Growth and Poverty in Sub-Saharan Africa

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Spatial and Temporal Multidimensional Poverty in Nigeria

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10.1 Introduction

Nigeria, no doubt, typifies a country that has had rapid economic growth but worsening poverty. The economy grew strongly at an average annual rate in excess of 6 per cent over the last decade, even during the global financial crisis (IMF 2013), ranking Nigeria as one of the fastest growing economies globally. In spite of this strong growth performance, the poverty incidence has remained high, rising from 42.7 per cent in 1992 to 65.6 per cent in 1996, with an all-time high of 69 per cent in 2010, according to data from the National Bureau of Statistics (NBS 2012). Furthermore, the benefit of growth has not been equitably shared as the Gini coefficient, a standard measure of income inequality increased from 0.42 per cent in 2004 to 0.45 per cent in 2010. Therefore, the theoretical arguments and empirical evidence from the literature that associate faster economic growth with poverty reduction seem to be failing in the Nigerian context. Not surprisingly, major issues in policy debates include how to proffer explanations and reconcile this paradoxical trend, and the need to investigate the key mechanisms through which growth can be translated into sustainable poverty reduction. This, no doubt, would require adequate measurement of poverty, an issue to which researchers and policymakers have given much prominence in recent years.

This chapter seeks to contribute to the debate by estimating non-monetary multidimensional poverty in Nigeria, across time and space within Nigeria's six geopolitical zones and the rural and urban sector. Using the first-order dominance (FOD) method recently developed by Arndt et al. (2012), we are able to compare these subpopulations using multiple-ordinal, discrete measures of poverty without imposing weighting schemes or making assumptions

about the preferences for each indicator. The FOD method allows multidimensional welfare comparisons based on the simple criterion that it is better to be non-deprived than deprived in any indicator. Furthermore, while the welfare indicators are ordinal in nature, the application of bootstrap sampling produces probabilities of one population performing better than another, which enables population ranking across time and space.

This chapter makes a distinct contribution to the literature. This is the first application of the FOD methodology to non-monetary multidimensional poverty in Nigeria. Moreover, few studies exist on multidimensional poverty in Nigeria. It complements earlier studies by Oyekale et al. (2009) which used the fuzzy set approach to assess the poverty profile of rural households in Nigeria based on the 2006 Core Welfare Indicator Survey data and Adetola and Olufemi (2012), which employed the Alkire and Foster (2007) counting approach to examine child poverty in rural Nigeria using the 2008 Demographic and Health Survey (DHS) data.

The remainder of the chapter is structured as follows. Section 10.2 reviews the poverty and poverty situation in Nigeria, drawing on available data from the DHS, while section 10.3 presents the methodology. The results are presented in section 10.4, and section 10.5 concludes.

10.2 Situation Analysis of Growth, Poverty, and Inequality in Nigeria

10.2.1 *Economic Growth*

Nigeria is the most populous country in Africa with a population of 168.8 million in 2012, distributed as 50.9 per cent urban and 49.1 per cent rural (*World Statistics Pocketbook* 2014). The country comprises of thirty-six states and the Federal Capital Territory, Abuja. The thirty-six states have been classified into six geopolitical zones based on a number of criteria, including location, cultures, ethnic composition, and common history.[1]

The depth and persistence of Nigeria's economic failure is well recognized. After a brief spurt of growth in the 1960s, the concurrence of political instability, an inert economic structure, and chronic levels of poverty despite huge hydrocarbon reserves have been a recurrent theme. Economic stagnation, declining welfare, and social instability have undermined development

[1] These zones are: *South East* = Anambra, Enugu, Ebonyi, Imo, and Abia states; *South South* = Edo, Delta, Rivers, Bayelsa, Cross-River, and Akwa-Ibom states; *South West* = Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti states; *North Central* = Kwara, Kogi, Plateau, Nassarawa, Benue, Niger, and FCT; *North East* = Taraba, Adamawa, Borno, Yobe, Bauchi, and Gombe states; *North West* = Sokoto, Zamfara, Kebbi, Kaduna, Katsina, Kano, and Jigawa states.

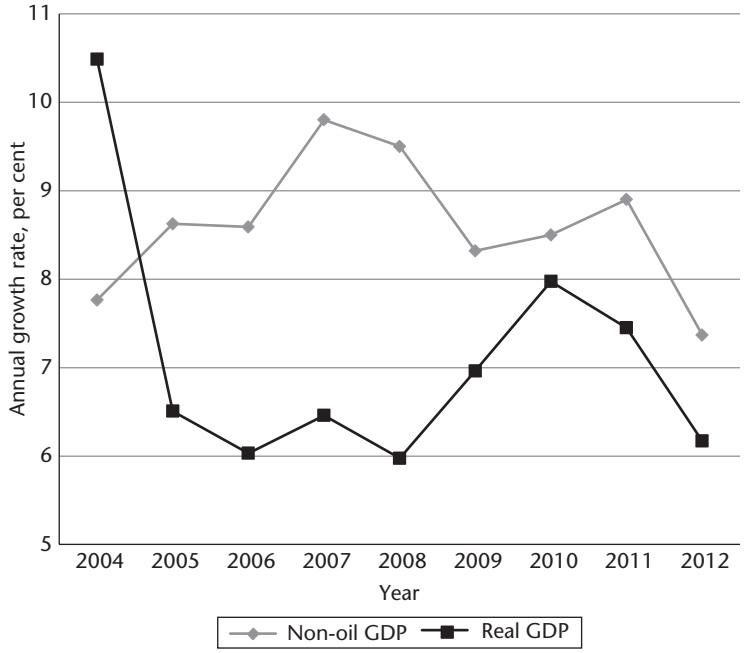

Figure 10.1. Nigeria's real GDP growth rate, 2004–12
Source: Underlying data based on Central Bank of Nigeria (2012)

for most of the post-independence period despite generating about US$500 billion as oil revenues in the past three decades (Ajakaiye and Jerome 2011).

Over the last ten years, Nigeria has attempted to turn the corner, implementing an ambitious reform agenda. Sound macroeconomic policies combined with structural reforms, aimed at increasing the supply responsiveness of the economy, ushered in sustained high growth averaging 7.6 per cent over the last decade and one of the highest in Africa (see Figure 10.1).[2] The performance of the economy continues to be underpinned by favourable improvements in the non-oil sector, with recently rebased real GDP growth of 5.3 per cent, 4.2 per cent, and 5.5 per cent in 2011, 2012, and 2013, respectively.

The profile of the Nigerian economy must consider the differential roles of the oil and non-oil sectors. The oil sector is the major export earner for the country as well as the largest revenue-earning sector for government. Figures 10.1 and 10.2 indicate that growth in the oil sector has been lagging behind growth in the non-oil sector in recent years. The drop in crude-oil

[2] The rebasing of Nigeria's GDP in April 2014, to better reflect the structure of the economy, saw it surge after South Africa to become Africa's largest economy with a revised GDP estimate of US$454 billion in 2012 and US$510 billion in 2013 (compared with the US$259 billion and US$270 billion that were previously reported), confirming Nigeria's lead as the continent's largest economy.

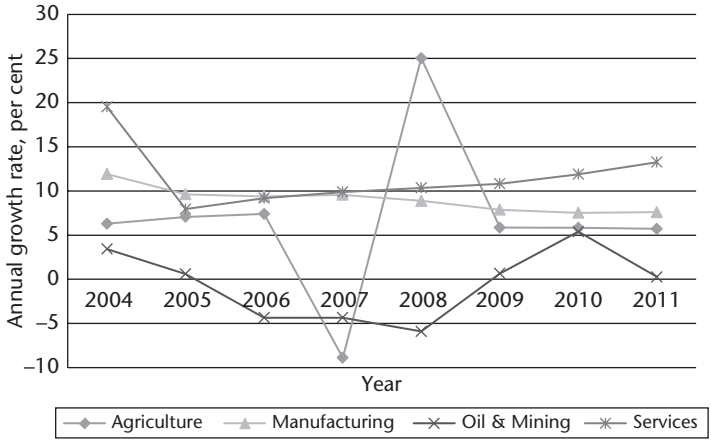

Figure 10.2. Nigeria's real sectoral GDP growth rates, 2004–11
Source: Underlying data based on Central Bank of Nigeria (2012) *Statistical Bulletin*

production was a result of large-scale oil theft[3] and other operational constraints experienced by some of the oil-producing companies. Within the non-oil sector, agriculture and services, especially the communication sector, are the main growth drivers. Agriculture has maintained its dominant role in the Nigerian economy, though it is still essentially rain-fed, while farmers have suffered tremendous crop failure as a result of climate variability.

While data on the geographic distribution of growth in Nigeria are still scanty, it does seem that growth has a very high geographic concentration and varies remarkably at the subnational level as the World Bank (2013) rightly observes. Lagos state, for example, which accounts for about 35 per cent of the national GDP, is experiencing exceptionally rapid growth, which enabled it to reduce its poverty headcount from an estimated 44 per cent of the population to 23 per cent between 2004 and 2010.

10.2.2 *Poverty*

Poverty is widespread in Nigeria no matter the method used in computing it, and the incidence has been on the rise over the last ten years.[4] Using food

[3] A recent study by Katsouris and Sayne (2013) estimated that an average of 100,000 barrels per day was stolen in the first quarter of 2013.

[4] The NBS periodically conducts the Harmonized Nigeria Living Standard Survey (HNLSS), which is used, among other things, to determine poverty and inequality trends in the country. The HNLSS uses four different approaches in the computation of poverty indicators: *relative poverty*, which is defined by reference to the living standards of the majority in a given society and separates the poor from the non-poor; *absolute poverty*, which reflects the minimal requirements necessary to afford minimal standards of food, clothing, health care, and shelter; the *basic needs approach*, which measures the proportion of those living on the less than US$1 per day poverty line; and *subjective*

Table 10.1. Incidence of poverty by sector and zones, 1980–2010, per cent

Levels	1980	1985	1992	1996	2004	2010
National	27.2	46.3	42.7	65.6	54.4	69.0
Urban	17.2	37.8	37.5	58.2	43.2	61.8
Rural	28.3	51.4	46.0	69.3	63.3	73.2
Geopolitical zones						
North Central	32.2	50.8	46.0	64.7	67.0	67.5
North East	35.6	54.9	54.0	70.1	72.2	76.3
North West	37.7	52.1	36.5	77.2	71.2	77.7
South East	12.9	30.4	41.0	53.5	26.7	67.0
South South	13.2	45.7	40.8	58.2	35.1	63.8
South West	13.4	38.6	43.1	60.9	43.0	59.1

Source: NBS (2009, 2012)

energy intake to measure poverty, the 2010 Nigeria Poverty Profile Report reveals that poverty incidence rose from 27.2 per cent in 1980 to 69.0 per cent in 2010 (NBS 2012).[5] Urban poverty has been consistently lower than rural poverty; hence while 61.8 per cent of urban residents were considered poor in 2010, more than 73 per cent of rural dwellers fell into the same category (Table 10.1).

Poverty also appears to be more prevalent in the northern part of the country with the highest rates hovering between the North East and North West zones. The high poverty rate had even become more pronounced by 2010 as virtually all the zones of the country had over 60 per cent poverty incidence (see Table 10.1).

A recent assessment by the World Bank using the NBS General Household Surveys (GHS) for 2010/2011 and 2012/2013 estimated the national poverty rate at 35.2 per cent and 33.1 per cent respectively, which are significantly lower than earlier NBS estimates using the HNLSS. The new GHS analysis also estimated rural poverty at 46.3 per cent and 44.9 per cent in 2010/2011 and 2012/2013 respectively compared to 69 per cent in the HNLSS 2009/2010 estimates by the NBS. The new living standards estimates also imply an even stronger divide between the North and South in Nigeria than do previous figures, with the North experiencing significantly higher poverty. In addition, a large number of Nigerians are clustered around the poverty line, implying a high degree of vulnerability for a large part of the population (World Bank 2014a).

In addition to poverty incidence, income inequality has been consistently high in the country although with some reduction in 1992 and 2004 (NBS

poverty, which is based on opinions from respondents on whether or not they consider themselves poor.

[5] Concerns have been expressed about the comparability of surveys through time. The figures presented in Tables 10.1, 10.2, and 10.3 should be interpreted with this in mind.

Table 10.2. Inequality trend by area of residence and zones, 1980–2010

Levels	1985	1992	1996	2004	2010
National	0.43	0.41	0.49	0.42	0.45
Urban	0.49	0.38	0.52	0.41	0.43
Rural	0.36	0.42	0.47	0.42	0.44
Geopolitical zones					
North Central	0.41	0.39	0.50	0.44	0.42
North East	0.39	0.40	0.49	0.41	0.45
North West	0.41	0.43	0.47	0.40	0.41
South East	0.44	0.40	0.39	0.38	0.44
South South	0.48	0.39	0.46	0.39	0.43
South West	0.43	0.40	0.47	0.41	0.41

Source: NBS (2009, 2012)

Table 10.3. Income shares distribution, 1986–2010

Year	Income share held by the rich		Income share held by the poor	
	10%	20%	10%	20%
1986	28.2	45.0	2.5	6.0
1992	31.5	49.4	1.4	4.0
1996	37.1	52.1	1.9	5.0
2004	29.9	46.1	2.2	5.6
2010	32.8	48.9	2.2	5.4

Source: WORLD Bank (2014b)

2012). Using the Gini coefficient, income inequality in the country increased between 1985 and 2010. Although national income inequality fell between 1985 and 1992, it rose in 1996, declined in 2004, and rose again in 2010 (Table 10.2). With the exception of 1985 and 1996, inequality has been higher in the rural areas relative to the urban areas, which is probably accounted for by the structure of employment and income in the rural areas. The agricultural sector has consistently been neglected until recently due to the dominance of the oil sector in the economy. Faced with the inability to invest in skills acquisitions like those in the urban areas, the predominantly rural population has become more vulnerable to poverty. Considering zones, in 2010 income inequalities were highest in the North East and lowest in the North West and South West.

Income inequality is further demonstrated in the share of income held by the top richest and the bottom poorest in the country. As revealed in Table 10.3, there is a very high disparity between the income of the richest and poorest deciles of the population. The income share of the richest 10 and 20 per cent increased from 28 and 45 per cent respectively in 1986 to 37 and 52 per cent in 1996, declined to 32 and 49 per cent in 2004, and then jumped to 38 and 54 per cent in 2010. This clearly defines Nigeria's paradoxical status

as a rich country with poor people; a country whose richest 20 per cent controlled 54.01 per cent of income in 2010 while most of the remaining 80 per cent were poor and struggled to live. A more equal distribution of Nigeria's income would assist greatly in curbing the increases in poverty rate.

10.3 Methodology

10.3.1 *Approach*

There is widespread agreement that poverty is a complex phenomenon with multidimensional properties and effects (Sen 1973). Thus, there has been a shift from the conventional one-dimensional approaches to measuring poverty, inequality, and welfare, using monetary values such as household income or expenditure per capita, to a multidimensional concept where both monetary and non-monetary measures of deprivation are integrated or applied independently.

More advanced approaches have evolved over time to assess living standards and make comparisons within a multidimensional framework since the pioneering efforts of Tsui (2002) and Bourguignon and Chakravarty (2003). The challenge, however, has been to empirically define and aggregate relevant attributes, as well as determine the minimum thresholds that can capture differences in levels of deprivation rather than choices and tastes (Layte et al. 2001).

Some approaches that have been adopted to handle the aggregation problem[6] are axiomatic and extensions of unidimensional poverty indices (Tsui 2002; Atkinson 2003; Bourguignon and Chakravarty 2003). Other non-axiomatic approaches in the literature include the fuzzy set approach (Cerioli and Zani 1990; Cheli and Lemmi 1994; Chiappero-Martinetti 2006), the distance function method (Lovell et al. 1994; Anderson et al. 2005), the information theory approach (Maasoumi 1993; Deutsch and Silber 2005; Maasoumi and Lugo 2008), the inertia approach and factor analysis (Klasen 2000; Sahn and Stifel 2003), and methods from the psychometric literature (Wagle 2005; Di Tommaso 2007; Krishnakumar and Ballon 2008).

Batana and Duclos (2008) draw attention to the concern that the arbitrary nature of assumptions involved in choosing poverty thresholds and in aggregating across welfare dimensions and individuals may diminish the robustness of results. The multidimensional dominance approach provides a methodology that is robust to each of these choices.

[6] See Batana (2008) for a good overview and summary of the different applications.

As noted elsewhere in this volume, the FOD approach does not impose a weighting scheme or ad hoc simplifying assumptions on the social welfare function. No assumptions are made about preferences for one indicator over another. The only criterion the method imposes is that it is better to be non-deprived than deprived in any indicator (Sonne-Schmidt et al. 2008; Arndt et al. 2012). This is the approach adopted in this study to investigate multidimensional poverty in Nigeria over time and space.

The FOD approach is a simple form of stochastic ordering applied in decision situations characterized by a probability distribution over possible binary outcomes. The approach describes the criterion in which one distribution can be ranked unambiguously 'better' than another, allowing us to make welfare comparisons between two populations on the basis of a series of discrete, ordinal welfare indicators without imposing arbitary weighting schemes or conditions on the social welfare function (Arndt et al. 2012).

This approach is well established in the theory of one-dimensional[7] and multidimensional FOD.[8] It allows for comparison between populations over time, on the basis of a series of binary ordinal welfare indicators. Therefore, the binary variables were created for each indicator, where '1' is the good outcome (non-deprived) and '0' is the bad outcome (deprived). Therefore, the outcome (0,0,0,0,0) indicates deprivation in all indicators of well-being while the outcome (1,1,1,1,1) means non-deprivation in all of the dimensions.

FOD is operationalized through the principles of the linear programming. To ameliorate the lack of information inherent in indeterminate outcomes of dominance, a bootstrapping approach is applied. In comparing repeated bootstrap samples, the empirical probability of domination provides an estimate of the extent to which one population dominates another. Furthermore, the probability of net domination (the probability a population dominates all other populations minus the probability that a population is dominated by all other populations) can be interpreted as a measure of welfare, which provides the basis to rank populations. Bootstrapping is a computational non-parametric technique for resampling and enables conclusions to be drawn based on the characteristics of the population. We ran the bootstrap analysis with 100 replications.

The analysis captured both spatial and temporal welfare domination for geopolitical zones and rural/urban sectors. Temporal FOD analysis measures domination of one time period over another in the same

[7] See Østerdal (2010) and Arndt et al. (2012) for detailed discussion.

[8] See Lehmann (1955), Strassen (1965), Levhari et al. (1975), Grant (1995) (cross reference from Arndt et al. 2012).

population. We define three possibilities of temporal domination for each population (states, geopolitical zones, and rural/urban sectors) as follows:

0: neither t+s FOD t nor t FOD t+s
1: t+s FOD t
-1: t FOD t+s

where t is a year such as 1999 and s is greater than or equal to one. These possible outcomes are averaged over all bootstrap iterations.

10.3.2 *Data Sources*

The study utilized the Nigeria Demographic Health Surveys (DHS) of 1999, 2003, and 2008 for the analysis. The 1999, 2003, and 2008 DHS are nationally representative surveys covering both urban and rural households. The surveys follow a stratified cluster sampling design. Details of the research design can be found in the final reports (NPC and ORC Macro 1999, 2004, and NPC and ICF Macro 2009). As indicated in the surveys, 7,647, 7,225, and 34,070 households were surveyed in 1999, 2003, and 2008, respectively. Due to the removal of missing values, 7,354, 7,121, and 32,896 households in 1999, 2003, and 2008 were utilized for the analysis.

10.3.3 *Choice of Welfare Indicators*

Poverty can be reflected in various broad dimensions. The welfare indicators used in this study are education, water, sanitation, shelter, and energy. All are binary variables (1: not deprived 0: deprived). The indicators are defined as follows:

Water: a household is not deprived if the household's water source is piped water, well water, or rainwater.
Sanitation: a household is not deprived if the household uses a flush toilet, an improved, ventilated pit latrine, or a composting toilet.
Access to electricity: a household is not deprived if the household has access to electricity.
Shelter: a household is not deprived if the household has flooring made of a material other than dirt, sand, or dung.
Education: a household is not deprived if any household member has completed three or more years of schooling at the primary level or above.

10.4 Results and Discussion

The analyses were conducted at the national, zonal, and sectoral (rural and urban) levels. Five binary indicators were selected, as mentioned in section

10.3.3, and the number of possible welfare combinations is 2^5=32, giving us 32 comparator subgroups. The national, zonal, and sectoral results are based on the 1999, 2003, and 2008 DHS datasets.[9]

10.4.1 *Households According to Welfare Indicators*

Table 10.4 presents the proportion of Nigerian households that are not deprived by the five different welfare indicators at national, zonal, and sectoral levels based on the 1999, 2003, and 2008 DHS datasets. Nationally, the table indicates a positive change in welfare indicators between 1999 and 2008 with the exception of education, which had a small negative change. However, the proportion of Nigerian households that had access to electricity declined from 51 per cent in 2003 to 48 per cent in 2008 and a similar decrease can be observed for shelter (64 per cent in 2003 and 62 per cent in 2008).

The change in deprivation levels from 1999 to 2008 varies across welfare indicators and areas. Both the urban and rural sectors experienced deterioration in two indicators between 1999 and 2008—water and electricity for urban populations and shelter and education for rural areas. The North Central zone performed the worst with negative changes in all welfare indicators except sanitation.

10.4.2 *Share of Households in Multidimensional Welfare Combinations*

Table 10.5 shows the percentage share of Nigerian households by the combination of welfare indicators for the nation, zones, and sectors from the 1999, 2003, and 2008 DHS surveys. The number of deprivations in the welfare indicators range from 0 to 5 where 0 signifies zero deprivation (a case of non-deprivation in any indicator (1,1,1,1,1)) and 5 implies acute deprivation (deprivation in all welfare indicators (0,0,0,0,0)). Between the two extremes are the various combinations of welfare indicators. However, our discussion will only consider the two extremes, i.e. acute deprivation and zero deprivation.

Nationally, the share of households experiencing acute deprivation (deprived in all indicators) was 3.3 per cent in 1999. It declined to 2.4 per cent in 2003, but increased to 3.1 per cent in 2008, although it remained below the 1999 level. Substantial improvement can be observed in the percentage of households with no deprivation (zero), with a 5.5 percentage point improvement from 13.4 to 18.9 per cent over the ten-year period. In the urban sector, only 0.4 per cent of households experienced acute deprivation in 2008 compared to 4.4 per cent in the rural sector. The share of rural households not

[9] Population weights are used throughout the analysis.

Table 10.4. Proportion of households not deprived, by welfare indicator and year

	Water			Sanitation			Electricity			Shelter			Education		
	1999	2003	2008	1999	2003	2008	1999	2003	2008	1999	2003	2008	1999	2003	2008
National	68.9	70.0	73.5	18.6	15.8	40.2	44.6	51.1	47.8	61.3	64.4	61.8	79.6	78.4	79.1
Rural	59.9	64.9	68.1	9.6	7.4	30.2	28.0	34.5	29.8	50.3	52.6	48.5	74.9	73.1	72.4
Urban	90.9	80.0	84.7	40.7	32.5	60.6	85.3	83.9	84.6	88.1	87.6	88.9	90.9	88.9	92.9
NC	66.3	50.7	60.5	18.6	10.1	32.6	50.9	47.2	32.3	73.9	69.3	62.4	86.5	88.3	84.9
NE	76.7	68.8	71.9	10.7	5.6	25.3	23.1	34.4	24.7	32.5	39.4	30.8	60.1	62.1	57.9
NW	89.6	84.3	87.5	8.1	5.8	48.4	30.7	45.0	38.3	43.0	56.1	39.1	52.9	61.4	59.4
SE	44.5	73.7	70.8	18.6	37.1	44.2	44.0	66.0	64.4	76.7	85.4	84.4	95.8	96.2	95.8
SS	47.0	59.6	67.1	21.2	28.3	35.3	48.4	55.9	56.9	67.5	76.0	79.5	96.3	96.8	97.0
SW	74.6	76.2	72.5	34.5	31.4	46.4	67.3	80.7	71.2	77.3	87.4	85.9	94.4	93.7	92.4

Source: Authors' calculations based on the 1999, 2003, and 2008 Nigeria DHS

Table 10.5. Percentage distribution of households by number of deprivations

	National	Urban	Rural	NC	NE	NW	SE	SS	SW
1999									
0	13.4	36.1	4.1	9.9	7.2	3.7	11.9	16.5	30.8
1	20.3	38.5	12.9	29.3	7.6	16.0	15.2	18.6	30.2
2	19.7	14.1	21.9	25.9	14.1	19.9	28.6	18.9	12.9
3	22.6	7.9	28.6	20.0	28.7	26.8	30.3	23.5	10.8
4	20.7	3.2	27.9	11.9	37.0	28.8	13.1	20.0	12.9
5	3.3	0.2	4.6	3.0	5.5	4.9	1.0	2.5	2.4
2003									
0	12.7	27.3	5.4	6.7	3.9	4.5	31.0	24.2	25.9
1	21.8	40.1	12.5	18.0	10.9	21.4	27.5	18.8	45.8
2	21.9	17.8	24.0	30.9	19.9	24.5	18.5	20.6	11.5
3	22.0	9.0	28.6	25.4	27.0	23.5	15.8	23.5	7.7
4	19.2	4.4	26.6	16.7	33.5	23.9	6.5	11.8	6.9
5	2.4	1.3	3.0	2.3	4.8	2.2	0.7	1.1	2.2
2008									
0	18.9	42.5	7.3	14.7	4.3	9.8	27.2	23.8	35.5
1	23.5	36.6	17.1	16.7	13.7	20.4	30.9	27.5	32.0
2	19.6	13.5	22.6	22.0	17.1	23.4	22.9	20.1	12.2
3	20.3	5.1	27.7	24.9	26.6	27.3	13.0	18.5	8.7
4	14.7	1.9	20.9	16.5	30.1	17.0	5.2	9.3	9.2
5	3.1	0.4	4.4	5.1	8.3	2.1	0.8	0.7	2.4

Source: Authors' calculations based on the 1999, 2003, and 2008 Nigeria DHS

deprived in any indicator marginally improved by 3.2 percentage points over the ten-year period.

Among the geopolitical zones, acute deprivation ranged from 1.0 per cent in the South East to 5.5 per cent in the North East zone in 1999. The proportion of households in the North East experiencing acute deprivation increased by over one-half from 5.5 per cent in 1999 to 8.3 per cent in 2008, while zero deprivation declined by almost one-half in the same period, 7.2 per cent and 4.3 per cent in 1999 and 2008, respectively. Generally, the northern zones are characterized by a higher share of acute deprivation and a marginal share in zero deprivation compared to the southern zones.

10.4.3 *Domination Comparisons: Spatial Analyses*

Spatial FOD static and bootstrap comparisons from the 1999, 2003, and 2008 DHS for the nation, zones, and sectors are reported in Tables 10.6–10.11. These are FOD comparisons across populations at a given point in time. In each table, the row (column) averages indicate the probability that a population dominated (is dominated by) other populations. In other words, a relatively large row and column average implies a relatively well-off population and a relatively poor population respectively.

Table 10.6. 1999 DHS static spatial FOD comparisons

Area	National	Rural	Urban	NC	NE	NW	SE	SS	SW	Avg.
National		1								0.13
Rural										0.00
Urban	1	1		1	1	1				0.63
NC		1								0.13
NE										0.00
NW										0.00
SE										0.00
SS										0.00
SW		1								0.13
Average	0.13	0.50	0.00	0.13	0.13	0.13	0.00	0.00	0.00	0.11

Source: Authors' calculations based on the 1999 Nigeria DHS

Table 10.7. 1999 DHS bootstrap spatial FOD comparisons (probabilities)

Area	National	Rural	Urban	NC	NE	NW	SE	SS	SW	Avg.
National		1			0.02					0.13
Rural										0.00
Urban	1	1		0.9	1	0.79			0.01	0.59
NC	0.01	0.6			0.04					0.08
NE										0.00
NW					0.03					0.00
SE										0.00
SS		0.02								0.00
SW	0.26	0.83		0.12	0.22		0.01	0.06		0.19
Average	0.16	0.43	0.00	0.13	0.16	0.10	0.00	0.01	0.00	0.11

Source: Authors' calculations based on the 1999 Nigeria DHS

Table 10.8. 2003 DHS static spatial FOD comparisons

Area	National	Rural	Urban	NC	NE	NW	SE	SS	SW	Avg.
National		1			1					0.25
Rural										0.00
Urban	1	1		1	1					0.50
NC										0.00
NE										0.00
NW										0.00
SE	1	1		1	1					0.50
SS										0.00
SW	1	1		1	1					0.50
Average	0.38	0.50	0.00	0.38	0.50	0.00	0.00	0.00	0.00	0.19

Source: Authors' calculations based on the 2003 Nigeria DHS

The urban sector consistently had the highest probability of dominating in all the three periods and strongly dominated the rural sector in all three years. On the other hand, the average probability of the rural sector being dominated steadily increased from 43 per cent in 1999 to 50 per cent in 2008 in the bootstrapped results (Tables 10.7 and 10.11). Performance among the zones

Table 10.9. 2003 DHS bootstrap spatial FOD comparisons (probabilities)

Area	National	Rural	Urban	NC	NE	NW	SE	SS	SW	Avg.
National		0.94			0.61					0.19
Rural					0.09					0.01
Urban	0.94	0.94		0.42	0.98	0.09				0.42
NC		0.01			0.01					0.00
NE										0.00
NW					0.2					0.03
SE	0.59	0.84		0.87	0.7	0.01		0.14		0.39
SS	0.02	0.13		0.29	0.11		0.01			0.07
SW	0.56	0.79		0.48	0.86	0.01	0.01			0.34
Average	0.26	0.46	0.00	0.26	0.45	0.01	0.00	0.02	0.00	0.16

Source: Authors' calculations based on the 2003 Nigeria DHS

Table 10.10. 2008 DHS static spatial FOD comparisons

Area	National	Rural	Urban	NC	NE	NW	SE	SS	SW	Avg.
National		1			1					0.25
Rural										0.00
Urban	1	1		1	1				1	0.63
NC										0.00
NE										0.00
NW					1					0.13
SE		1		1						0.25
SS				1						0.13
SW		1		1	1					0.38
Average	0.13	0.50	0.00	0.50	0.50	0.00	0.00	0.00	0.13	0.19

Source: Authors' calculations based on the 2008 Nigeria DHS

Table 10.11. 2008 DHS bootstrap spatial FOD comparisons (probabilities)

Area	National	Rural	Urban	NC	NE	NW	SE	SS	SW	Avg.
National		1			0.67					0.21
Rural					0.03					0.00
Urban	1	1		1	1	0.1			0.6	0.59
NC										0.00
NE										0.00
NW					0.68					0.09
SE	0.09	0.83		0.97	0.32					0.28
SS		0.23		0.71	0.1					0.13
SW	0.17	0.97		0.98	0.54					0.33
Average	0.16	0.50	0.00	0.46	0.42	0.01	0.00	0.00	0.08	0.18

Source: Authors' calculations based on the 2008 Nigeria DHS

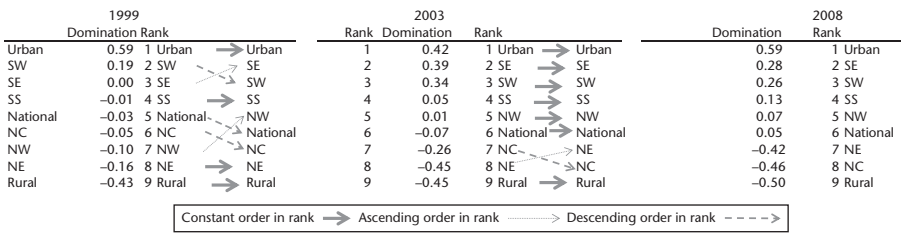

Figure 10.3. Spatial FOD ranking and probability of net domination for national, sectoral, and zonal levels in 1999, 2003, and 2008

Source: Authors' calculations based on the 1999, 2003, and 2008 Nigeria DHS

indicated that southern zones had higher probabilities of dominating compared to the northern zones. Notably, the South West zone almost doubled its probability of dominating over the ten-year period. However, the probability of the North Central and North East zones being dominated increased considerably from 13 and 16 per cent in 1999 to 46 and 42 per cent in 2008 (Table 10.7 and 10.11). This implies that the rural sector, North Central, and North East geopolitical zones are relatively poor while South West and the urban sector are relatively wealthy.

10.4.4 *Net Dominance and Inequality*

Net dominance is the difference between the average probability of dominating and being dominated by all other areas, i.e. the column average minus the row average. Net dominance is an indicator of the strength of domination over others and allows populations to be ranked. It is also an indicator of inequality. While positive figures indicate a high dominancy level and negative figures show low dominancy, an increase(decrease) in these values over time is related to increase(decrease) in inequality across the different populations. Figure 10.3 presents the change in dominance and ranks the populations (national, rural, and urban sectors, and the six geopolitical zones) across time.

The national net domination was −0.03 and −0.07 in 1999 and 2003 respectively but moved to marginal positive net dominance (0.05) in 2008. While the urban sector consistently maintained the highest ranking, the rural sector had the lowest ranking throughout the ten years. A significant change in rankings could be observed within the populations between 1999 and 2003, but between 2003 and 2008 the movement was not dramatic with North East moving up by one point to the seventh position and North Central falling in ranking to the eighth position in 2008.

10.4.5 *Temporal FOD Comparisons*

The net temporal domination score is the average of the three possible outcomes in comparing one year to another, i.e. the average that one year

Table 10.12. Temporal net FOD comparisons, DHS (probabilities)

	2003 FOD 1999		2008 FOD 1999		2008 FOD 2003	
	Static	Boot	Static	Boot	Static	Boot
NC		−0.04				
NE		−0.01				
NW		0.02		0.07		
National		0.01		0.15		
Rural		0.03		0.04		
SE	1	0.36		0.38		0.05
SS	1	0.4	1	0.6		0.24
SW				0.03		0.01
Urban	−1	−0.37			1	0.45

Source: Authors' calculations based on the 1999, 2003, and 2008 Nigeria DHS

dominates (1), neither dominates nor is dominated by (0), or is dominated by (−1) another year over all bootstraps. Net domination scores for the nation, zones, and sectors are presented in Table 10.12.

Nationally, the temporal results show that 2003 dominated 1999 by a very low probability of 0.01; a slightly higher probability of 0.15 net domination can be observed between 2008 and 1999; and neither 2008 dominates 2003 nor 2003 dominates 2008. However, these are very low probabilities indicating little evidence of advancement over the years. Among the zones, North Central and North East experienced 1999 dominating 2003 while South East, South South, and South West experienced positive probability of dominance between 2008 and 2003 with the highest chance in the South South (0.24). In the sectors, the urban sector displays some probability of decline between 1999 and 2003 but had a high probability of 2008 dominating 2003 with 0.45.

10.5 Conclusion

This study set out to appraise non-monetary multidimensional poverty in Nigeria using the FOD approach. The methodology is quite robust and lends credence to the general observation that the distribution of positive economic performance in Nigeria has not translated positively to improvements in welfare/poverty in the country over time. This is consistent with the lack of pro-poor growth observed by Ichoku et al. (2012).

The results indicate that Nigeria registered few gains in non-income poverty over the decade from 1999 to 2008. While there was a decrease in the percentage of the population experiencing acute deprivation between 1999 and 2003, an increase was observed between 2003 and 2008, which resulted in a total decline of merely −0.25 percentage points between 1999 and 2008.

An examination of the performance of the five indicators over the decade indicates that only sanitation recorded a substantial positive change; education had a negative change; and the rest had an improvement of less than 10 per cent. The results indicate that the country has not achieved broad-based progress across a number of welfare indicators for different populations especially in indicators like water, education, and electricity that are directly accruable from public expenditure.

The spatial FOD comparisons indicate that regional inequalities remain profound with huge disparities mirrored also in the results for states.[10] The FOD temporal results indicate that the probability of experiencing welfare improvement between any two years was low. South East, South South, South West zones, and the urban sector were the only areas with positive probability of advancement between 1999 and 2008; however, the probabilities for South South and South West zones were virtually zero.

It is imperative that Nigeria finds a recipe for making growth inclusive while alleviating poverty in a larger part of the country, recognizing that poverty rates appear to be geographically concentrated in some zones and rural areas.

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[10] A detailed result of state analyses can be found in Ajakaiye et al. (2014).

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