53	-0.44	-0.19	0.00	-0.21	0.06	

RAV = Row Average dominance, CAV = Column Average dominance, ND = Net Dominance (RAV-CAV), NAT = National, RA = Rural area, UA = Urban area, CZ = Coastal zone, FZ = Forest zone, SZ = Savannah zone, AR = Ashanti region, BAR = Brong Ahafo region, CR = Central region, ER = Eastern region, GAR = Greater Accra region, NR = Northern region, UER = Upper East region, UWR = Upper West region, VR = Volta region, WR = Western region

Note: Bold values indicate domination in the static case.

Source: Authors' calculation based on GLSS5 (GSS 2007).

Table 6: Bootstrap spatial FOD comparisons in 2013

Area	NAT	RA	UA	CZ	FZ	SV	AR	BAR	CR	ER	GAR	NR	UER	UWR	VR	WR	RAV
NAT		**1.00**				0.05						0.16			**0.50**		0.11
RA																	0.00
UA	**1.00**	**1.00**		0.05	**1.00**	**1.00**		**0.90**	0.16	0.23		**1.00**	**0.92**	**0.50**	**1.00**		0.58
CZ	**1.00**	**1.00**			**0.96**	**0.71**		**0.74**	0.01	0.25		**0.69**	**0.43**		**0.98**		0.45
FZ		**0.99**										0.03			0.78		0.12
SZ																	0.00
AR	**0.89**	1.00			**0.98**	**0.63**		**0.91**		**0.33**		**0.55**	**0.75**		**0.95**		0.47
BAR		**0.35**				0.02						0.01			0.26		0.04
CR		**0.69**				0.07		0.01		0.01		0.11			**0.66**		0.10
ER		0.19													0.27		0.03
GAR	**1.00**	**1.00**		**0.52**	**1.00**	**1.00**	0.21	**1.00**		**0.78**		**1.00**	**1.00**	**0.79**	**1.00**	0.15	0.70
NR																	0.00
UER																	0.00
UWR																	0.00
VR																	0.00
WR	**0.47**	**0.98**			**0.54**	**0.70**		**0.44**		0.21		**0.72**	0.03		**0.96**		0.34
CAV	0.29	0.55	0.00	0.04	0.30	0.28	0.01	0.27	0.01	0.12	0.00	0.28	0.21	0.09	0.49	0.01	0.18
ND	-0.18	-0.55	0.58	0.41	-0.18	-0.28	0.45	-0.22	0.09	-0.09	0.70	-0.28	-0.21	-0.09	-0.49	0.33	

RAV = Row Average dominance, CAV = Column Average dominance, ND = Net Dominance (RAV-CAV), NAT = National, RA = Rural area, UA = Urban area, CZ = Coastal zone, FZ = Forest zone, SZ = Savannah zone, AR = Ashanti region, BAR = Brong Ahafo region, CR = Central region, ER = Eastern region, GAR = Greater Accra region, NR = Northern region, UER = Upper East region, UWR = Upper West region, VR = Volta region, WR = Western region

Note: Bold values indicate domination in the static case.

Source: Authors' calculation based on GLSS6 (GSS 2014).

Table 7: ND (probabilities) and rankings of deprivation child poverty across regions over time

	2006		2013		2006-2013
Regions	ND	Rank1	ND	Rank2	Differ
Greater Accra	0.53	1	0.7	1	0
Ashanti	0.37	2	0.45	2	0
Western	0.06	4	0.33	3	1
Central	0.12	3	0.09	4	-1
Eastern	-0.03	6	-0.09	5	1
Upper West	0	5	-0.09	5	0
Upper East	-0.19	8	-0.21	7	1
Brong Ahafo	-0.13	7	-0.22	8	-1
Northern	-0.44	10	-0.28	9	1
Volta	-0.21	9	-0.49	10	-1

Source: Authors' calculation based on GLSS5 (GSS 2007) and GLSS6 (GSS 2014).

Table 8: Incidence and rankings of child income poverty, and consumption expenditure poverty across the ten regions

Regions	2006					2013				
	CIP (%)	Ranks (R1)	CEP (%)	Ranks (R2)	Differ1 R1-R2	CIP (%)	Ranks (R3)	CEP (%)	Ranks (R4)	Differ2 R3-R4
Western	20.0	2	22.6	3	-1	16.0	1	20.9	4	-3
Central	32.0	5	23.4	4	1	33.0	7	18.8	3	4
Greater Accra	11.0	1	13.5	1	0	18.0	2	5.6	1	1
Volta	38.0	6	37.3	7	-1	23.0	6	33.8	7	-1
Eastern	29.0	3	17.8	2	1	19.0	3	21.7	5	-2
Ashanti	30.0	4	24.0	5	-1	20.0	4	14.8	2	2
Brong Ahafo	39.0	7	34.0	6	1	21.0	5	27.9	6	-1
Northern	41.0	8	55.7	8	0	42.0	8	50.4	9	-1
Upper East	70.0	10	72.9	9	1	54.0	10	44.4	8	2
Upper West	62.0	9	89.1	10	-1	53.0	9	70.7	10	-1

CIP = Child Income Poverty; CEP= Consumption Expenditure Poverty.

Differ1= Differences in rankings in 2006.

Differ2= Differences in ranking in 2013.

Source: Authors' and GSS calculation from GLSS5 (GSS 2007) and GLSS6 (GSS 2014).

Table 9: Comparison of rankings of child deprivation poverty, child income poverty, and consumption expenditure poverty in 2006

Regions	Ranks of child deprivation Poverty (R1) (2006)	Ranks of child income poverty (R2)(2006)	Differ1 R1-R2	Ranks of consumption expenditure poverty (R3)(2006)	Differ2 R1-R3
Western	4	2	2	3	1
Central	3	4	-1	4	-1
Greater Accra	1	1	0	1	0
Volta	9	6	3	7	2
Eastern	6	3	3	2	4
Ashanti	2	4	-2	5	-3
Brong Ahafo	7	7	0	6	1
Northern	10	8	2	8	2
Upper East	8	10	-2	9	-1
Upper West	5	9	-4	10	-5

Source: Authors' derivation from GLSS5 (GSS 2007).

Table 10: Comparison of rankings of child deprivation poverty, child income poverty, and consumption expenditure poverty in 2013

Regions	Ranks of child deprivation poverty in 2013 (R1)	Ranks of child income poverty 2013 (R2)	Differ1 R1-R2	Ranks of consumption expenditure poverty in 2013(R3)	Differ2 R1-R3
Western	3	1	2	4	-1
Central	4	7	-3	3	1
Greater Accra	1	2	-1	1	0
Volta	10	6	4	7	3
Eastern	5	3	2	5	0
Ashanti	2	4	-2	2	0
Brong Ahafo	8	5	3	6	2
Northern	9	8	1	9	0
Upper East	7	10	-3	8	-1
Upper West	5	9	-4	10	-5

Source: Authors' derivation from GLSS6 (GSS 2014).

Appendices

Appendix A: Static comparisons in 2006

Area	NAT	RA	UA	CZ	FZ	SZ	AR	BAR	CR	ER	GAR	NR	UER	UWR	VR	WR	RAV
NAT		1				1						1					0.2
RA																	0.00
UA	1	1			1	1		1				1	1		1		0.53
CZ	1	1			1	1						1	1		1		0.47
FZ		1				1						1					0.20
SZ																	0.00
AR	1	1			1	1		1				1	1				0.47
BAR						1											0.07
CR						1						1			1		0.20
ER																	0.00
GAR	1	1			1	1		1				1	1		1		0.53
NR																	0.00
UER																	0.00
UWR																	0.00
VR																	0.00
WR		1										1			1		0.20
CAV	0.27	0.47	0.00	0.00	0.27	0.53	0.00	0.20	0.00	0.00	0.00	0.53	0.27	0.00	0.33	0.00	0.18

Source: Authors' calculation from GLSS5 (GSS 2007).

Appendix B: Static spatial FOD comparisons in 2013

Area	NAT	RA	UB	CZ	FZ	SZ	AR	BAR	CR	ER	GAR	NR	UER	UWR	VR	WR	RAV
NAT		1													1		0.13
RA																	0.00
UA	1	1			1	1		1				1	1	1	1		0.60
CZ	1	1			1	1		1				1	1		1		0.53
FZ		1													1		0.13
SZ																	0.00
AR	1	1			1	1		1		1		1	1		1		0.60
BAR		1															0.07
CR		1													1		0.13
ER																	0.00
GAR	1	1		1	1	1		1		1		1	1	1	1		0.73
NR																	0.00
UER																	0.00
UWR																	0.00
VR																	0.00
WR		1			1	1		1				1			1		0.40
CAV	0.27	0.60	0.00	0.07	0.33	0.33	0.00	0.33	0.00	0.13	0.00	0.33	0.27	0.13	0.53	0.00	0.21

Source: Authors' calculation from GLSS6 (GSS 2014).