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Composition of growth and alleviation of income poverty and child undernutrition in Sub-Saharan Africa

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Abstract

This paper analyzes how the size and composition of growth are correlated with poverty reduction. Unlike most studies that focus only on income poverty, this study uses both income/consumption poverty and child undernutrition in the analysis, and extends the discussion on growth-poverty relationship further to include non-income poverty. Using a cross section data from SSA, the analysis has been made first to see the poverty reducing effect of sectoral growth after decomposing the sectors into seven, and then the significance of labour intensity in such differential impacts. Results indicate that both the size and composition of growth matter for income poverty reduction. However, the effect on child undernutriton is not conclusive. Underweight and stunting are negatively correlated with the size and composition of growth but not wasting. Wasting is mainly affected by the growth of per capita health expenditure.

Key word: Composition of growth, income poverty, child undernutrition, Sub-Saharan Africa

1. Introduction

Africa has faced long years of economic stagnation. The low economic performance coined with a number of other social and political difficulties has made the continent a home to the most poor. But over the last decade or so, the African economies have shown a good turn around. Since 2000 the continent has seen a prolonged commodity boom and sustained growth trend. And although growth slowed from an average of 5.6 per cent in 2002–2008 to 2.2 per cent in 2009—hit by the global financial crisis and steep food and fuel price rises—Africa quickly recovered with growth of 4.6 per cent in 2010. The continent's growth slipped again in 2011 owing to political transition in North Africa, but rebounded strongly once more to 5.0 per cent in 2012, despite the global slowdown and uncertainty. Africa's medium term growth prospects remain strong, too, at for example 4.8 per cent in 2013 and 5.1 per cent in 2014. (UNECA, 2013)

The recent economic growth in Africa points to progress in the fight against income poverty. World Bank's provisional figures showed that the proportion of Africans living on less than $1.25 a day fell from 58% to 48.5% between 1996 and 2010 (World Bank 2013). Although the broad picture that African economies are expanding robustly and poverty is coming down is not contested, the aggregate hides a great deal of diversity in performance among the African countries including among the fast growing countries. Growth in some countries has reduced poverty significantly but similar growth in other countries has led to little changes in poverty. For example, the World Bank asserts that despite high rate of growth recorded in resource rich than resource poor African countries, poverty reduction is higher among the latter than the former. Poverty headcount estimated at US $1.25/day declined from 65% during 1995-2000 to an estimated 49% during 2008-2011 in the resource poor African countries but it declined by an estimated 7% for the resource rich countries, despite a 2.2 times faster growth recorded in the latter than the former (World Bank 2013). This supports the general assertion that higher economic growth does not automatically translate into higher poverty reduction.

The relationship between economic growth and poverty has long been documented. Economic growth is regarded as crucial for lowering unemployment and poverty. However, although economic growth is necessary for reduction of unemployment and poverty alleviation, it is not sufficient, because growth alone cannot overcome all the crucial factors that contribute to unemployment and poverty. Most empirical evidences point considerable difference on the relationship between growth and poverty: growth in some countries is accompanied by significant poverty reduction than in others. Understanding the source of this difference is a growing area of interest.

Moreover, most studies have focused on the relationship between growth and poverty measured by income or expenditure. The implication of growth, on other indicators of poverty that are equally important in explaining welfare of individuals and communities are little addressed. One such measure is child undernutrition, which is an important indicator of child welfare and hence welfare of communities. There is dearth of empirical evidence on the effect of macro variables such as economic growth on child undernutrition.

It is against the above background that this study aims to address the issues of poverty and growth in Africa by broadly defining poverty to include not only income/expenditure poverty but also other measures of poverty such as child undernutrition.

The rest of the paper is divided into four sections. Section two discuses an empirical assessment of growth and poverty reduction followed by section three which is devoted to empirical analysis in which issues on sampling and data source, indicators of poverty and estimation approaches are discussed. Results and discussion are presented in section four and finally section five concludes.

2. Growth and Poverty Reduction: Theoretical and Empirical Assessment

The contribution of economic growth to poverty reduction is not contested. Increased growth rates, effectively measured by rising *per capita* mean incomes, would yield lower poverty levels in a society. The evidence is mounting and coming from various sources: cross-country analyses (Besley and Burgess, 2003; Dollar and Kraay, 2002; Kraay, 2006; and López, 2004), cross-regional and time-series comparisons (Ravallion and Chen, 2007; Ravallion and Datt, 2002), and the evaluation of poverty evolution using household data (Bibi, 2005; Contreras, 2001; Menezes-Filho and Vasconcellos, 2004).

Cross country results indicate that the absolute value of the elasticity of poverty with respect to economic growth (as measured by the survey mean income or consumption) ranges from 1 to 5, with an average of 3 (Ravallion & Chen, 1997). Hence, there is strong evidence that economic growth is a necessary condition for poverty reduction. At the same time, it is clear that the effect of economic growth on poverty reduction is not always the same. In fact, most studies point to considerable heterogeneity in the poverty-growth relationship: some economies are more able to achieve pro-poor growth than others. Understanding the sources of this divergence is a growing area of investigation (Bourguignon, 2003; Kakwani et al., 2004; and Ravallion, 2004).

Most literatures focus on socio-economic conditions of the population as determinants of the relationship between growth and poverty reduction. Thus, wealth and income inequality, literacy rates, urbanization

levels, and morbidity and mortality rates, among others, have been found to influence the degree to which output growth helps reduce poverty (Loayza and Raddatz, 2010).

An important set of studies, focus on the pattern and sources of growth, as well as, the manner in which its benefits are distributed as extremely important from the point of view of achieving the goal of poverty reduction. For example, Loayza and Raddatz (2010) find that growth in unskilled intensive sectors contributed to changes in poverty, after controlling for average growth. Ravallion and Datt (2002) link sectoral value added growth to poverty changes in India, and find that growth in agriculture helped reduce poverty while growth in manufacturing did not.

The aforementioned empirical evidences are concerning the relationship between income poverty and economic growth. An equally important concern is the relationship between growth and other forms of poverty such as child undernutrition. Concerning the relationship of child undernutrition as an indicator of poverty and economic growth, there is very little literature. Only a few studies have analysed the effect of macroeconomic development on the nutritional status of children. Smith and Haddad (2002) estimate the effect of economic development on undernutrition of children at the macro level using a panel data for 63 developing countries. They find a very strong effect and conclude that increases in GDP per capita between 1570 and 1995 have contributed roughly half of the total reduction in the prevalence of child undernutrition in developing countries. Klasen (2008) in his cross country analysis finds that income affects undernutrition but the effect is small. Subramanyam et al (2001) analysed the association of state economic growth and child undernutrition in India using panel data for three rounds. The authors failed to find consistent evidence that economic growth leads to reduction in childhood undernutrition in India. Recently, Harttgen et al. (2012) analysed the relationship between income growth and reduction of child malnutrition in Africa. They find increases in GDP per capita are associated with lower individual probabilities of being under weight of about 2.5 percent per one hundred dollars.

Despite the disparate motivation and different coverage of issues of the above empirical evidences, the different sets of studies have a large common area of interest. To see this clearly, one needs to consider the process that links economic growth with poverty reduction. While different other broader indicators are often used, the basic indices of poverty that are common to them all relate to shortfalls from some minimum acceptable level of income or consumption (the poverty threshold) for the income/expenditure poverty, and different indicators of child undernutrition namely underweight, stunting and wasting. A change in poverty (both income and child undernutrition) indicators are mainly determined by: a) the change in average income/consumption; and b) the change in the distribution of income/consumption.

Changes in employment influence both determinants of poverty – the change in average income and the change in distribution of income. While changes in employment along with changes in productivity improves the growth rate of the economy, the most powerful way that changes in employment and productivity can influence poverty is through changes in distribution of income. With more and more of people in employment and productivity of employees increased, more income goes to pay the labour force and this improves the share of the poor from the national product. As most of the poor are endowed with labour as their only significant resource, enhancement of opportunities for poor to be employed more intensively, productively and remuneratively reduces poverty more than a mere improvement of the access of the poor to other resources such as land and capital (Khan, 2007).

Employment elasticity of output growth, measured as the proportionate change in employment divided by the proportionate change in GDP during a given period, is often considered as a summary indicator of employment growth that is associated with a given output growth. That is employment elasticity is taken as a surrogate for employment intensity of growth. However, employment elasticity reflects the inverse of labour productivity. As Islam (2004) stated, while an elasticity higher than unity implies decline in productivity, a lower than unity elasticity means that employment expansion is taking place along with an increase in productivity. A rise in productivity would lead to a reduction in employment elasticity. Therefore, raising employment elasticity in individual activities cannot be the objective as that would mean a further lowering of productivity in economies that may already be characterized by widespread low-productivity employment.

Thus, the analysis of the summary indicator of the employment-intensity of economic growth as indicated above would need to be supplemented by a more detailed examination of whether and how growth has led to structural changes in an economy which has benefited the poor. In that regard, an important thing to examine would be the sectors and occupations where the poor are concentrated and what the trends in productivity and earnings in various occupations are like. World Bank (2005) found that in 3 of the 14 countries studied pro-poor growth was associated with more labor-intensive growth. In a related analysis, Islam (2004) uses a cross-country sample of 23 developing countries to find out whether the employment intensity of growth in manufacturing contributes to explain poverty reduction, but finds that results are not robust to the inclusion of per capita GDP growth. Prasada Rao et al. (2004) find that the significance of output per worker in explaining poverty reduction is not robust to the inclusion of the log of GDP per capita, or the estimation period.

In a case study for Brazil, Kakwani et al. (2006) decompose the sources of pro-poor growth. The authors find that productivity was the major labor income source of pro-poor growth, while the role of employment growth was small. The role of productivity growth in agriculture on poverty has also been the focus of much work. The results from Computable General Equilibrium literature suggest that factor market assumptions and agricultural trade are crucial in determining the poverty reducing impact of agricultural productivity. Coxhead and Warr (1995), for example, find that, assuming full labor mobility and product prices given by world markets, rises in agricultural productivity reduced poverty. On the other hand, Fane and Warr (2002) find that agricultural productivity has a meager effect on poverty. In an empirical paper Datt and Ravallion (1998) find that productivity growth in India decreased poverty. Loayza and Raddatz (2010) find that the sectoral composition matters for poverty alleviation with largest contributions from unskilled labour intensive sectors.

The empirical evidences from country case studies discussed above appear to point to the fact that the sectoral growth pattern and its employment and productivity profile matter for poverty alleviation, an issue which this paper explores. Using cross country data from SSA, this paper contributes to the existing mix of empirical evidences on whether sectoral growth pattern and its employment and productivity profile matter for poverty alleviation, and extends the discussion from income poverty to non-income poverty indicator namely child undernutrition.

3. Empirical Analysis

3.1 Data and Sample

To analyse the impact of sectoral value added growth on poverty (poverty being measured by income poverty and child undernutrition), we use cross sectional data for African countries with comparable measures of income poverty changes and/or child undernutrition changes, and disaggregated value added growth rates at 3, 5 and 7 sectors. The data is obtained from different sources: from UNCTAD STAT for sectoral value added, UN data for labour share of each sector, WDI (2013) for GDP PC and finally data for child undernutrition is obtained from WHO Global Database on Child Growth and Malnutrition (2011). In this way, income poverty data has been obtained for 29 countries in SSA, and for child undernutrition, data was obtained for a total of 36 countries. The list of countries and their respective spells of poverty and undernutrition are shown on appendix table A1.

We focus on changes occurring over long horizons, where the income poverty and child undernutrition reduction and economic growth relationship is most stable. For this reason, we use only one spell per country for each of the poverty indicators (income poverty, underweight, stunting and wasting), where the duration of the spell corresponds to the longest period for which initial and final income poverty and child undernutrition data exist for the country. The rest of the variables such as value added growth rates are calculated over the corresponding period per country.

3.2Indicators of poverty

The underlying theoretical framework for the choice of the dependent and independent variables to study significance of sectoral value added growth on poverty in Africa closely follows the analytical framework used by Loayza and Raddatz (2010).

To analyze the effect of sectoral growth on income poverty, the dependent variable considered is the proportional change in poverty (headcount index)[1] over a period of time (spell) per country. Specifically this is the annualized rate of change in headcount index over the period.[2]

For the child undernutrition analysis, we used the three commonly used indicators of child undernutrition, i.e., underweight, stunting and wasting. The three indicators of child undernutrition are based on z-scores, that is, whether the z-score (weight for age – underweight, height for age – stunting, weight for age – wasting) is below -2 standard deviations from the median of the reference population (WHO 2006). The z-score is defined as $z = \frac{Al_i - MAI}{\sigma}$, where Al_i refers to the individual anthropometric indicator, MAI refers to the median of the reference population, and σ refers to the standard deviation of the reference population. Like the income poverty indicator, annualized rates of change are used for each of the three indicators of child undernutrition.

Regarding the explanatory variables, we work with growth rates of sectoral value added and employment data at three levels of disaggregation. The first is the traditional three sector division of agriculture, industry and services. The second disaggregates industry further into mining, manufacturing and construction, and the third disaggregates services into wholesale, transport and other forms of services. Sectoral growth rates

[1] Headcount index is used because of its simplicity, widespread application and its importance in the literature.

[2] Annualized rate of change of headcount index is given by $\left(\frac{P_E}{P_I}\right)^{1/n} - 1$ where P represents poverty measure, n the length of the spell; and the subscripts I and E, initial and end respectively.

are calculated directly from data on sectoral value added as annualized percentage rates of changes of value added between the end and start of the corresponding spell.

3.3 Estimation approach

We are interested in estimating the effect of sectoral growth on poverty reduction. The regression equation can then be written as,

$$\hat{p}_j = \beta_0 + \sum_{i=1}^{n} \beta_1 . s_{ij} . \hat{y}_{ij} + \varepsilon_j \dots\dots\dots\dots\dots\dots (1)$$

Where $\hat{p}$ is the annualized rate of change of the headcount poverty index or any of the three measures of undernutrition (underweight, stunting and wasting), $\hat{y}$ is the annualized rate of change of sectoral value added, s is the sectoral value added share in GDP, and the subscript i and j represent sector and country, respectively. The set n consists of three or five or seven sectors, depending on whether industry and service sectors are considered as a whole or disaggregated into their major categories.

When exploring the sectoral growth on poverty, some sectors reduce poverty more than other sectors. To explain differences in sector's growth contribution to poverty alleviation, it is important to consider the labour intensity of growth of the different sectors. When labour intensity in production varies across sectors, the change in workers' income depends not only on aggregate production growth but also on its sectoral composition.

Following Loayza and Raddatz (2010), we formulate wage growth as a linear function of production growth in each sector, with weights corresponding to both its relative value added and its labour intensity.

$$\hat{\omega} = \sum_{i=1}^{2} s_i \hat{y}_i + \left(\frac{\varepsilon - 1}{\varepsilon}\right) \sum_{i=1}^{2} (l_i - s_i) \hat{y}_i \dots\dots\dots\dots . (2)$$

Where $\hat{\omega}$ is changes in real wage rate, l_i is sector i's labour share in total employment, ε is elasticity of substitution across sectors in the final good and the other notations as described in equation (1) above.

The above equation points two components of growth rate of real wage rate. The first one corresponds to the production effect. When output in each sector grows ($\hat{y}_i$), it corresponds to a higher output per worker that maps into higher wages. The contribution of each sector in this sense depends on its size (s_i), i.e. the sectoral value added share in GDP. The larger the size the higher the contribution.

The second component is the reallocation effect. The impact of a sector's growth on this component depends on the elasticity of substitution across sectors in the production of the final good (ε) and on the sector's labour intensity which is shown by the difference between its labour share of total employment and its share in total output ($(l_i - s_i)$.

The elasticity of substitution determines whether labour will move into and out of a growing sector and by how much. The higher the elasticity of substitution, the more labour moves into that sector when the sector experiences growth. Moreover, if a sector is labour intensive (i.e., its labour share of total employment exceeds its share in total output), then expansion in the sector leads to higher employment to achieve wage equalization.

The poor's primary asset is labour. A rise in wage rate is assumed to be translated into poverty reduction in a linear fashion as follows:

$$\hat{p} = \theta_0 + \theta_1 \hat{\omega} \dots\dots\dots (3)$$

Substituting equation (2) in equation (3), we can express changes in poverty on sectoral growth.

$$\hat{p} = \theta_0 + \theta_1 \left(\sum_{i=1}^{n} s_i . \hat{y}_i \right) + \theta_2 \left(\sum_{i=1}^{n} (l_i - s_i) . \hat{y}_i \right) \dots\dots\dots (4)$$

Collecting like terms together, we get

$$\hat{p} = \theta_0 + \sum_{i=1}^{n} \left(\theta_1 - \theta_2 + \theta_2 \frac{l_i}{s_i} \right) s_i . \hat{y}_i \dots\dots\dots (5)$$

Equation (5) indicates that a sector's poverty reduction effect depends not only on the size of growth in the sector but also on its labour intensity given by $\frac{l_i}{s_i}$.

Using a more formal notation, equation (4) can be rewritten as a regression equation of the change in poverty on aggregate and sector growth,

$$\widehat{p_j} = \theta_0 + \theta_1 \hat{y}_j + \theta_2 \left(\sum_{i=1}^{n} \left(\frac{l_{ij}}{s_{ij}} - 1 \right) . s_{ij} . \hat{y}_{ij} \right) + \varepsilon_j \dots\dots\dots (6)$$

where $\hat{y}_j \cong (\sum_{i=1}^{n} s_i \hat{y}_i)$ is GPD per capita growth. The coefficients θ_1 and θ_2 reveal the size and composition effects respectively.

4. Results and discussion

4.1 Descriptive results

Tables A2 and A3 in the appendix show the level of poverty and mean rates of child undernutrition (underweight, stunting and wasting) as well as GDP per capita in USD PPP (constant 2005 prices) by country and survey year. Taking all the poverty survey years in our sample, average poverty stands at 23.9 and 53.7 for poverty gap and poverty head count respectively. However, if we limit the average poverty to the last poverty survey years of each country in our sample, average poverty is 17.6 and 45 percent for poverty gap and headcount respectively. This indicates a decline in poverty both in poverty gap and headcount. Despite a decline, poverty is still staggeringly high in SSA. Similarly, taking the last Demographic and Health Survey (DHS) data of each country in our sample, on average 21.2% of the children under the age of five are underweight, 38.2% are stunted, and 9.4% are wasted. However, for all DHS survey years, the figures are 23.4%, 41.5% and 10.1% respectively. Like the income poverty level, the average child undernutrition levels for the last survey years is lower than the average over all survey years indicating a declining trend in child undernutrition.

Tables A2 and A3 reveal large differences in income poverty, child under nutrition and income per capita across countries. Lowest poverty levels are found in Cameron and South Africa where less than 14 per cent of the population is below poverty line. On the other hand, poverty level is high in Mali, Sierra Leone, Nigeria, Mozambique, Malawi, Central African Republic, Rwanda, Zambia, Madagascar and Burundi where more than one-half of their population is below poverty line.

Child under nutrition rates also show significant variation. For almost all countries in the sample, the stunting rates are considerably higher than wasting rates, followed by rates of underweight. Taking the latest stunting rates in our sample, we observe that the lowest stunting rates are found in Mauritania, Gambia, Guinea, Ghana, Senegal, Angola and Togo. Even in these countries, although relatively low, stunting rates are high. Between 20 and 30 percent of the children were stunted – indicating a persistent problem of chronic under nutrition. The highest levels of child under nutrition measured by the stunting rate are found in Madagascar, Niger and Burundi where more than one-half of their children under five are stunted.

Levels of GDP per capita also differ between countries. Some countries such as DRC, Burundi, Niger, Eritrea and Central Africa Republic have a GDP per capita of less than 800 USD. At the same time, other countries such as Cameron, Mauritania, Angola, Swaziland, South Africa and Botswana showed considerably higher levels of GDP. However, on average GDP per capita are very low and the SSA countries are among the poorest countries in the world.

Tables A2 and A3 also reveal first interesting insights into changes in income/expenditure poverty and child under nutrition rates over time. First, there is very clear trend observable that SSA increases its level of GDP per capita over time for most countries; there are some exceptions though. Second, income poverty seems to change (a decline) over time in a clearer way than child under nutrition.

To verify this observation, we need to compare the annualized rate of changes in the poverty indicators (both income poverty and child under nutrition) and GDP per capita. Tables A4 and A5 in the appendix reveal this for income poverty and child under nutrition respectively. The following important findings are revealed in these tables.

First, GDP per capita growth is positive in almost all countries, except Central Africa, Guinea Bissau, Madagascar, Comoro's and Cote d'ivoire. Second, the annualized rate of change of income poverty is negative for almost all countries except Kenya, Nigeria and Zambia, implying that income poverty went down in most countries in the sample. Third, reductions in under nutrition rates are unevenly distributed across countries and across indicators. Largest progress has been made in reducing wasting rates, with an average annualized reduction of 2.3 percent[3], followed by underweight with an average annualized reduction of 1.8 percent. The least average annualized reduction is recorded for stunting which is slightly more than half a percentage point.

To illustrate the unequal distribution of progress, figure 1 shows the poverty rates and GDP per capita levels, and figure 2 shows the three indicators of under nutrition and GDP per capita levels for each country and survey year.

We can broadly categorize three groups of countries with respect to their development of GDP per capita overtime. First, a group of countries with a positive trend in GDP per capita levels between 1990 and 2010. This group includes Burkinafaso, Botswana, Ethiopia, Ghana, Lesotho, Mali, Mozambique, Namibia, Nigeria, Senegal, South Africa, Swaziland, Uganda, Sudan, Uganda, Chad and Rwanda. The second group consists of countries that have experienced a decline in GDP per capita. This group includes Niger, Guinea Bissau, Madagascar, Comoros, Djibouti, Democratic Republic of Congo, Eretria, Burundi, Togo and Central African Republic. The third group includes those countries where no clear trend is observable. These countries include Angola, Guinea, Benin, Cameron, Gambia, Malawi, Zambia, Sierra Leone etc.

For most countries in the sample, poverty level measured by headcount ratio decreased throughout the poverty survey years or has shown a declining trend in the later years of the survey. Exceptions in this regard

[3] The annualized rate of change of wasting is high because of a high average wasting reduction in Togo (26.34%). However, if we exclude this outlier, the average rate of change becomes -1.61 which is lower than that of underweight.

where poverty rate has started to rise up in the most recent poverty survey years are Kenya, Zambia and Madagascar.

Unlike the trends in poverty, it is more difficult to identify clear trends in the under nutrition rates. For most of the countries in the sample, stunting rates are higher followed by underweight rates. Moreover, the three indicators of under nutrition move together for most of the countries in the sample. There are countries such as Ethiopia, Ghana, Mozambique, Swaziland, Uganda etc where increases in GDP per capita are associated with a continuous reduction in under nutrition rates. On the other hand, for countries such as Central Africa Republic, Madagascar, Comoros and Djibouti where a decrease in GDP per capita is associated with a rise in child under nutrition rates. In countries such as Kenya, under nutrition rates improved when GDP per capita was fairly constant and under nutrition rates were fairly constant when GDP per capita strongly increased. In few countries such as Burundi, under nutrition rates declined despite a decline in GDP per capita. For quite a significant number of countries in the sample, under nutrition rates fluctuate – sometimes increase and decrease at other times implying there is no clear pattern across countries.

In figures 3 to 8 we illustrate the association between GDP per capita with poverty and child undernutrition. Figures 3 and 4 display respectively the average rates of poverty and child under nutrition for the latest available surveys. The countries are sorted by their level of GDP per capita from rich (left) to poor (right). Neither poverty measured by headcount nor any of the indicators of child undernutrition show a clear gradient in GDP per capita.

In figures 5 and 6, we show the direct associations between GDP per capita and poverty and child undernutrition respectively. The association between GDP per capita and headcount poverty is somewhat negative but weak. Similarly, GDP per capita is negatively but weakly associated with underweight and stunting. But it seems evident that there is no association between GDP per capita and wasting.

Figures 7 and 8 compare the annualized rate of change of GDP per capita with annualized rates of changes of poverty and child undernutrition respectively. Except for wasting, annualized rates of changes in headcount poverty, underweight and stunting show a clear negative gradient in annualized rate of change of GDP per capita.

4.2 Estimation results

To see if sectoral composition really matters to reduction of poverty (both income and non-income poverty) as economies grow, we regress poverty on sectoral growth. To account the different size of the sectors, we weighted the sectoral growth by its relative size. Doing so will have the advantage that it allows for a simple test of whether the growth composition matters (Ravallion and Chen, 2007 cited in Loayza and Raddatz,

2010). If all the coefficients of the sectors cannot be distinguished from each other, it means that rather than sectoral composition, it is only the overall GDP growth that matters for poverty reduction.

Table 1 presents the results when GDP is decomposed into agriculture, industry and services. The regressions are conducted for both income poverty and child undernutrition. The size adjusted value-added growth rates of the three sectors affect the different measures of poverty differently.

Table 1: Income and nutrition poverty reduction and sectoral growth

	Income poverty (head count)		Underweight		Stunting		Wasting	
	Unconstrained (1)	Partially Constrained (2)	Unconstrained (3)	fully constrained (4)	Unconstrained (5)	Partially constrained (6)	Unconstrained (7)	Fully constrained (8)
Agriculture growth	-1.118*	-0.522*	-0.109	-0.262	0.152	-0.117	0.038	0.013
	0.628)	(0.278)	(0.269)	(0.215)	(0.230)	(0.159)	(0.768)	(0.207)
Industry growth	0.161	0.299	-0.094	-0.262	-0.161	-0.117	0.109	0.013
	(0.19)	(0.251)	(0.210)	(0.215)	(0.197)	(0.159)	(0.143)	(0.207)
Service growth	-0.266	-0.522*	-0.883***	-0.262	-0.825***	-0.798***	-0.304	0.013
	(0.261)	(0.278)	(0.295)	(0.215)	(0.224)	(0.217)	(0.711)	(0.207)
Constant	-1.193	-1.430	0.081	-0.859	1.106	1.318	-2.103	-2.634
	(0.835)	(0.875)	(0.864)	(1.156)	(0.658)	(0.658)	(2.177)	(1.821)
Test	Agric=Indust	Agri=indust	Agri=Indust		Agri=Indust		Agri=Indus	
Test p-value	0.077	0.08	0.964		0.245		0.931	
Test	Agic=service		Agri=Service		Agri=service			
Test p-value	0.229		0.111		0.016		Agri=service 0.797	
observations	29	29	36	36	36	35	36	36
R-Squared	0.139		0.201		0.259		0.007	

Numbers in parenthesis are robust standard errors

*significant at 10%; **significant at 5% and ***significant at 1%

Income poverty as shown in column 1 is negatively related to the size adjusted value-added growth rates in agriculture and the service sectors. However, the relationship is statistically significant only with the former with a coefficient a little over one. Size adjusted value-added growth in the industrial sector, however, has

not only no effect on income poverty but also the relationship is positive. Moreover, testing the equality of the coefficients of the sectors reveals that the equality of the coefficients of agriculture and the service sector cannot be rejected but the equality of the coefficients of the agricultural and industrial sectors is rejected at 10% level of significance. Taking the failure to reject the equality of the coefficients of agriculture and the service sectors at face value, we estimated a constrained regression that assumes equal effects of the agricultural and service sectors. The result is revealed in column 2. In this column, the growth rate of poverty is negative and statistically significant for both the agricultural and service sectors. But the coefficient of the industrial sector remains positive but statistically insignificant.

Looking at the under nutrition rates, the service sector enters with a negative coefficient and is statistically significant for underweight and stunting. The other two sectors, agriculture and industry, remained statistically insignificant whether in the unconstrained or the constrained regression results.

The results on table 1 could be camouflaged by the insufficiently disaggregated output categories. We examine the effect of the sectoral value added growth on poverty after disaggregating the sectors into 5 and 7 sectors. The results are shown on tables 2 and 3. Table 2 indicates the effect of the sectoral value added growth after the industrial sector is further disaggregated into manufacturing, mining and construction.

In the unconstrained regression for income poverty, only agricultural growth carries a significantly negative coefficient. The pattern of sign is diverse across sectors, with agriculture, manufacturing, mining and service carrying negative coefficient, while mining presenting positive coefficient.

Next, we restrict the model to be estimated by pulling sectors that can be pulled together. One way of doing this is to pull together sectors that appear to have similar effects on poverty. A first approximation is to group together sectors that present negative coefficients in the unconstrained regression, and do likewise with those that carry positive coefficients. Before grouping them, we can test the equality of their coefficients. These test (shown at the bottom of table 2 column 1) indicate that agriculture, manufacturing construction and service (the sectors carrying negative coefficients) can be pulled together.

Applying these restrictions, we can estimate the corresponding constrained regression, whose results are presented in column 2 of table 2. Growth in agriculture, manufacturing, construction and service sectors now appear to have a clear, significant poverty reducing effect. In contrast, growth in mining does not seem to reduce poverty, once growth in other sectors is controlled for. The test for the equality of coefficients in the constrained regression confirms that the two groups (agriculture/manufacturing/construction/service on one side and mining on the other) have statistically different impacts on income poverty (see bottom of table 2 column 2).

Table 2: Income and nutrition poverty reduction and sectoral growth (five sectors case)

	Income poverty (head count)		Underweight		Stunting		Wasting	
	Unconstrained (1)	Partially Constrained (2)	Unconstrained (3)	Partially constrained (4)	Unconstrained (5)	Partially constrained (6)	Unconstrained (7)	partially constrained (8)
Agriculture growth	-1.124*	-0.396*	-0.164	-0.527***	0.140	-0.385***	-0.137	0.018
	(0.651)	(0.203)	(0.299)	(0.164)	(0.258)	(0.117)	(0.891)	(0.147)
Mining growth	0.240	0.406	-0.028	-0.037	-0.074	-0.087	0.072	0.018
	(0.373)	(0.296)	(0.105)	(0.109)	(0.107)	(0.107)	(0.089)	(0.147)
Manufacturing growth	-0.458	-0.396*	-0.907	-0.527***	-0.336	-0.385***	-1.706	0.018
	(0.860)	(0.203)	(1.33)	(0.164)	(0.984)	(0.117)	(2.702)	(0.147)
Construction growth	-0.675	-0.396*	-0.876	-0.527***	-0.639	-0.385***	-1.949	0.018
	(1.685)	(0.203)	(1.303)	(0.164)	(0.834)	(0.117)	(3.420)	(0.147)
Service growth	-0.300	-0.396*	-0.716**	-0.527***	-0.740	-0.385***	0.085	0.018
	(0.333)	(0.203)	(0.344)	(0.164)	(0.302)	(0.117)	(1.002)	(0.147)
Constant	-1.203	-1.524*	0.352	0.113	1.134	0.911	-1.222	-2.668
	(0.846)	(0.822)	(1.00)	(0.954)	(0.716)	(0.677)	(2.016)	(1.583)
Test	Agri=manuf=const=serv=mining	Agri=mining	Agri=manuf=const=mining=serv	Agri=mining	Agri=manuf=const=mining=serv		Agri=manuf=const=serv	
Test p-value	0.046	0.08	0.06	0.009	0.015		0.794	
Test	Agri=manuf=const=serv		Agri=manuf=const=serv		Agri=manuf=const=serv			
Test p-value	0.56		0.406		0.156			
n	29	29	36	36	36	36	36	36
R-Squared	0.149		0.215		0.278		0.019	

Numbers in parenthesis are robust standard errors

*significant at 10%; **significant at 5% and ***significant at 1%

Similarly, columns 3 to 8 of table 2 indicate the effect of the sectoral growth on the three indicators of child undernutrition after disaggregating the industry sector into three sectors. In the unconstrained regression, none of the sectoral growth rates except the services in the case of underweight have any significant effect on child under nutrition. Tests for pulling the sectors together indicate that the four sectors (agriculture, manufacturing, construction and services) can be pulled together. The partially constrained regression results

(see columns 4, 6 and 8 of table 2) clearly indicate that growth in agriculture, manufacturing, construction and services have a negative and significant effect on underweight and stunting rates. However, similar effects were not observed in the case of wasting. Wasting seems to be not affected by growth in any of the sectors.

To see the effect of more disaggregated output categories, the service sector is further disaggregated into three sectors namely wholesale, transport and other services. Table 3 shows the constrained and unconstrained regression results for the seven sectors.

In the unconstrained regression, none of the sectors significantly influence income poverty level. But as far as the signs of the coefficients are concerned, agriculture, manufacturing, construction, and wholesale have entered with a negative sign and the remaining three sectors namely mining, transport and other service have entered with positive signs. We tested if the sectors with similar signs of the coefficients can be pulled together. Test results as indicated at the bottom of column 1 of table 3 show that the four sectors (agriculture, manufacturing, construction and wholesale) can be pulled together and the remaining three sectors (mining, transport and other services) can be pulled into one.

Applying these restrictions, column 2 shows results for constrained regression. The partially constrained result clearly indicates that value added growth in agriculture, manufacturing, construction and wholesale has a negative and significant effect on income poverty. On the other hand, value added growth in mining, transport and other services does not appear to have an income poverty reducing effect. Moreover, test results for equality of the coefficients in the constrained regression indicated at the bottom of column 2 indicates that the two groups have different impacts on poverty.

In a similar fashion, the effects of sectoral growth on child undernutrition after disaggregating the former into seven sectors are analyzed. Results are shown in columns 3 to 8 of table 3. In all the unconstrained regressions, none of the sectoral growths have any significant effect on child undernutrition. For the constrained regression (see columns 4, 6 and 8), the same sectors that negatively and significantly affect income poverty namely value added growth in agriculture, manufacturing, construction and wholesale sectors have negative and significant effect on underweight and stunting. Although the signs are negative, none of these sectors significantly affect wasting level. It seems that wasting is not affect by value added growth in any of the sectors.

`Table 3: Income and nutrition poverty reduction and sectoral growth (7 sectors case)

	Income poverty (head count)		Underweight		Stunting		Wasting	
	Unconstrained (1)	Partially Constrained (2)	Unconstrained (3)	Partially constrained (4)	Unconstrained (5)	Partially constrained (6)	Unconstrained (7)	Fully constrained (8)
Agriculture growth	-0.63	-0.82***	-0.04	-0.51**	-0.11	-0.37**	0.25	-0.02
	(0.44)	(0.30)	(0.28)	(0.20)	(0.25)	(0.16)	(0.80)	(0.37)
Mining growth	0.40	0.38	0.01	-0.08	0.06	-0.11	0.09	0.01
	(0.43)	(0.20)	(0.12)	(0.15)	(0.10)	(0.12)	(0.10)	(0.14)
Manufacturing growth	-0.64	-0.82***	-0.67	-0.51**	-0.47	-0.37**	-0.77	-0.02
	(0.89)	(0.30)	(1.34)	(0.20)	(1.00)	(0.16)	(2.26)	(0.37)
Construction growth	-1.01	-0.82***	-0.35	-0.51**	-0.72	-0.37**	-0.46	-0.02
	(1.78)	(0.30)	(1.44)	(0.20)	(0.90)	(0.16)	(2.80)	(0.37)
Wholesale growth	-0.94	-0.82***	-0.64	-0.51**	-1.54	-0.37**	2.83	-0.02
	(1.51)	(0.30)	(0.87)	(0.20)	(0.40)	(0.16)	(2.85)	(0.37)
Transport growth	4.23	0.38	0.03	-0.08	-0.51	-0.11	1.42	0.01
	(2.67)	(0.20)	(0.42)	(0.15)	(0.40)	(0.12)	(1.02)	(0.15)
Other service growth	0.80	0.38	-1.59	-0.08	0.08	-0.11	-4.68	0.01
	(0.50)	(0.20)	(1.21)	(0.15)	(0.75)	(0.12)	(2.55)	(0.15)
Constant	-0.36	-1.59**	0.22	-0.58	0.87		-0.75	-2.53
	(1.00)	(0.751)	(0.97)	(0.93)	(0.85)		(2.05)	(1.79)
Test	Agri=manuf=const=wholesale		Agri=manuf=const=wholesale		Agri=manuf=const=wholesale		Agri=manuf=const=wholesale	
Test p-value	0.83		0.89		0.57		0.83	
Test	Mining=transport=other service		Mining=transport=other service		Mining=transport=other service		Mining=transport=other	
Test p-value	0.21		0.76		0.49		0.17	
Test		Agri=mining 0.02		Agri=mining 0.07				
n	29	29	36	36	36	36	36	36
R-Squared	0.35		0.24		0.29		0.21	

Numbers in parenthesis are robust standard errors

*significant at 10%; **significant at 5% and ***significant at 1%

Poverty reduction and labour intensity growth:

The fact that growth in some sectors contributes to poverty alleviation more than growth in other sectors poses the question why growth in some sectors explains poverty reduction than similar growth in other sectors? Although a wide range of reasons could explain why growth in some sectors is negatively and strongly related with poverty than others, some of the possible explanations include: a) limited or absence of movement between different markets. If markets are highly segmented and if movement between markets are limited or absent (i.e. if the wage equalization effect among the sectors is minimal), then growth in the sectors in the markets where the poor concentrate would have a strong and negative effect on poverty than growth in the sectors where the concentration of the poor is minimal. b) A second reason could be related to the match between a sectors output and the consumption pattern of the poor. If a sector produces outputs that are favoured by the poor, then growth in the sector would lead to a price reducing effect which in turn would improve the welfare of the poor. A typical example is growth in the agricultural sector which could lead to a fall in price of food and this in turn improves the poor's consumption basket. c) A third possible reason which this paper focuses could be due to differences in labour absorption capacity of sectors. Some sectors could be more labour intensive than others and improvements in output in the labour intensive sectors could lead not only in improving the wage rate of the existing workers but also in creating more and more new employment opportunities. Thus, growth in the labour intensive sectors would have a positive distribution effect.

Using equation (6) in section 3.3 (Estimation approach) we can show the size and composition effect of GDP growth on income poverty and child undernutrition. In the growth-poverty relationship, labour intensity can be considered for each sector for each country (separate for each country) or for each sector but for all countries (one figure for each sector across countries). In our case, we used the latter for the following reasons. First, data on labour intensity is not available for all countries in the sample, second, differences in approach of labour use by sectors across countries could bias results and finally labour intensities could be more of technologically driven and differ across sectors than across countries given a comparable level of technology in the SSA countries.

Table 4 presents the estimation results for income poverty and child undernutrition. For comparison, a benchmark regression with per capita GDP growth as sole explanatory variable is included. Results indicate that the coefficients of aggregate growth are always negative and significant for income poverty, underweight and stunting. In the case of wasting, although the coefficient is negative, it is not statistically significant. When labour intensity is controlled for, the effect of aggregate growth remains the same except that the coefficients on aggregate growth enter with larger magnitudes.

Table 4: Poverty reduction and labour intensive growth

	Income poverty		Child undernutrition					
			Underweight		Stunting		Wasting	
	Volume of GDP growth	Volume and composition of GDP growth	Volume of GDP growth	Volume and composition of GDP growth	Volume of GDP growth	Volume and composition of GDP growth	Volume of GDP growth	Volume and composition of GDP growth
GDP growth	-0.195***	-0.219***	-0.577***	-0.754***	-0.563***	-0.699***	-0.256	-0.355
	(0.158)	(0.174)	(0.230)	(0.216)	(0.183)	(0.171)	(0.401)	(0.456)
Labour intensity growth		-0.197***		-0.287***		-0.220***		-0.16
		(0.38)		(0.067)		(0.047)		(0.150)
Constant	-2.321**	-2.39**	-1.194*	-1.292**	0.165	0.09	-2.108	-2.163
	(0.694)	(0.755)	(0.611)	(0.573)	(0.500)	(0.481)	(1.48)	(1.479)
Observation	29	29	36	36	36	36	36	36
R-squared	0.13	0.14	0.172	0.250	0.223	0.286	0.007	0.013

Numbers in parenthesis are robust standard errors
*significant at 10%; **significant at 5% and ***significant at 1%

Coming to the coefficient on labour intensity weighted sectoral growth, the coefficients enter with negative signs and are highly statistically significant for all types of poverty except for wasting. Like the aggregate growth variable, the labour intensive growth variable enters with a negative sign in the case of wasting too although it is not statistically significant. In general, it can be said that in addition to the size of growth, the composition of growth regarding its labour intensity is statistically and economically relevant for explaining income poverty and child under nutrition except for wasting. Neither the volume nor the composition of GDP growth seems to affect wasting.

Since child undernutrition could be affected by other factors other than the size and composition of GDP mainly by the level of health expenditure, we controlled for annualized rate of growth of health expenditure per capita over the spells for which child undernutrition has been calculated for each country. Results are shown on table 5. Even after controlling for rate of growth of health expenditure per capita, the effect of size and composition of growth on the three measures of child undernutrition remains the same. Both the aggregate growth variable and labour intensive growth variable enter with negative signs and are statistically significant in the case of underweight and nutrition. But the effect of these variables on wasting remains insignificant. It seems evident that wasting is influenced more by the growth of health expenditure per capita than a mere growth of GDP.

Table 5: Child undernutrition, labour intensity of growth and growth of health expenditure per capita

	Child undernutrition		
	Underweight	Stunting	Wasting
	Volume and composition of GDP growth	Volume and composition of GDP growth	Volume and composition of GDP growth
GDP growth	-0.522*	-0.553***	0.369
	(0.308)	(0.235)	(0.533)
Labour intensity growth	-0.24***	-0.191***	-0.015
	(0.07)	(0.055)	(0.235)
Growth of per capita health expenditure	-0.201	-0.127	-0.627***
	(149)	(113)	(0.235)
Constant	-0.361	0.678	-1.836
	(0.633)	(0.689)	(2.29)
Observation	36	36	36
R-squared	0.287	0.306	0.091

Numbers in parenthesis are robust standard errors
*significant at 10%; **significant at 5% and ***significant at 1%

Impact of inequality and initial level of poverty:

In understanding the growth-poverty linkage, a number of factors could influence the linkage, which could in turn influence the welfare consequences of economic growth revealed in our model. Two of the important factors are inequality and initial level of poverty.

One over-riding factor in the growth-poverty linkage is of course how it is intermediated through distribution of income. If inequality is brought into the picture, does it change the growth-poverty linkage? Evidence seems to suggest that the initial level of income inequality within an economy is important in predicting the magnitude of the impact of growth on poverty (Ravallion, 1997; Ravallion, 2001 cited in Bhorat, 2009). Specifically, higher levels of initial income inequality are likely to be associated with a lower impact on poverty from growth, *ceteris parabus*. This is to be expected, given that an initial mal-distribution of physical, human and financial resources should make it much harder for the poor to participate in, and therefore gain from, the process of economic growth. Ravallion (2004) for example illustrates through cross-country evidence how, at very high levels of initial income inequality within his sample, growth-poverty elasticities are not significantly different from zero.

The second factor is initial level of poverty. Poorer countries tend to undergo larger poverty reductions than relatively better off countries. It can be argued that labour-intensive growth might be capturing the effect related to initial level of poverty: poorer countries may experience both growth in labour intensive sectors and faster poverty reduction.

To control for the inequality and initial poverty effects, we add to the volume and composition of growth regression the inequality variable indicated by Gini coefficient and initial levels of income poverty and child undernutrition. Results are indicated in table 6.

Table 6 reveals that the Gini coefficient variable has entered with a positive coefficient in the income poverty as well as in all the three indicators of child undernutrition regressions. This implies that high level of inequality has a worsening effect on the rate of changes in poverty. However, the result is statistically insignificant. Moreover, the inclusion of the inequality in the regression does not influence the sign and significance of GDP growth and labour intensive growth variables on both income poverty and child underntrition. Similarly table 6 also shows the effect of initial level of income poverty and child undernutrition. The variable enters with a negative sign in all cases implying that high initial level of poverty leads to significant reduction in poverty when growth occurs. However, the coefficient is statistically insignificant in all cases except in the case of wasting. Moreover, the inclusion of the initial level of income

poverty and child undernutrition does not change the sign and significance of the size and composition of growth on income poverty and child undernutrition except in the case of wasting. The labour intensive growth variable was statistically insignificant in the case of wasting before the inclusion of initial level of wasting but it became significant once the initial level of wasting is controlled for.

Table 6: Poverty and child undernutrition reduction, and labour intensive growth controlling for inequality and initial level of poverty

	Income poverty		Child undernutrition					
			Underweight		Stunting		Wasting	
	Volume and composition of growth controlling for inequality	Volume and composition of growth controlling for initial headcount	Volume and composition of growth controlling for inequality	Volume and composition of growth controlling for initial underweight	Volume and composition of growth controlling for inequality	Volume and composition of growth controlling for initial stunting	Volume and composition of growth controlling for inequality	Volume and composition of growth controlling for initial wasting
GDP Growth	-0.227	-0.222	-0.745***	-0.748***	-0.677***	-0.552***	-0.341	-0.329
	(0.18)	(0.176)	(213)	(0.209)	(0.171)	(0.142)	(0.461)	(0.407)
Labour intensive growth	-0.165	-0.214	-0.286***	-0.288***	-0.217***	-0.199***	-0.158	-0.279**
	(0.388)	(0.364)	(0.068)	(0.069)	(0.046)	(0.048)	(0.153)	(0.135)
Gini coeff.	0.019		0.017		0.044		0.029	
	(0.045)		(0.051)		(0.031)		(0.109)	
Initial poverty		-0.006		-0.006		-0.073		-0.392**
		(0.029)		(0.036)		(0.029)		(0.195)
Constant	-3.21	-2.034		-1.151	-1.823	3.007**	-3.453	2.107
	(2.04)	(1.987)		(1.25)	(1.524)	(1.468)	(5.189)	(2.16)
Obs.	29	29	36	36	36	36	36	
R-squared	0.0294	0.0277	0.2526	0.2504	0.3076	0.3771	0.0142	

Numbers in parenthesis are robust standard errors

*significant at 10%; **significant at 5% and ***significant at 1%

5. Conclusions

There is little doubt that economic growth contributes significantly to poverty alleviation. There are mounting evidences that growth is a necessary condition for poverty reduction. For this, the first and primary concern of developing countries in their effort to reduce poverty is achieving a sustainable economic growth. At the same time, it is clear that the effect of economic growth on poverty reduction is not always the same. In fact, a complaint that is often heard in countries around the world is that the poverty response to growth is sometimes disappointing.

This paper illustrates the connection between economic growth, poverty reduction (taking both income and non-income poverty indicators), labour intensity and sectoral growth. It conducted empirical analysis with the change in poverty as the dependent variable of interest. To address the change in poverty issues, both income and non-income poverty have been considered. The income/consumption poverty is an important indicator of the current level of welfare. Nutritional status of children is another important indicator of child health and overall well-being. It is by now well known that nutritional status of early in life has severe consequences for adult health, cognitive development and adult socio-economic status. Investments in child health and in particular child nutrition have a potentially high pay-off for the long-run development of the individual and of the society. It is important to understand if and to what extent macroeconomic development can contribute to improvement of children's nutritional status. In particular it is unclear whether overall economic growth reaches those who are in need.

To analyse the impact of output growth on poverty, value added growth was considered for different classification of sectors. First using the traditional sectoral classification into three sectors (agriculture, industry and service), then five sectors after the industrial sector is further divided into three and finally seven sectors after the service sector is further divided into three sectors. Results indicate that the impact of output growth on poverty reduction varies from sector to sector and that there is a systematic pattern to this variation. Income poverty and child undernutriton measures except wasting are responsive to growth in the sectors that are more labour intensive in relation to their size. Thus, agriculture is the most poverty reducing sector followed by manufacturing, construction and some services in the category of wholesale, retail trade, restaurants and hotels.

The paper further analysed the size and composition effects of aggregate growth by considering annualized poverty as a function of aggregate growth (which indicate the size of growth) alone first and then in combination with a measure of labour intensive growth (which would represent its composition effect). Results indicate that size of growth is a significant factor for poverty reduction, i.e., poverty alleviation depends on the size of growth. Moreover, results also indicate that the effect of size of growth on poverty is

stronger when growth is more in the labour intensive sectors. This result is true for income poverty and the two indicators of child undernutrition, i.e., underweight and stunting. But wasting seems to be unresponsive to either size or composition of growth. It is more influenced by rate of growth in health per capita expenditure.

Results in this paper are useful to understand the disparity in the responsiveness of poverty to economic growth, i.e., why growth in some cases leads to a considerable reduction in poverty and in other cases it does not lead to a similar changes in poverty. However, the paper has limitations in the sense that it does not provide ground for selective policies and interventions as necessary elements in poverty reduction strategies. Moreover, the paper also does not address individual characteristics that may strongly influence poverty reduction efforts.

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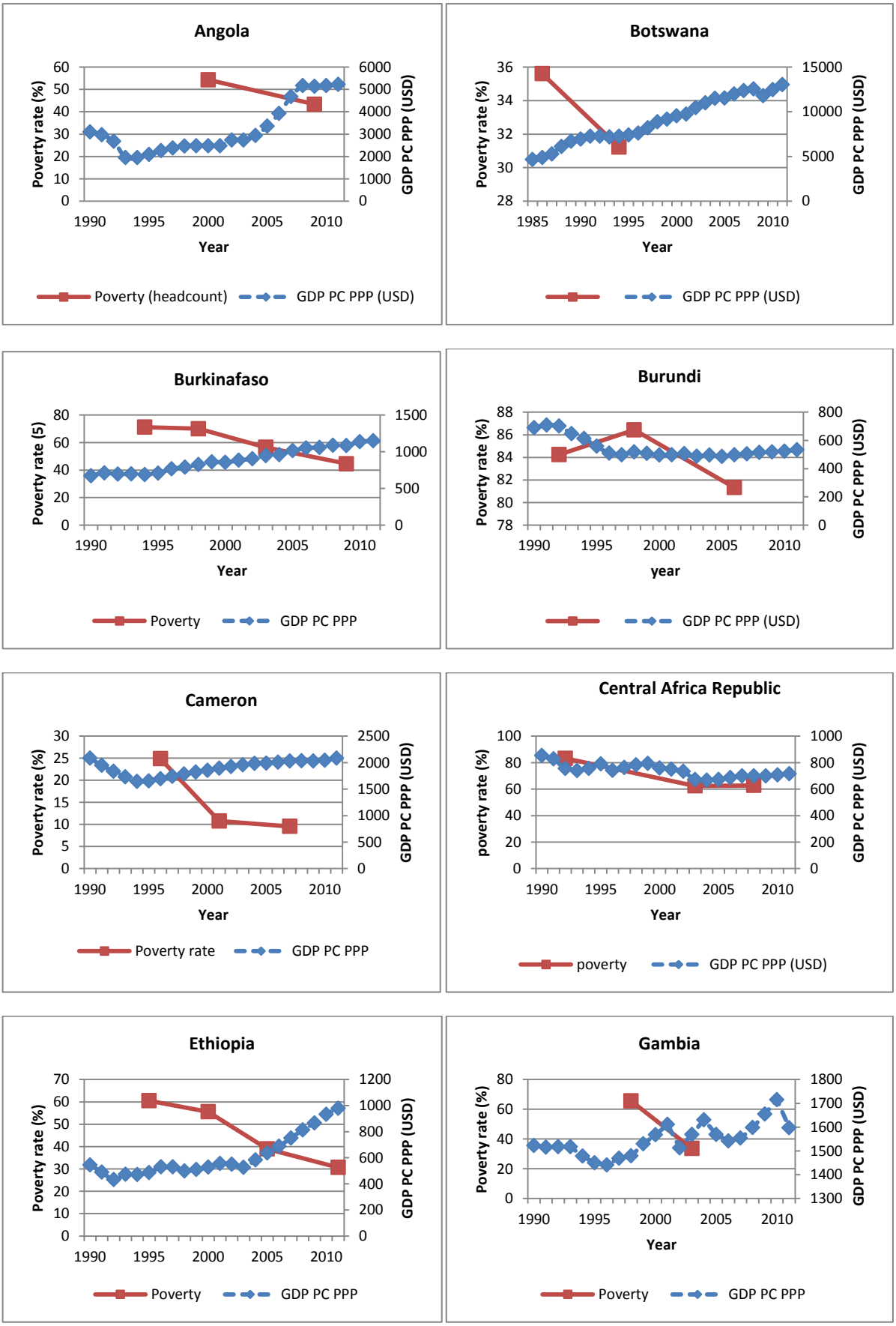
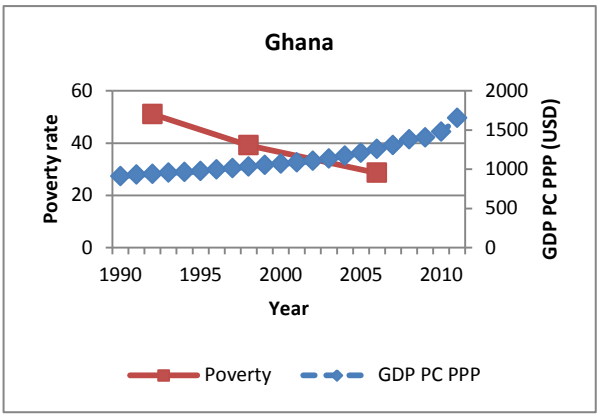
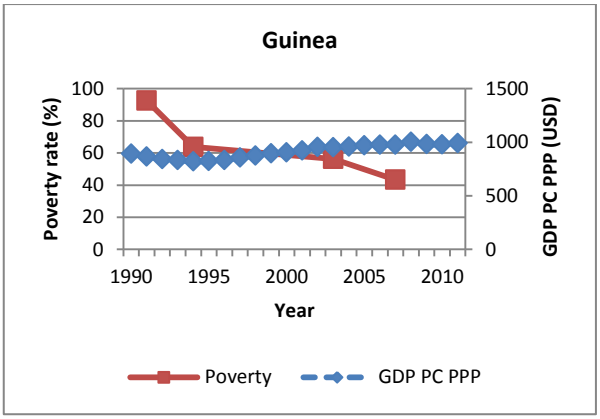
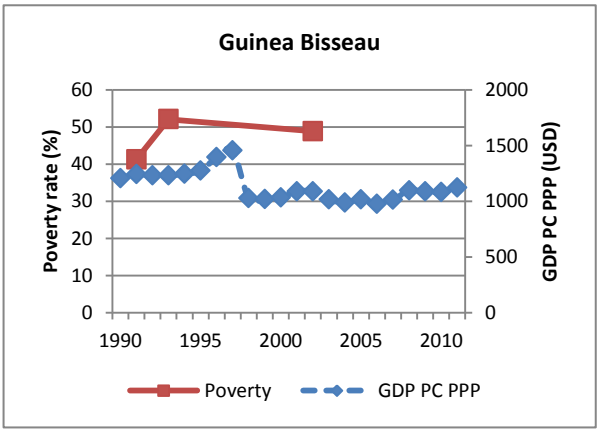
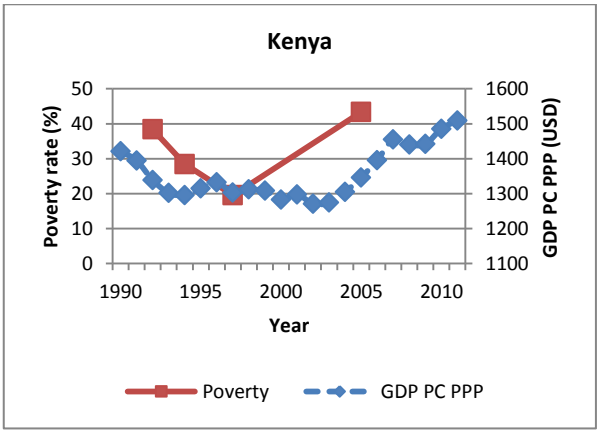
Figure 1: Poverty rate and GDP per capita by country and year

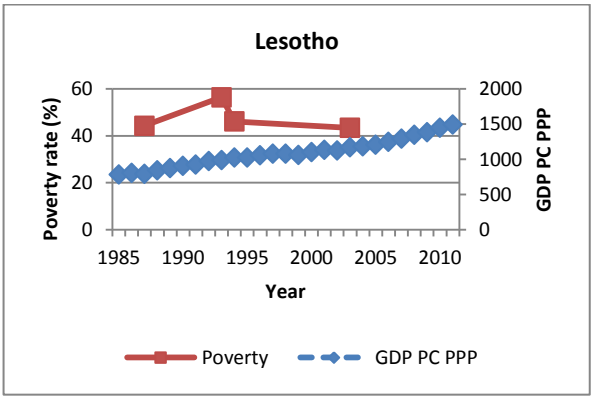


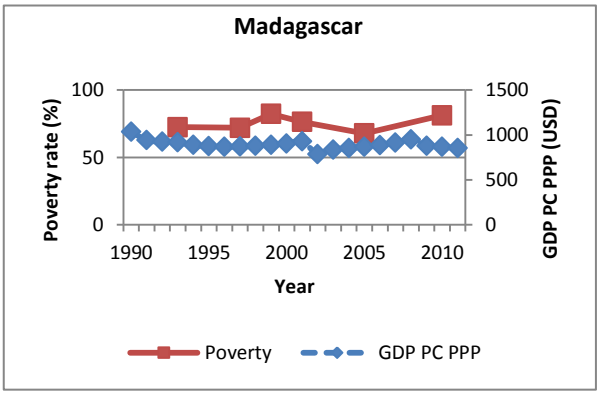

Ghana
Poverty rate
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

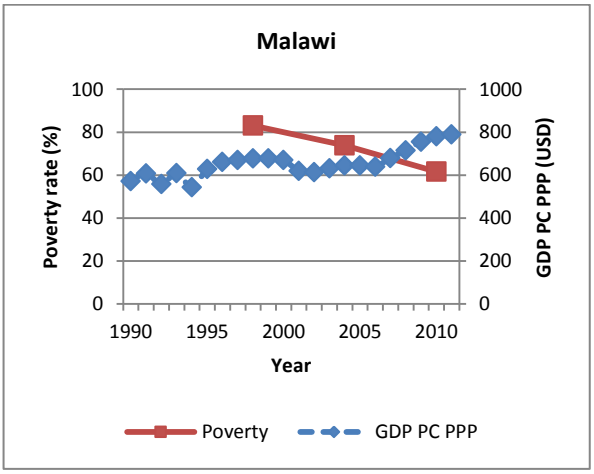

Guinea
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

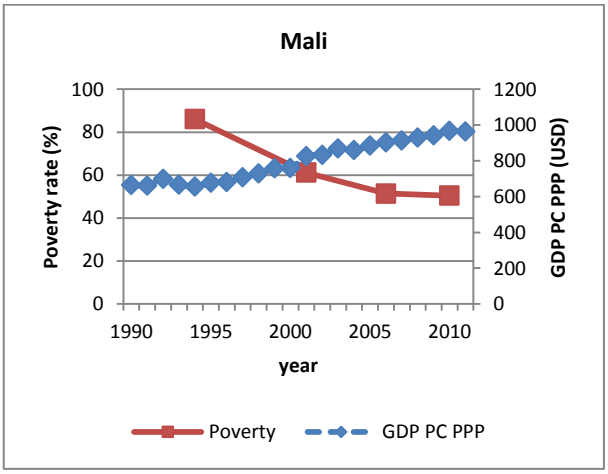

Guinea Bisseau
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

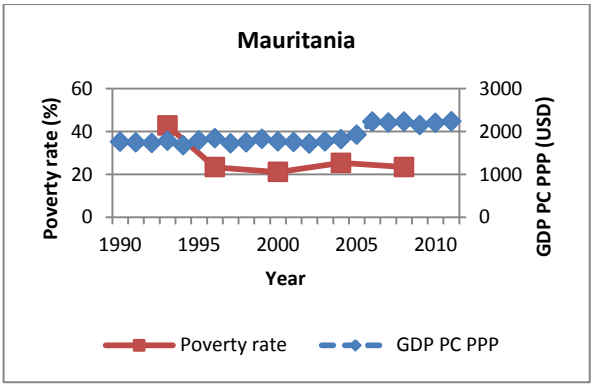

Kenya
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

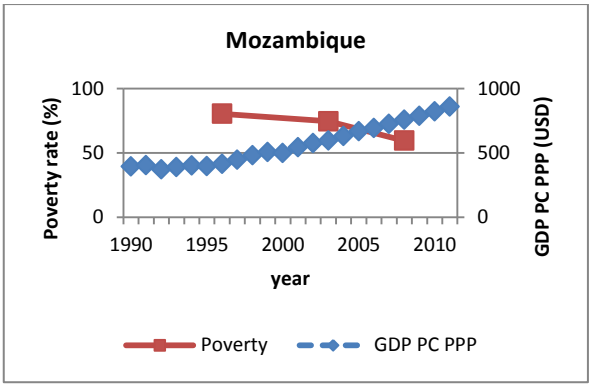

Lesotho
Poverty rate (%)
GDP PC PPP
Year
Poverty
GDP PC PPP

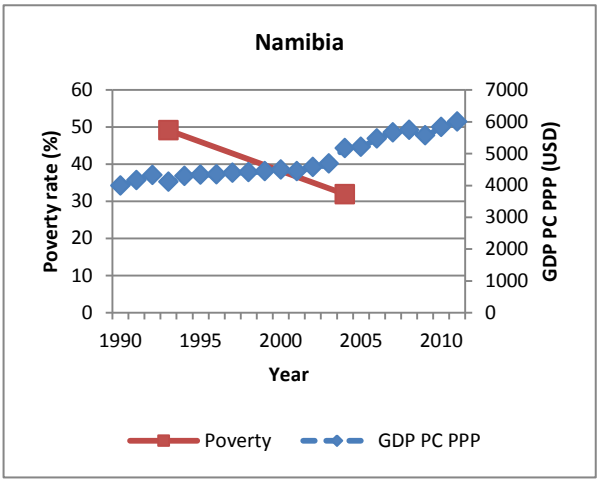

Madagascar
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

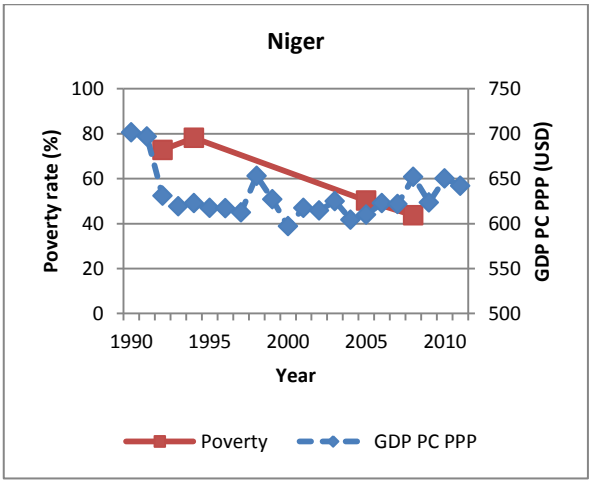

Malawi
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

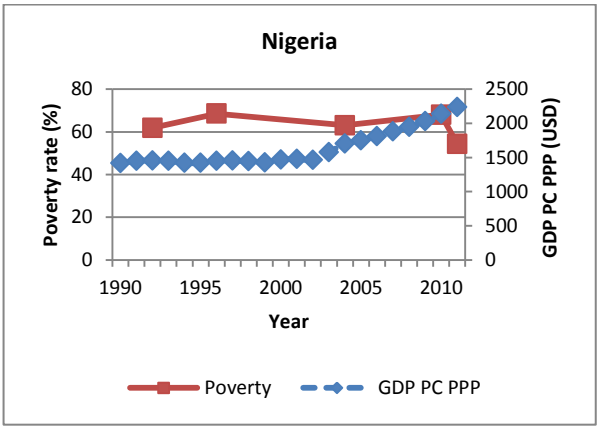

Mali
Poverty rate (%)
GDP PC PPP (USD)
year
Poverty
GDP PC PPP

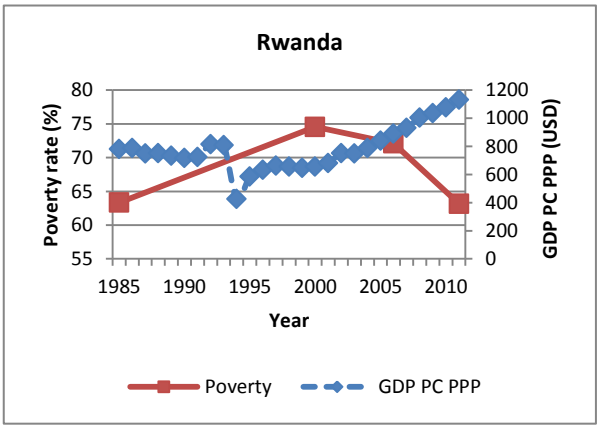

Mauritania
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty rate
GDP PC PPP

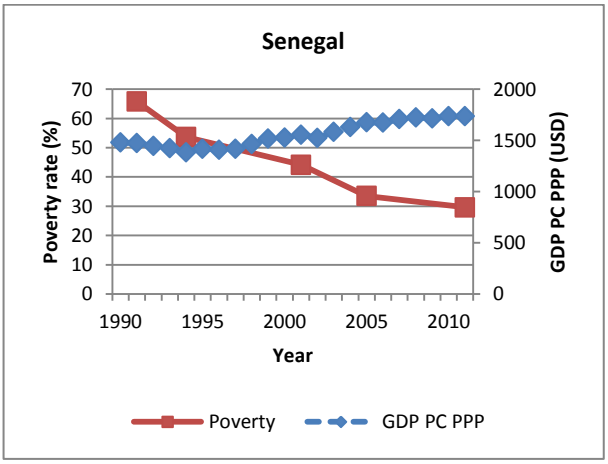

Mozambique
Poverty rate (%)
GDP PC PPP (USD)
year
Poverty
GDP PC PPP

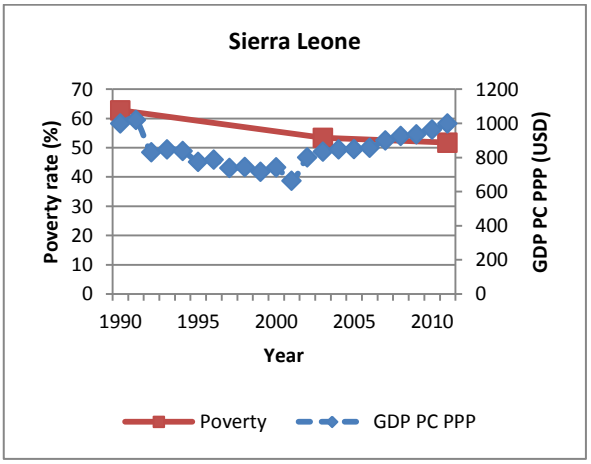

Namibia
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

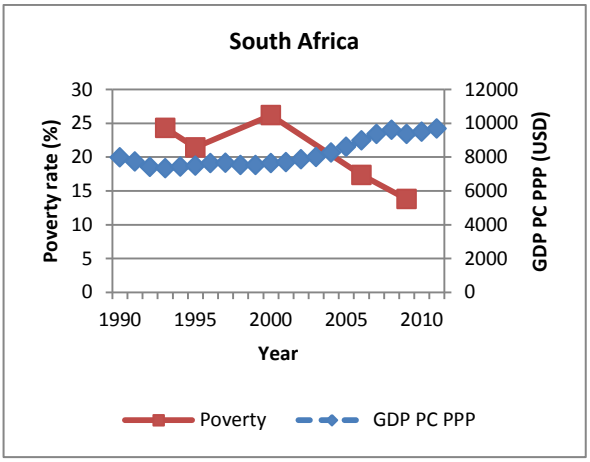

Niger
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

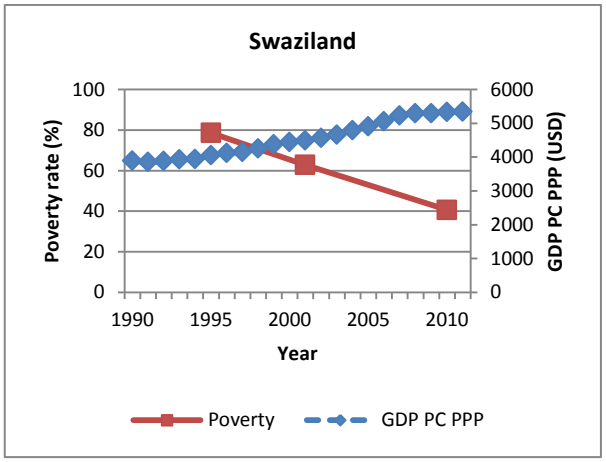

Nigeria
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

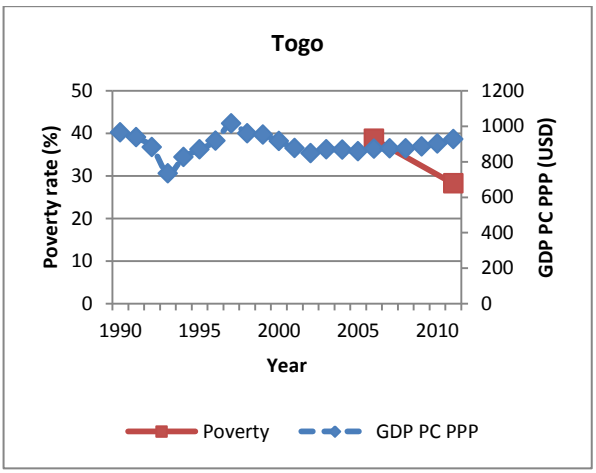

Rwanda
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

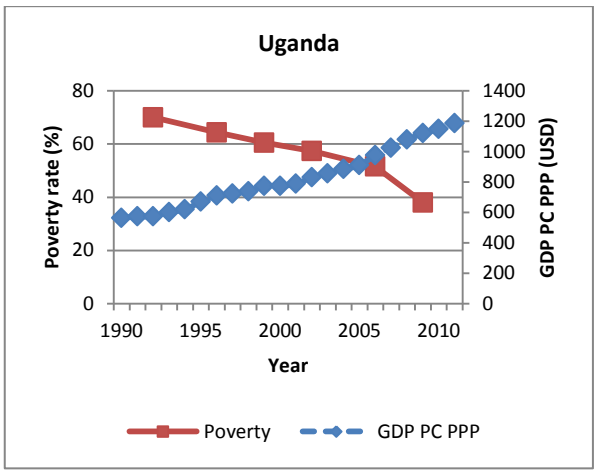

Senegal
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP


Sierra Leone
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP


South Africa
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP


Swaziland
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP


Togo
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP


Uganda
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

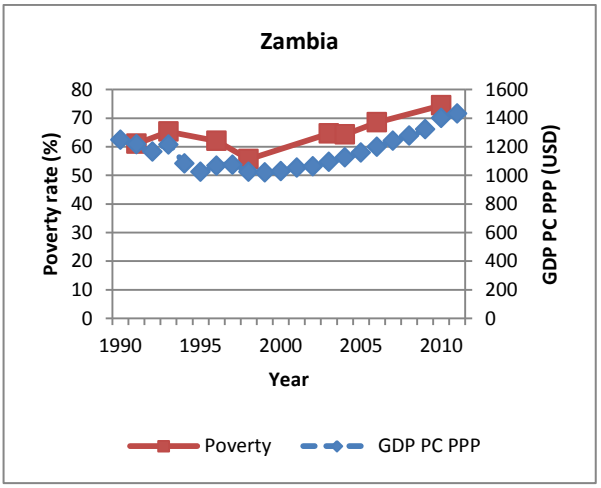
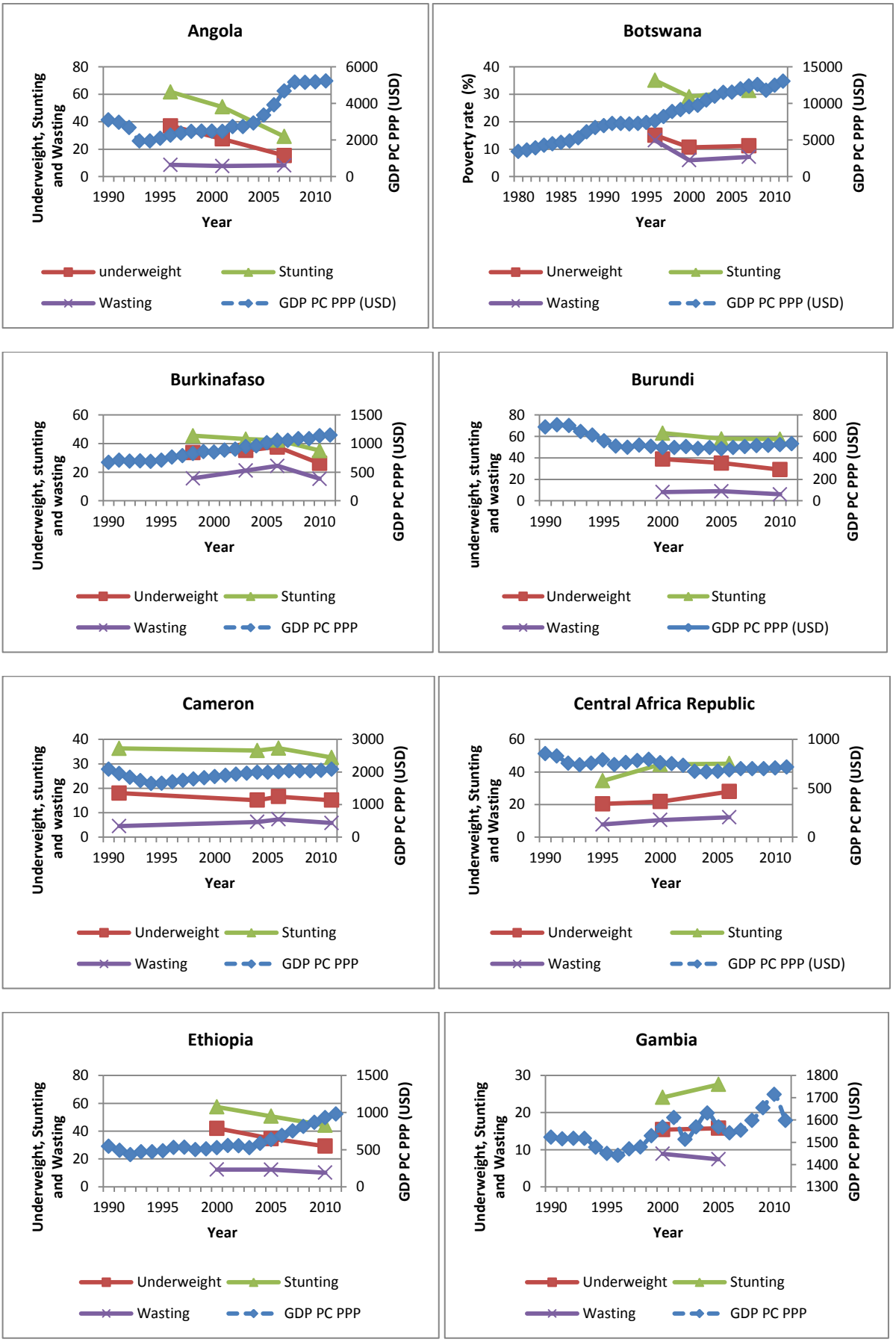
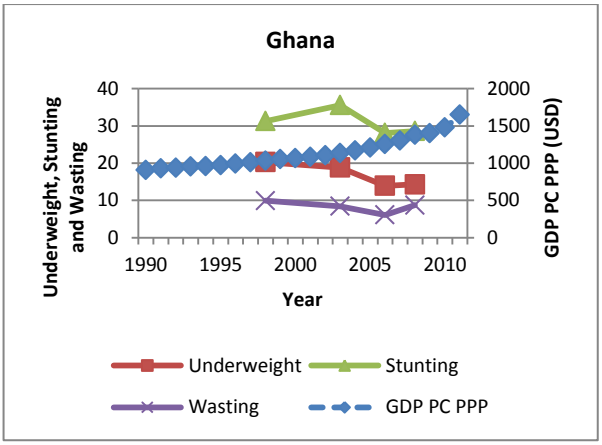
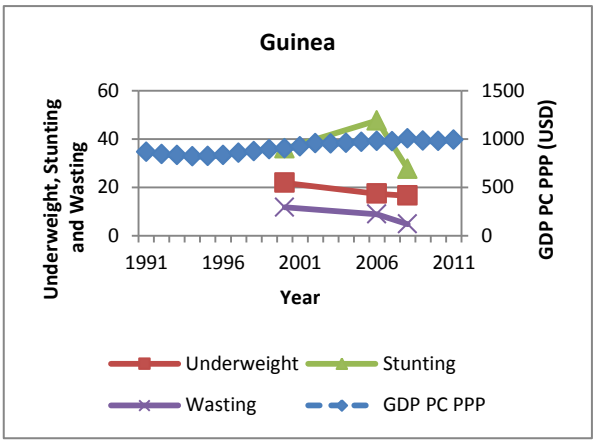
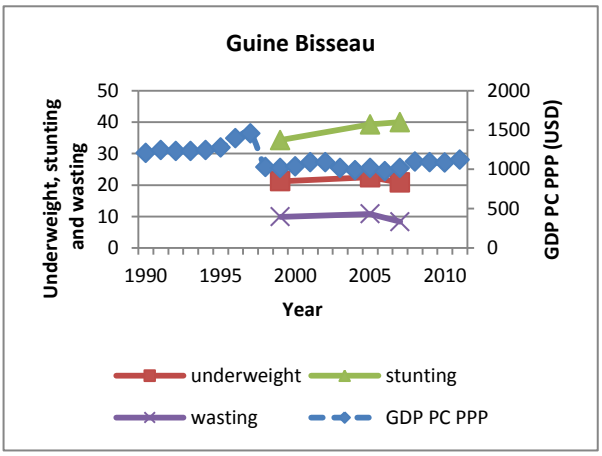

Zambia
Poverty rate (%)
GDP PC PPP (USD)
Year
Poverty
GDP PC PPP

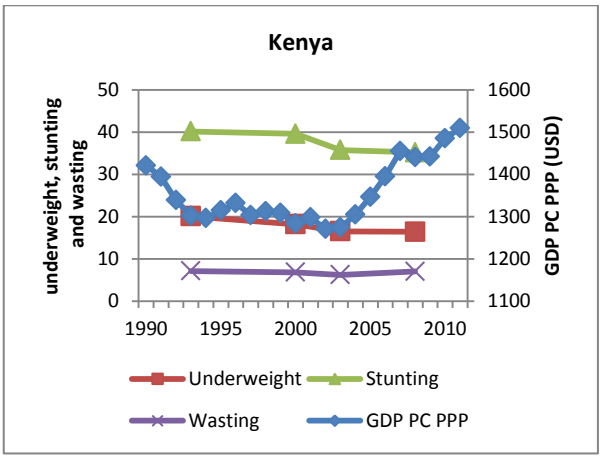
Figure 2: Under nutrition rates and GDP per capita by country and year

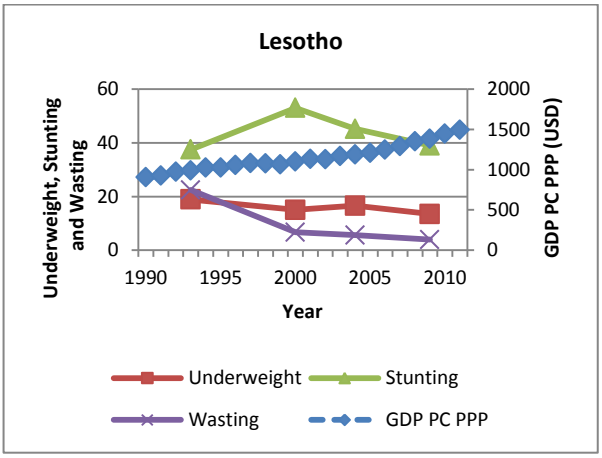


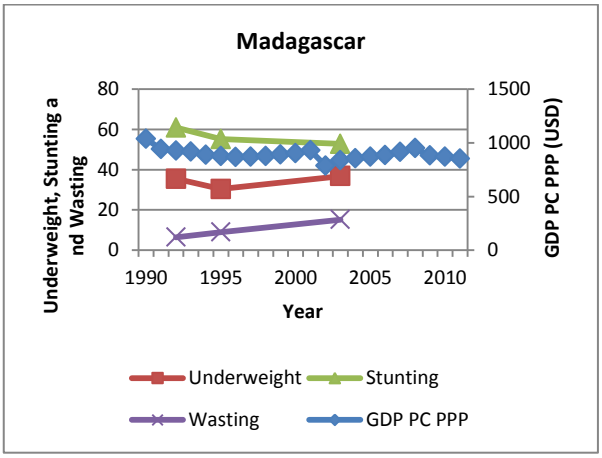

Ghana
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

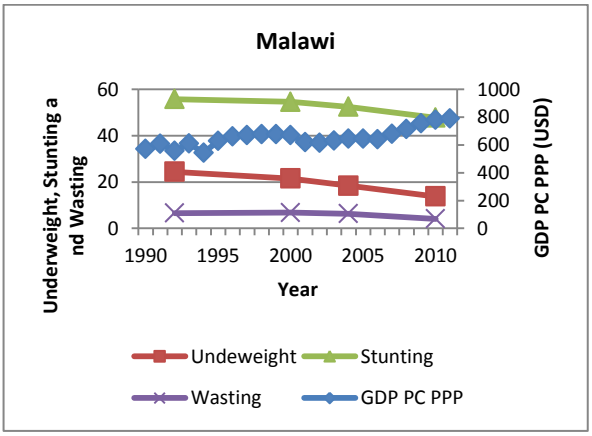

Guinea
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

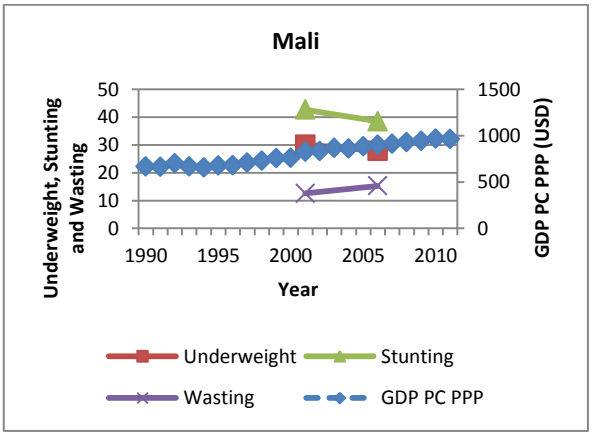

Guine Bisseau
Underweight, stunting and wasting
GDP PC PPP (USD)
Year
underweight
stunting
wasting
GDP PC PPP

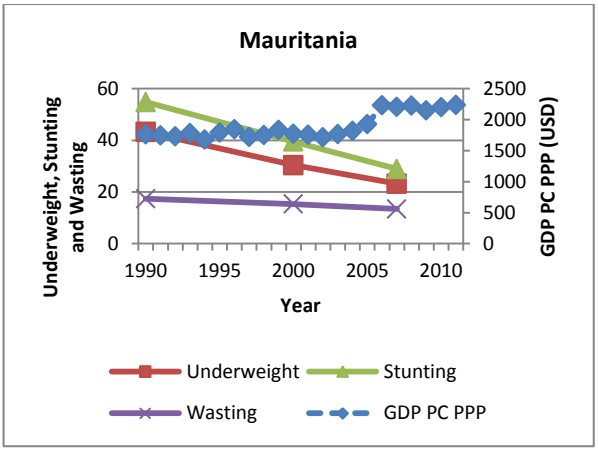

Kenya
underweight, stunting and wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

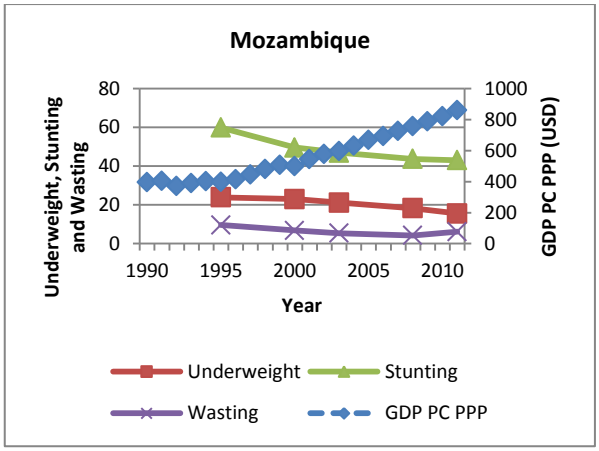

Lesotho
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

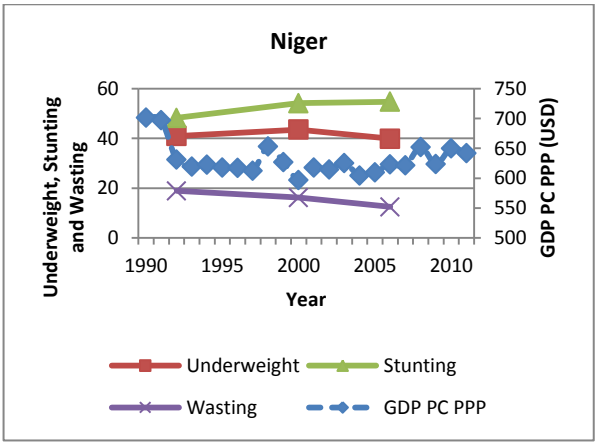

Madagascar
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

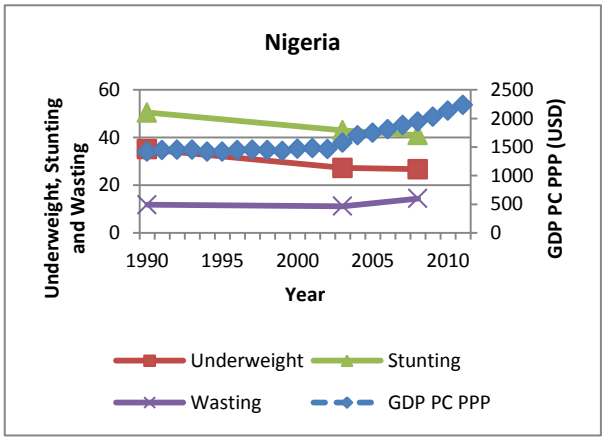

Malawi
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Undeweight
Stunting
Wasting
GDP PC PPP

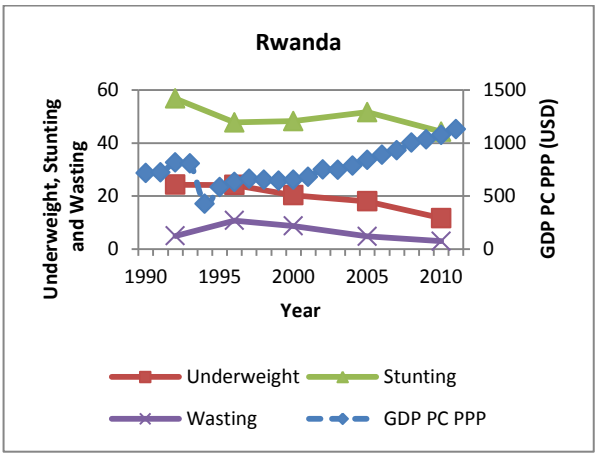

Mali
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

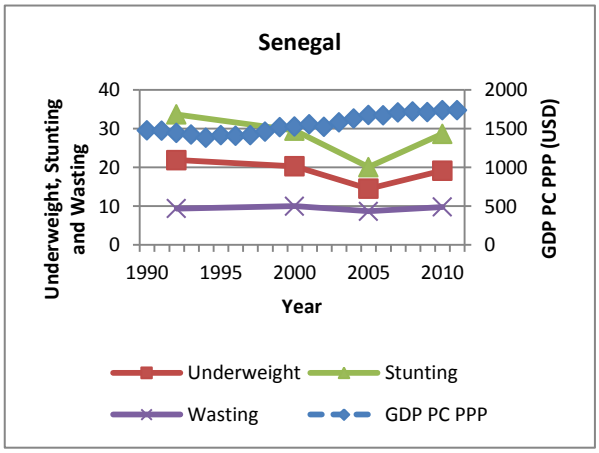

Mauritania
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

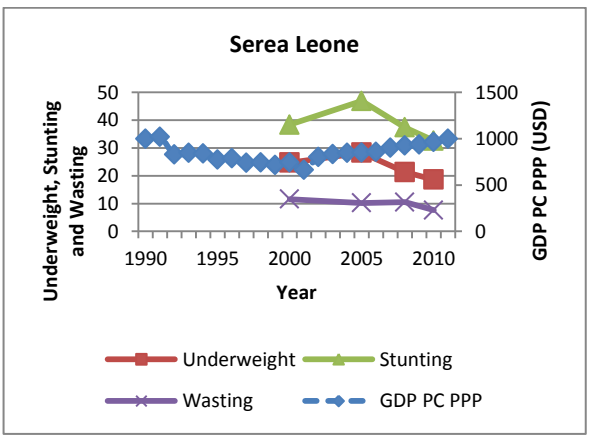

Mozambique
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

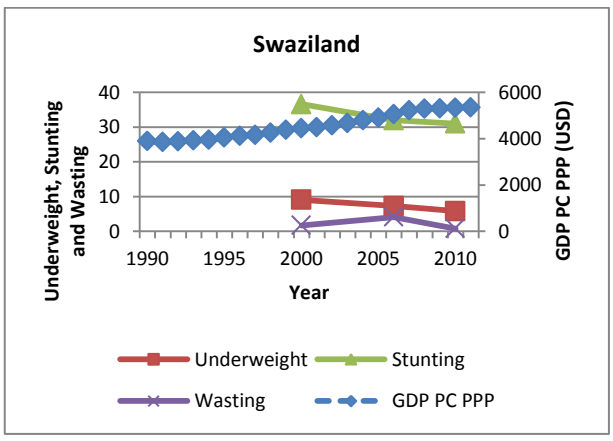

Niger
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

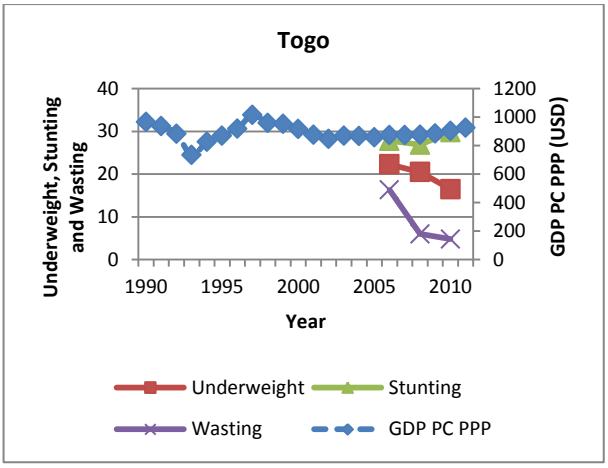

Nigeria
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

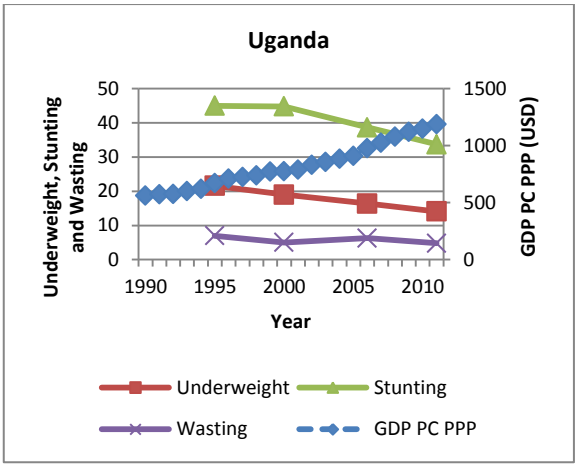

Rwanda
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

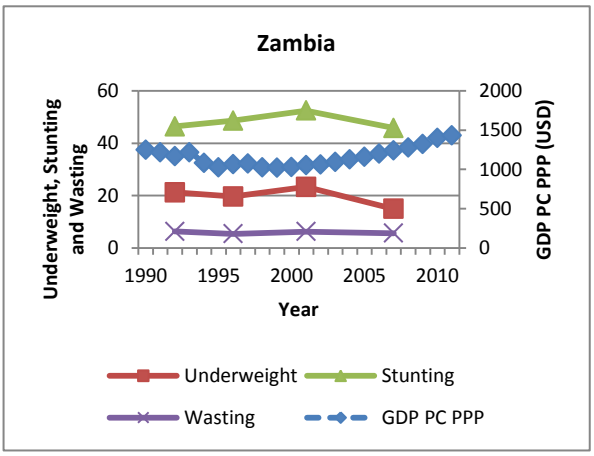

Senegal
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

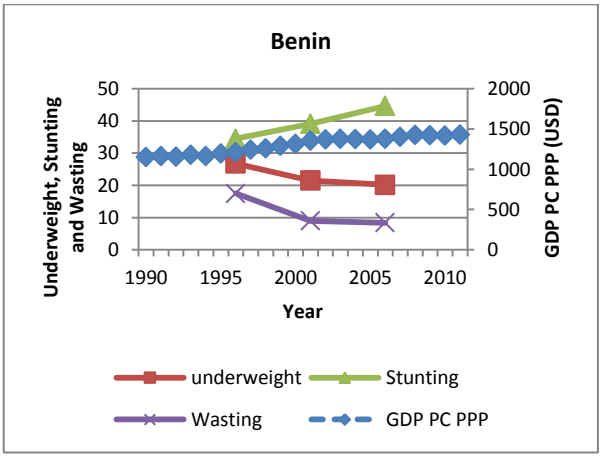

Serea Leone
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

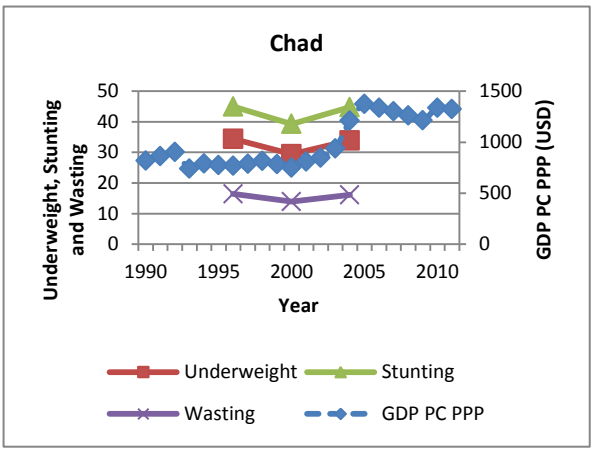

Swaziland
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

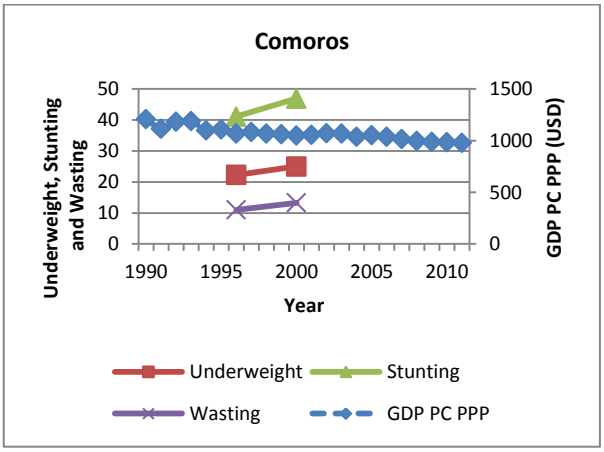

Togo
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
1990
1995
2000
2005
2010
Underweight
Stunting
Wasting
GDP PC PPP

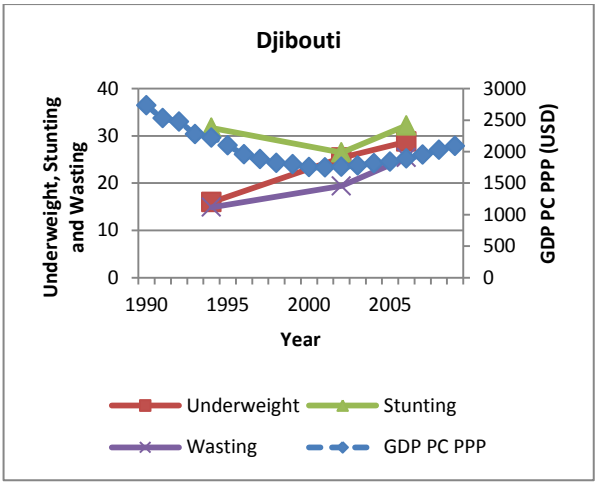

Uganda
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
1990
1995
2000
2005
2010
Underweight
Stunting
Wasting
GDP PC PPP

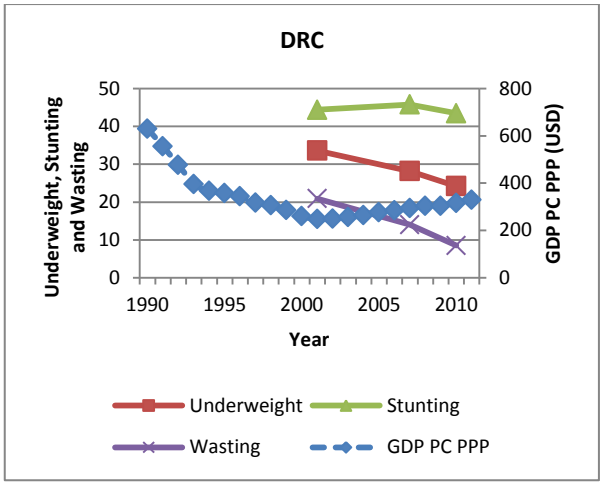

Zambia
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
1990
1995
2000
2005
2010
Underweight
Stunting
Wasting
GDP PC PPP

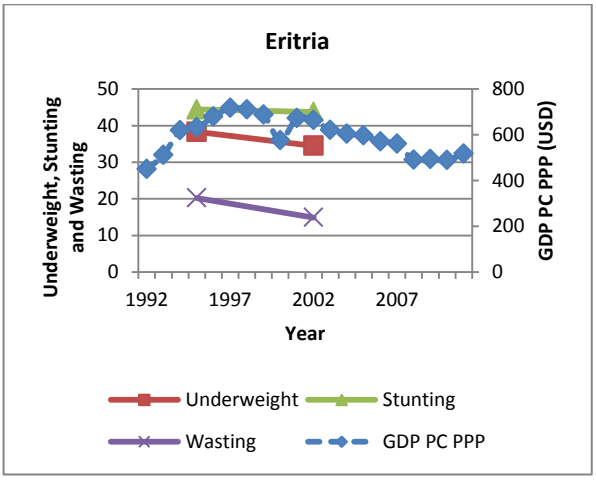

Benin
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
1990
1995
2000
2005
2010
underweight
Stunting
Wasting
GDP PC PPP


Chad
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
1990
1995
2000
2005
2010
Underweight
Stunting
Wasting
GDP PC PPP


Comoros
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
1990
1995
2000
2005
2010
Underweight
Stunting
Wasting
GDP PC PPP


Djibouti
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP


DRC
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP


Eritria
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

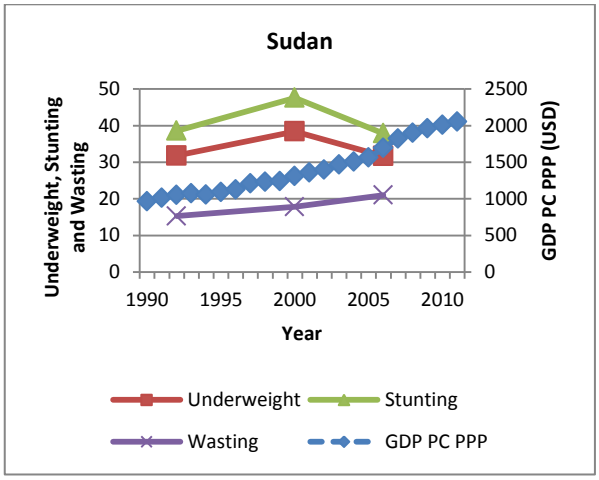

Sudan
Underweight, Stunting and Wasting
GDP PC PPP (USD)
Year
Underweight
Stunting
Wasting
GDP PC PPP

Figure 3: Poverty rate by GDP per capita levels

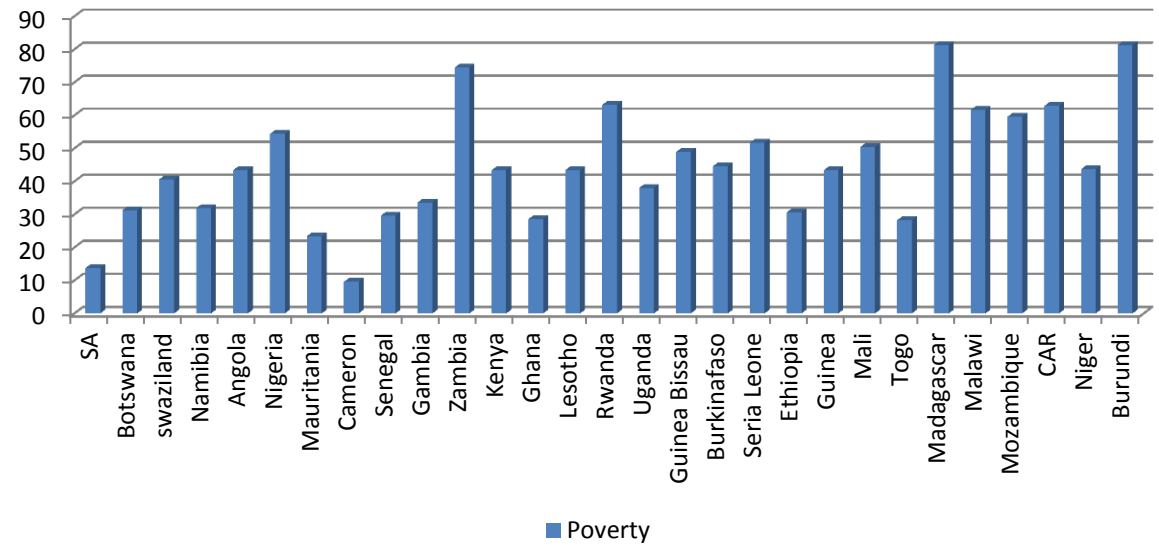
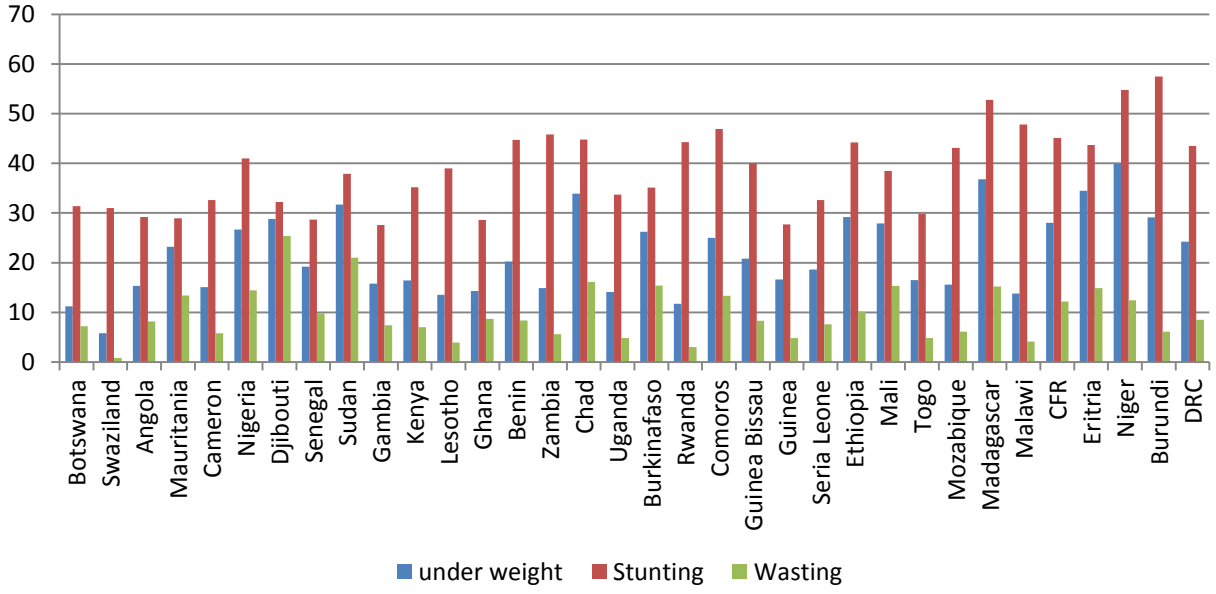


Figure 4: Undernutrition rates by GDP per capita levels



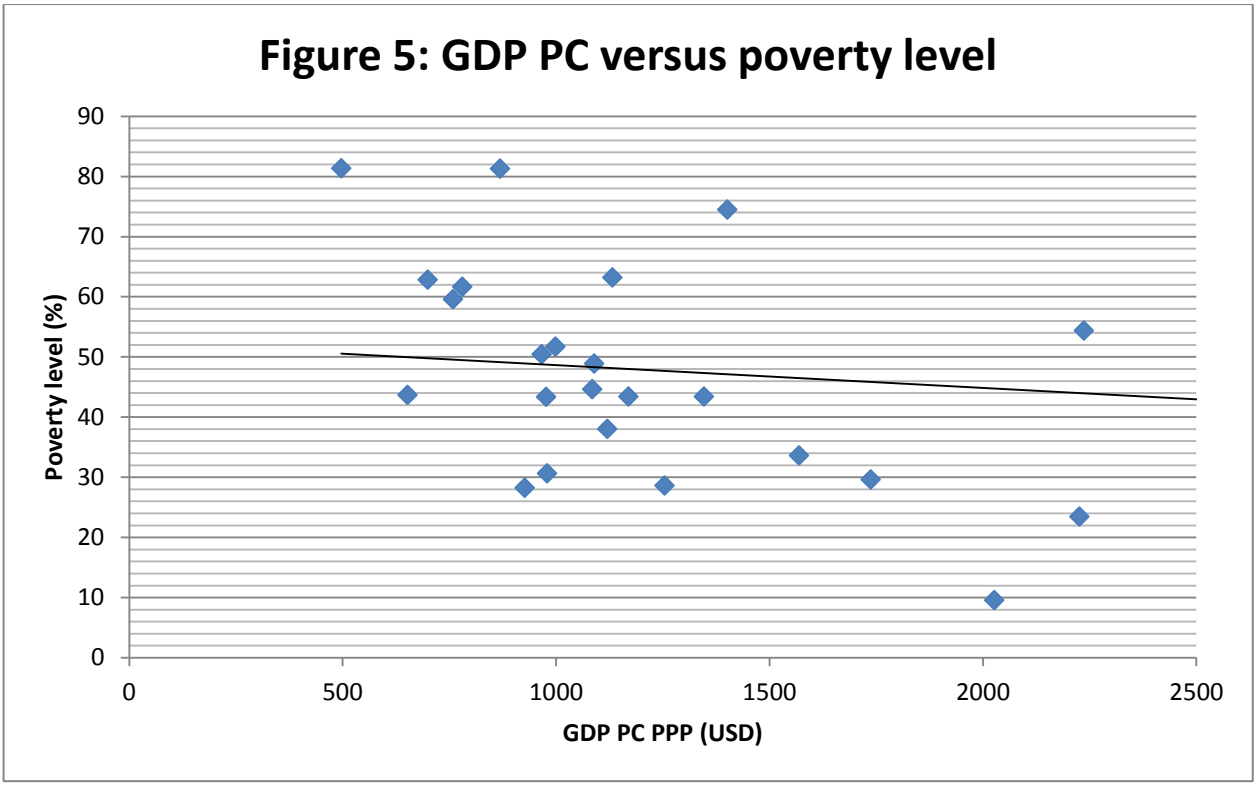
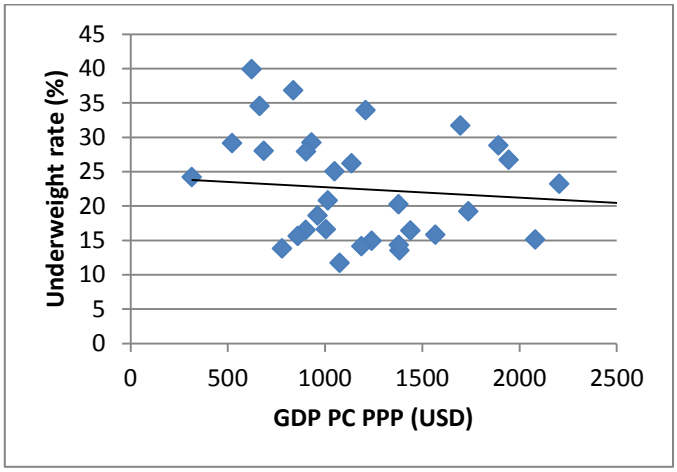
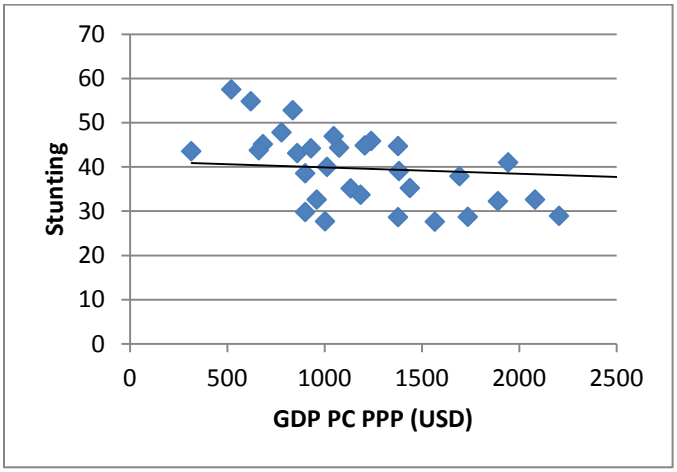
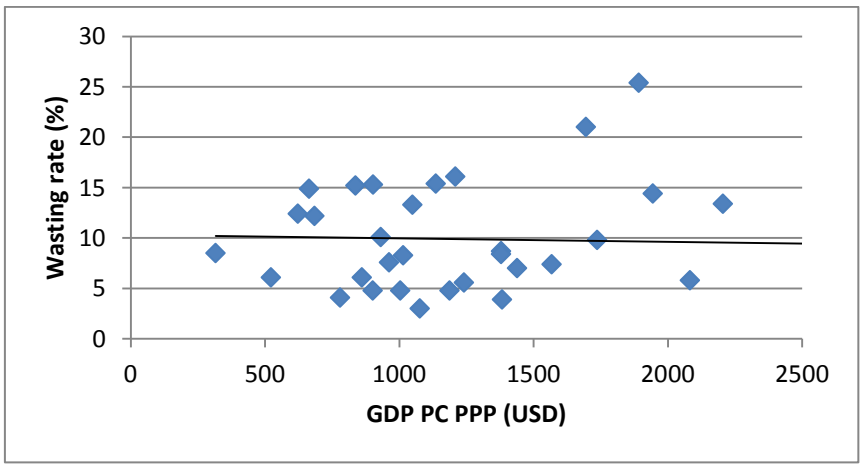


Figure 6: GDP PC versus Child Undernutrition







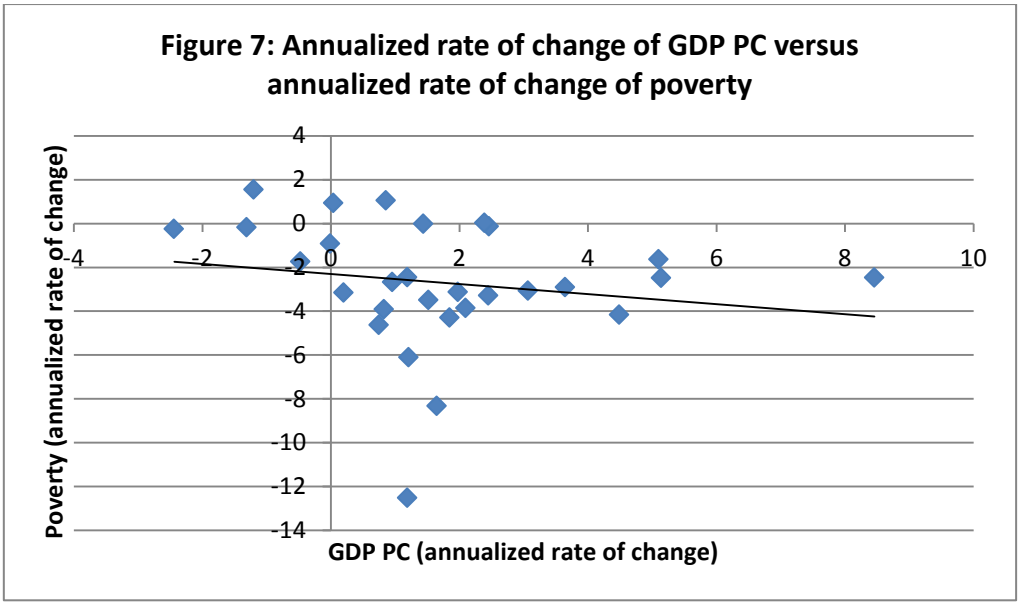
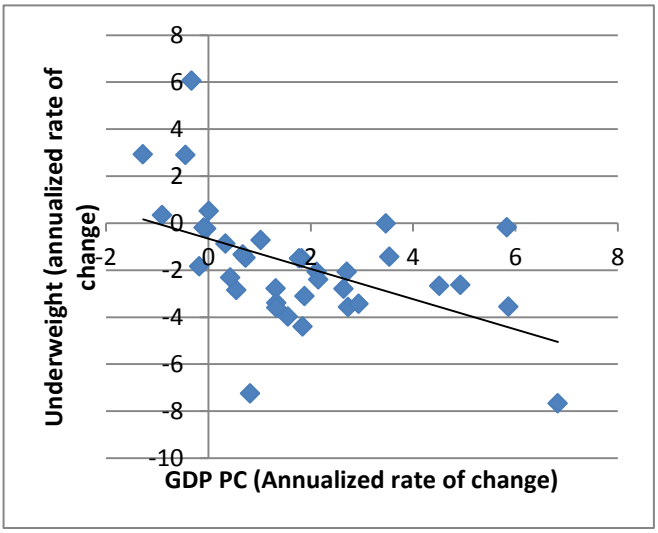
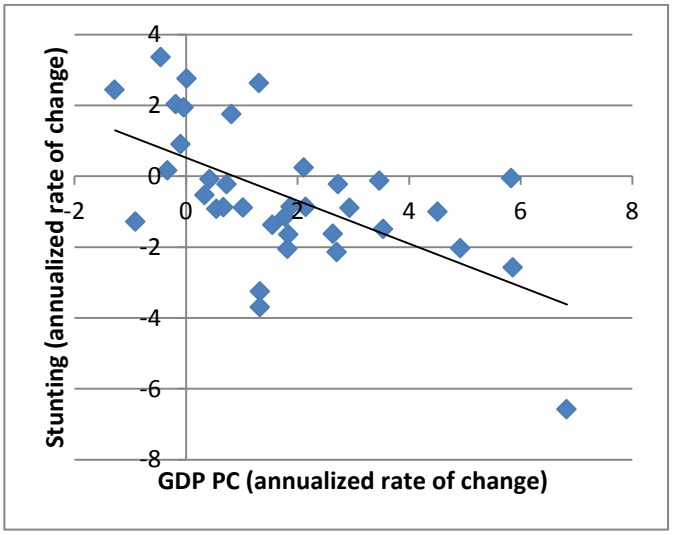
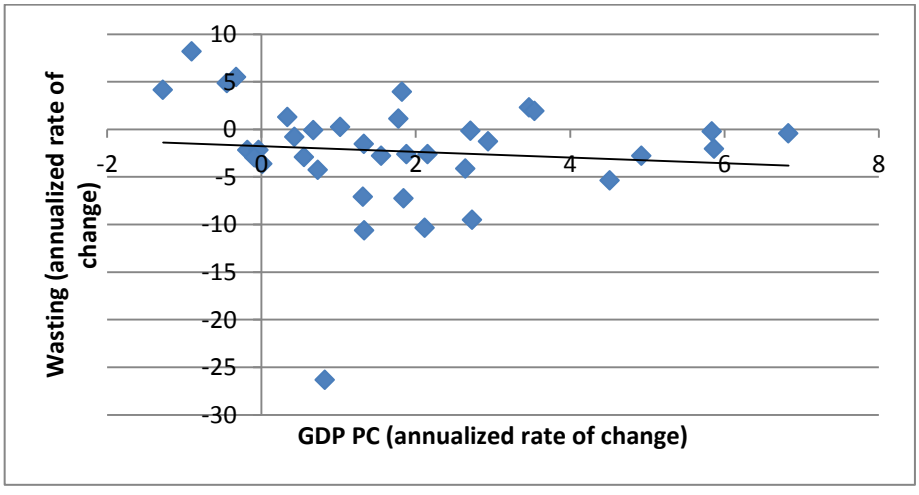


Figure 8: Annualized rate of change of GDP PC versus annualized rate of change of child undernutrition







Appendix

Table A1: Data Sample

Country	Sample Year		Country	Sample Year		Country	Sample Year		Country	Sample Year	
	Poverty	Under nutrition		Poverty	Under nutrition		Poverty	Under nutrition		Poverty	Under nutrition
Angola	2000	1996	Comoros		1996	Guinea	1991	2000	Mali	1994	2001
Angola	2009	2001	Comoros		2000	Guinea	1994	2006	Mali	2001	2006
Angola		2007	Cote d'ivoire		1994	Guinea	2003	2008	Mali	2006	
Benin		1996	Cote d'ivoire		1998	Guinea	2007		Mali	2010	
Benin		2001	Cote d'ivoire		2006	Guinea_bisseu	1991	1999	Mauritania	1987	1990
Benin		2006	Djibouti		1996	Guinea_bisseu	1993	2005	Mauritania	1993	2000
Botswana	1986	1996	Djibouti		2002	Guinea_bisseu	2002	2007	Mauritania	1996	2007
Botswana	1994	2000	Djibouti		2006	Kenya	1992	1993	Mauritania	2000	
Botswana		2007	DRC		2001	Kenya	1994	2000	Mauritania	2004	
Burkinafaso	1994	1998	DRC		2007	Kenya	1997	2003	Mauritania	2008	
Burkinafaso	1998	2003	DRC		2010	Kenya	2005	2008	Mozambique	1996	1995
Burkinafaso	2003	2006	Eritrea		1995	Lesotho	1987	1993	Mozambique	2003	2000
Burkinafaso	2009	2010	Eritrea		2002	Lesotho	1993	2000	Mozambique	2008	2003
Burundi	1992	2000	Ethiopia	1995	2000	Lesotho	1994	2004	Mozambique		2008
Burundi	1998	2005	Ethiopia	2000	2005	Lesotho	2003	2009	Mozambique		2011
Burundi	2006	2010	Ethiopia	2005	2010	Madagascar	1980	1992	Namibia	1993	
Cameroon	1996	1991	Ethiopia	2011		Madagascar	1993	1995	Namibia	2004	
Cameroon	2001	2004	Gambia	1998	2000	Madagascar	1997	2003	Niger	1992	1992
Cameroon	2007	2006	Gambia	2003	2005	Madagascar	1999		Niger	1994	2000
Cameroon		2011	Ghana	1988	1998	Madagascar	2001		Niger	2005	2006
CentralAfrica	1992	1995	Ghana	1989	2003	Madagascar	2005		Niger	2008	
CentralAfrica	2003	2000	Ghana	1992	2006	Madagascar	2010		Nigeria	1986	1990
CentralAfrica	2008	2006	Ghana	1998	2008	Malawi	1998	1992	Nigeria	1992	2003
Chad		1996	Ghana	2006		Malawi	2004	2000	Nigeria	1996	2008
Chad		2000				Malawi	2010	2004	Nigeria	2004	
Chad		2004				Malawi		2010	Nigeria	2010	

	Sample Year			Sample Year			Sample Year			Sample Year	
Country	Poverty	Under nutrition	Country	Poverty	Under nutrition	Country	Poverty	Under nutrition	Country	Poverty	Under nutrition
Nigeria	2011		Sierra Leone	1990	2000	Swaziland	2001	2006	Uganda	1999	2011
Rwanda	1985	1992	Sierra Leone	2003	2005	Swaziland	2010	2010	Uganda	2002	
Rwanda	2000	1996	Sierra Leone	2011	2008	Tanzania		1991	Uganda	2006	
Rwanda	2006	2000	Sierra Leone		2010	Tanzania		1996	Uganda	2009	
Rwanda	2011	2005	South Africa	1993		Tanzania		1999	Zambia	1991	1992
Rwanda		2010	South Africa	1995		Tanzania		2004	Zambia	1993	1996
Senegal	1991	1992	South Africa	2000		Tanzania		2009	Zambia	1996	2001
Senegal	1994	2000	South Africa	2006		Togo	2006	2006	Zambia	1998	2007
Senegal	2001	2005	South Africa	2009		Togo	2011	2008	Zambia	2003	
Senegal	2005	2010	Sudan		1992	Togo		2010	Zambia	2004	
Senegal	2011		Sudan		2000	Uganda	1989	1988	Zambia	2006	
			Sudan		2006	Uganda	1992	2000	Zambia	2010	
			Swaziland	1995	2000	Uganda	1996	2006			

Table A2: Poverty level by country and survey year

Country	year	Poverty gap	Head count	GDP PC
Angola	2000	29.94	54.31	2476
Angola	2009	16.45	43.37	5143
Botswana	1986	13.81	35.61	4873
Botswana	1994	11.04	31.23	7255
Burkinafaso	1994	34.72	71.17	689
Burkinafaso	1998	30.18	70.03	825
Burkinafaso	2003	20.27	56.54	946
Burkinafaso	2009	14.66	44.6	1085
Burundi	1992	40.2	84.24	702
Burundi	1998	47.28	86.43	518
Burundi	2006	36.39	81.32	497
Cameroon	1996	6.34	24.88	1693
Cameroon	2001	2.27	10.77	1893
Cameroon	2007	1.2	9.56	2027
Cent. Africa	1992	57.41	83.15	755
Cent. Africa	2003	28.3	62.43	671
Cent. Africa	2008	31.26	62.83	700
Ethiopia	1982	22.39	66.22	588
Ethiopia	1995	21.23	60.52	485
Ethiopia	2000	16.21	55.58	527
Ethiopia	2005	9.6	38.96	636
Ethiopia	2011	8.19	30.65	979
Gambia	1998	33.81	65.61	1479
Gambia	2003	11.69	33.63	1569
Ghana	1988	17.99	50.59	882
Ghana	1989	17.18	49.37	902
Ghana	1992	18.34	51.07	937
Ghana	1998	14.35	39.12	1033
Ghana	2006	9.88	28.59	1255
Guinea	1991	63.34	92.55	867
Guinea	1994	29.67	63.81	821
Guinea	2003	21.28	56.32	952
Guinea	2007	14.96	43.34	977
Guinea bisseu	1991	21.7	41.31	1244
Guinea Bis.	1993	20.55	52.11	1233
Guinea Bis.	2002	16.55	48.9	1089
Kenya	1992	15.35	38.42	1339
Kenya	1994	9.35	28.5	1296
Kenya	1997	4.64	19.57	1303
Kenya	2005	16.91	43.37	1346
Lesotho	1987	20.9	44.35	793
Lesotho	1993	30.15	56.43	990
Lesotho	1994	25.64	46.15	1024
Lesotho	2003	20.76	43.41	1170
Madag.	1980	50.52	85.89	1289
Madag.	1993	34.8	72.49	917
Madag.	1997	32.8	72.04	871
Madag.	1999	44.25	82.32	890
Madag.	2001	41.37	76.34	929
Madag.	2005	26.52	67.83	869
Madag.	2010	43.26	81.29	869
Malawi	1998	45.96	83.07	677
Malawi	2004	32.31	73.86	645
Malawi	2010	26.18	61.64	780
Mali	1994	53.09	86.08	656
Mali	2001	25.78	61.18	825
Mali	2006	18.79	51.43	903
Mali	2010	16.36	50.43	967
Maurit.	1987	17.99	41.32	1823
Maurit.	1993	14.44	42.79	1782
Maurit.	1996	7.06	23.4	1845
Maurit.	2000	5.66	21.16	1771
Maurit.	2004	6.95	25.41	1817
Maurit.	2008	6.79	23.43	2227
Mozamb.	1996	41.16	80.56	416
Mozamb.	2003	35.4	74.69	597
Mozamb.	2008	25.13	59.58	759
Namibia	1993	24.59	49.14	4114
Namibia	2004	9.45	31.91	5168
Niger	1992	29.66	72.79	631
Niger	1994	38.57	78.17	623
Niger	2005	18.33	50.2	610
Niger	2008	12.42	43.62	652
Nigeria	1986	21.9	53.93	1240
Nigeria	1992	31.12	61.9	1455
Nigeria	1996	32.05	68.51	1447
Nigeria	2004	28.66	63.07	1702
Nigeria	2010	33.74	67.98	2137
Nigeria	2011	21.84	54.37	2237
Rwanda	1985	19.71	63.33	780
Rwanda	2000	36.85	74.56	654
Rwanda	2006	34.82	72.1	889
Rwanda	2011	26.64	63.17	1132
Senegal	1991	34.32	65.81	1473
Senegal	1994	19.21	53.64	1384
Senegal	2001	14.34	44.19	1556
Senegal	2005	10.8	33.5	1677
Senegal	2011	9.13	29.61	1737
Sierra Leo.	1990	44.81	62.79	1000
Sierra Leo.	2003	20.3	53.37	834
Sierra Leo.	2011	16.64	51.71	998
SA	1993	6.92	24.3	7346
SA	1995	5.22	21.43	7490
SA	2000	8.18	26.2	7641
SA	2006	3.27	17.35	8977
SA	2009	2.3	13.77	9356
Swaziland	1995	47.74	78.59	4054
Swaziland	2001	29.38	62.85	4494
Swaziland	2010	16	40.63	5338
togo	2006	11.37	38.68	873
togo	2011	8.81	28.22	927
Uganda	1989	33.18	68.65	547
Uganda	1992	30.33	70.01	574
Uganda	1996	24.8	64.39	710
Uganda	1999	24.52	60.49	774
Uganda	2002	22.67	57.37	830
Uganda	2006	19.11	51.53	977
Uganda	2009	12.21	38.01	1121
Zambia	1991	39.69	61.05	1216
Zambia	1993	35.56	65.27	1214
Zambia	1996	29.49	62.07	1067
Zambia	1998	26.94	55.67	1024
Zambia	2003	27.13	64.6	1093
Zambia	2004	32.76	64.29	1125
Zambia	2006	37.02	68.51	1200
Zambia	2010	41.91	74.45	1431
Ave. - all surv. years		23.9	53.7	
Ave. – last surv. years		17.6	45	

Table A3: Mean rates of child under nutrition by country and survey year

Country	Year	GDP PC	Under weight	stunting	wasting
Angola	1996	2259	37	61.7	8.6
Angola	2001	2472	27.5	50.8	7.7
Angola	2007	4672	15.36	29.2	8.2
Benin	1996	1211	26.8	34.5	17.5
Benin	2001	1354	21.5	39.1	9
Benin	2006	1380	20.2	44.7	8.4
Botswana	1996	7614	15.1	35.1	13.2
Botswana	2000	9531	10.7	29.1	6
Botswana	2007	12376	11.2	31.4	7.2
Burkina faso	1998	825	33.7	45.5	15.7
Burkina faso	2003	946	35.2	43.1	21.2
Burkina faso	2006	1051	37.6	42.4	24.4
Burkina faso	2010	1137	26.2	35.1	15.4
Burundi	2000	496	38.9	63.1	8.2
Burundi	2005	486	35.2	57.7	9
Burundi	2010	524	29.1	57.5	6.1
Cameron	1991	1947	18	36.3	4.5
Cameron	2004	1985	15.1	35.4	6.2
Cameron	2006	2005	16.6	36.4	7.3
Cameron	2011	2083	15.1	32.6	5.8
Central Africa	1995	790	20.4	34.6	7.8
Central Africa	2000	759	21.8	44.6	10.5
Central Africa	2006	686	28	45.1	12.2
Chad	1996	768	34.4	45	16.4
Chad	2000	750	29.4	39.3	13.9
Chad	2004	1209	33.9	44.8	16.1
Comoros	1996	1069	22.3	41.1	11
Comoros	2000	1050	25	46.9	13.3
Cote d'ivoire	1994	1685	20.9	31.5	11.2
Cote d'ivoire	1998	1933	18.2	31.5	6.9
Cote d'ivoire	2006	1649	16.7	40.1	8.6
Djibouti	1996	1956	16	31.7	14.9
Djibouti	2002	1758	25.4	26.5	19.4
Djibouti	2006	1893	28.8	32.2	25.4
DRC	2001	248	33.6	44.4	20.9
DRC	2007	294	28.2	45.8	14
DRC	2010	316	24.2	43.5	8.5
Eritrea	1995	631	38.3	44.4	20.2
Eritrea	2002	664	34.5	43.7	14.9
Ethiopia	2000	527	42	57.4	12.4
Ethiopia	2005	636	34.6	50.7	12.3
Ethiopia	2010	932	29.2	44.2	10.1
Gambia	2000	1568	15.4	24.1	8.9
Gambia	2005	1569	15.8	27.6	7.4
Ghana	1998	1033	20.3	31.3	9.9
Ghana	2003	1134	18.8	35.6	8.4
Ghana	2006	1255	13.9	28.1	6.1
Ghana	2008	1380	14.3	28.6	8.7
Guinea	2000	904	21.9	36.1	11.8
Guinea	2006	978	17.4	47.7	8.9
Guinea	2008	1005	16.6	27.7	4.8
Guinea Bissau	1999	1018	21.2	34.3	9.9
Guinea Bissau	2005	1017	22.5	39.3	10.8
Guinea Bissau	2007	1015	20.8	40	8.3
kenya	1993	1302	20.1	40.2	7.1
kenya	2000	1283	18.2	39.6	6.8
kenya	2003	1274	16.5	35.8	6.2
kenya	2008	1440	16.4	35.2	7
lesotho	1993	990	18.9	37.5	22.4
lesotho	2000	1102	15	53	6.7
lesotho	2004	1186	16.6	45.2	5.6
lesotho	2009	1384	13.5	39	3.9
Madaga.	1992	926	35.5	60.9	6.4
Madaga.	1995	867	30.4	55.2	9
Madaga.	2003	838	36.8	52.8	15.2
Malawi	1992	558	24.4	55.8	6.6
Malawi	2000	670	21.5	54.6	6.8
Malawi	2004	645	18.4	52.5	6.3
Malawi	2010	780	13.8	47.8	4.1
Mali	2001	825	30.1	42.7	12.6
Mali	2006	903	27.9	38.5	15.3
Mauritania	1990	1763	43.3	54.8	17.4
Mauritania	2000	1771	30.4	39.5	15.3
Mauritania	2007	2206	23.2	28.9	13.4
Mozamb.	1995	399	23.9	59.9	9.6
Mozamb.	2000	501	23	49.6	6.8
Mozamb.	2003	597	21.2	47	5.4
Mozamb.	2008	759	18.3	43.7	4.2
Mozamb.	2011	861	15.6	43.1	6.1

Country	Year	GDP PC	Under weight	stunting	wasting
Niger	1992	631	41	48.3	18.9
Niger	2000	597	43.6	54.2	16.2
Niger	2006	623	39.9	54.8	12.4
Nigeria	1990	1417	35.1	50.5	11.8
Nigeria	2003	1577	27.2	43	11.2
Nigeria	2008	1945	26.7	41	14.4
Rwanda	1992	816	24.3	56.8	5
Rwanda	1996	632	24.2	47.8	10.8
Rwanda	2000	654	20.3	48.3	8.7
Rwanda	2005	840	18	51.7	4.8
Rwanda	2010	1077	11.7	44.3	3
Senegal	1992	1447	21.9	33.7	9.4
Senegal	2000	1527	20.3	29.5	10
Senegal	2005	1677	14.5	20.1	8.7
Senegal	2010	1738	19.2	28.7	9.8
Seirra Leone	2000	742	24.7	38.4	11.6
Seirra Leone	2005	850	28.3	46.9	10.2
Seirra Leone	2008	926	21.3	37.4	10.5
Seirra Leone	2010	963	18.6	32.6	7.6

Country	Year	GDP PC	Under weight	stunting	wasting
Sudan	1992	1052	31.8	38.6	15.3
Sudan	2000	1310	38.4	47.6	17.8
Sudan	2006	1696	31.7	37.9	21
Swaziland	2000	4448	9.1	36.6	1.7
Swaziland	2006	5060	7.3	32	4.1
Swaziland	2010	5338	5.8	31	0.8
Tanzania	1991	848	25.1	49.7	7.9
Tanzania	1996	812	26.9	49.7	8.5
Tanzania	1999	848	25.3	48.3	5.6
Tanzania	2004	1024	16.7	44.4	3.5
Tanzania	2009	1244	16.2	42.5	4.9
Togo	2006	5338	22.3	27.8	16.3
Togo	2008	875	20.5	26.9	6
Togo	2010	902	16.5	29.8	4.8
Uganda	1988	534	19.7	47.6	3.1
Uganda	2000	774	19	44.8	5
Uganda	2006	977	16.4	38.7	6.3
Uganda	2011	1188	14.1	33.7	4.8
Zambia	1992	1165	21.2	46.4	6.3
Zambia	1996	1067	19.6	48.6	5.4
Zambia	2001	1053	23.3	52.5	6.2
Zambia	2007	1242	14.9	45.8	5.6

Overall average level of under nutrition

	Underweight	Stunting	Wasting
Average of all survey years	23.4	41.5	10.1
Average of last survey years of each country	21.2	38.8	9.4

Table A4: Annualized rate of change of poverty and GDP per capita

Country	annualized rate of change of poverty (headcount)	annualized rate of change of GDP Per Capita
Angola	-2.47	8.46
Botswana	-1.63	5.1
Burkinafaso	-3.07	3.07
Burundi	-0.25	-2.44
Cameroon	-8.33	1.65
Central_Africa	-1.74	-0.47
Ethiopia	-4.16	4.49
Gambia	-12.51	1.19
Ghana	-3.12	1.98
Guinea	-4.63	0.75
Guinea_bisseu	1.55	-1.2
Kenya	0.94	0.04
Lesotho	-0.13	2.46
Madagascar	-0.18	-1.31
Malawi	-2.46	1.19
Mali	-3.29	2.45
Mauritania	-2.67	0.96
Mozambique	-2.48	5.14
Namibia	-3.85	2.1
Niger	-3.15	0.2
Nigeria	0.03	2.39
Rwanda	-0.01	1.44
Senegal	-3.91	0.83
Sierra_Leone	-0.92	-0.01
South_Africa	-3.49	1.52
Swaziland	-4.3	1.85
Togo	-6.11	1.21
Uganda	-2.91	3.65
Zambia	1.05	0.86

Table A5: Annualized rate of change in GDP PC and child under nutrition

Country	annualized rate of change in GDP PC	annualized rate of change in underweight	Annualized rate of change in stunting	Annualized rate of change in wasting
Angola	6.83	-7.68	-6.58	-0.43
Benin	1.32	-2.79	2.62	-7.08
Botswana	4.52	-2.68	-1.01	-5.36
Burkinafaso	2.71	-2.08	-2.14	-0.16
Burundi	0.55	-2.86	-0.93	-2.92
Cameron	0.34	-0.88	-0.54	1.28
CentralAfrica	-1.28	2.92	2.44	4.15
Chad	5.84	-0.18	-0.06	-0.23
Comoros	-0.45	2.90	3.36	4.86
cote_d'ivoire	-0.18	-1.85	2.03	-2.18
Djibouti	-0.33	6.05	0.16	5.48
DRC	2.73	-3.58	-0.23	-9.51
Eritrea	0.73	-1.48	-0.23	-4.25
Ethiopia	5.87	-3.57	-2.58	-2.03
Gambia	0.013	0.51	2.75	-3.62
Ghana	2.94	-3.44	-0.90	-1.28
Guinea	1.33	-3.40	-3.26	-10.64
Guinea_Bissau	-0.04	-0.24	1.94	-2.18
Kenya	0.67	-1.35	-0.88	-0.09
Lesotho	2.12	-2.08	0.25	-10.35
Madagaskar	-0.90	0.33	-1.29	8.18
Malawi	1.88	-3.12	-0.86	-2.61
Mali	1.82	-1.51	-2.05	3.96
Mauritania	1.33	-3.60	-3.69	-1.53
mozambique	4.93	-2.63	-2.04	-2.79
Niger	-0.09	-0.19	0.91	-2.97
Nigeria	1.78	-1.51	-1.15	1.11
Rwanda	1.56	-3.98	-1.37	-2.80
Senegal	1.02	-0.73	-0.89	0.23
Seirra_leone	2.64	-2.80	-1.62	-4.14
Sudan	3.47	-0.02	-0.13	2.29
Swaziland	1.84	-4.40	-1.65	-7.26
Tanzania	2.15	-2.40	-0.87	-2.62
Togo	0.82	-7.25	1.75	-26.34
Uganda	3.54	-1.44	-1.49	1.92
Zambia	0.43	-2.32	-0.09	-0.78

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