Educational Resource Inequality Among Children in sub Saharan Africa: Trends and Drivers

Vongai Kandiwa
PhD Candidate, Cornell University
Development Sociology and Demography
435 Warren Hall, Ithaca NY 14853
Email:vk30@cornell.edu

Abstract

Uneven fertility transitions and economic reversals could foster socio-economic inequality across sub Saharan African countries. But, the extent to which these processes influence educational resource inequality among children remains unclear. This study seeks to (i) determine levels and trends in educational resource inequality among children in sub Saharan Africa, and (ii) account for factors that drive changes in observed inequality. Using data from Penn World Tables and World Bank's World Development Indicators, it estimates standards measures of inequality and applies decomposition techniques to account for factors that drive inequality. The evidence reveals high levels of resource inequality among children. Decomposition results show that age structure, size of economy, and share of GDP allocated to children's schooling drive changes in resource inequality while variation in child population size has little effect. Overall, the study highlights consequences of uneven demographic transitions and argues that research on dividends should focus on children inequality.

Introduction

The salience of education is well acknowledged in the literature. Not only is education an end in itself (UN 1948), but, it mediates accomplishment of various social outcomes such as economic growth (Lucas 1988; Becker Murphy and Tamura 1990; Mulligan and Sala-i-Martin 1993) poverty, improved health, greater equity, and reduced fertility (Filmer and Pritchett 1999; Glewwe and Ilias 1996). Unsurprisingly, two of the United Nations' Millennium Development goals specifically focus on ensuring universal access to primary education and reducing gender inequality in access and achievement. At present, African countries improved access in participation through policies that removed economic barriers to entry and participation even though they are unlikely to meet the target for universal access by 2015 (UN 2009). Specifically, the proportion of children out of school reduced from 42% in 1999 to about 26% in 2007 (World Bank 2010). On the one hand, these positive gains were unprecedented and commendable. Yet, they also put tremendous pressure on existing infrastructural resources and raise new questions on educational quality as well as inequality issues.

Inequality, especially inequality among children across sub Saharan African (SSA) countries is both understudied and underappreciated. This omission is rather surprising given ongoing socio-economic and cultural changes that might suggest possible divergence in social outcomes for children. For instance, economic booms spurred by forest, mineral and oil resources in some countries are equally matched with significant economic reversals or civic unrest in others. Apart from differences in economic performance, SSA countries vary in their level of financial commitment to children. Moreover, even though they have begun their demographic transitions, the rate and pace differs significantly across (Bongaarts 2006) and within countries (Shapiro and Tambashe 2001). On the one hand, uneven fertility transitions *across* countries spur inequality as they change relative age structures and concentration of children cohorts and young adults in particular countries. On the other hand, uneven fertility transitions *within* countries could result in poor families carrying the largest child rearing burden as middle class women precipitously reduce their fertility and concentrate their resources on fewer children (Blake 1981, McLanahan 2004). Determining how these economic and demographic factors shape patterns of educational resource inequality among children is one aim of this study.

Previous studies on cross country inequality largely focused on tracing trends and drivers inequality at a global level[1]. With a few exceptions[2], this body of literature generally focused on whole populations without treating children as distinctive sub populations. On the other hand, studies that examine cross country inequality in SSA limited their attention to how inequality is linked to economic growth (Nel 2003), corruption (Gyimah-Brempong 2002), democracy (Muller 1988), institutions (Chong and Calderon 2000) or institutions and colonial experience (Van de Walle 2009). Other studies examine overall trends and drivers of economic inequality across countries (Kandiwa 2006) or investigated determinants of healthy inequality among adults across countries (Moradi and Batten 2005). To my knowledge, no study has documented cross country trends in socio-economic inequality among children in SSA (herein after African children). But, this does not suggest a lack of interest in the wellbeing of African children. Rather, a rich body of literature documents poverty dynamics and within country socio economic inequality among children. For instance, several studies examine the impact of poverty, hunger and malnutrition (Pinstrup-Andersen *et al* 1999; Sanchez 2002; Borlaug 2002; Toenniessen et al 2008; Ejeta 2010) or identify vulnerable children (UN 2004; Mishra and Bignami-Van Assche 2008). Studies that investigate inequality among children at national, or sub national levels focus on social outcomes such as access to and achievement in education (Buchmann 1999; Case and Deaton 1999; Nielsen and Nielsen 2001; Chilisa 2002; Eloundou-Enyegue 2004; Giroux 2008; Madhavan and Thomas 2006; Fiske and Ladd 2004; Reschovsky 2006; Lloyd and Blanc 1996; Ainsworth and Filmer 2007; Case *et al* 2004; Kendall 2007; Case and Ardington 2006; Evans and Miguel 2007; Beegle et al 2010). Together, these studies provide valuable insights on how race, gender, class and orphanhood status shape inequality among children. Yet, they only do so within countries. Given that a recent study found evidence that suggests divergence in social outcomes for children across countries at the global level (Eloundou-Enyegue and Rehman 2009), what remains unclear is to what extent the global trends mirror the reality on the African continent? This study fills this knowledge gap by asking three interrelated questions: (i) what are the levels and trends in educational resources inequality among Africa children, (ii) how do trends in inequality among children compare to adults

[1] See for instance Korzeniewicz and Moran (1997); Pritchett (1997); Schultz (1998); Bourguignon and Morrison (2002); Milanovic (2002); Melchior and Telle (2001); Radetzki and Johnsson (2001); Sala-i-Martin (2002); Firebaugh and Goesling (2004); Sverdberg (2004) and others.

[2] For instance Eloundou-Enyegue and Rehman (2009) focused on global socio-economic inequality among children.

income inequality trends, and (iii) what factors account for the observed changes in observed resource inequality over time?

I use data from Penn World Tables and World Development Indicators to estimate standard measures of inequality (Gini coefficient, Theil index, Coefficient of variation, and Mean Logarithmic Deviation). Further, I apply decomposition techniques to account for the factors that drive changes in resource inequality over time. Results show that inequality in the distribution of educational resources among African children increased steadily between 1971 and 1999 before gradually declining but remaining high and stable thereafter (Gini of 0.59 in 2007). For the entire study period, levels of resource inequality among children were over double those among adults. Nigeria and South Africa have inordinately large effects on observed educational resource inequality trends. Age structure, size of economy, and allocation to children (education) drive changes in inequality compared to variation in population size per se. Overall, this study provides an alternative lens through which to evaluate the welfare of African children at a time of globalization and standardization of welfare benchmarks.

The rest of the paper is organized as follows. First, I briefly discuss the relevance of investigating inter-country inequality among children. Second, I discuss the previous studies on inequality among children and illuminate the nature and locus of existing knowledge gaps. This is followed by a description of data sources and their limitations. Fourth, I outline inequality measures and decomposition techniques employed in this study. Last, study findings are presented followed by a discussion and conclusion.

Relevance

This study is timely and relevant for several reasons. First, by placing inequality at the center of scientific inquiry, this study enriches our understanding of the wellbeing of African children beyond routine preoccupation with poverty. We know that eliminating poverty does not suggest an equalization of economic opportunity nor does it signal a convergence in social outcomes (Dollar and Kraay 2002; Ravallion 2005; Edward 2006). Moreover, development literature, including research on individual happiness, acknowledges the disjuncture between absolute and relative deprivation (Graham and Shelton 2005; Firebaugh and Schroeder 2009). As such, it is important to recognize that the discourse on African children's welfare remains incomplete if one does not acknowledge the coexistence of poverty, and inequality.

Second, SSA is rearing 17% of the world's children even though it controls only 2.3% of the global income resources. Given recent economic up and downturns within countries in SSA countries, it is important to evaluate how they impacted social and economic resources available to children. Recognizing the diversity of experiences of countries in terms of democracy, civil wars, and new economic resources from forestry, mining and agriculture[3], it is unclear how all these translate into substantive investments and social outcomes for children. Besides, I focus on educational resources because resources are an instrumental means to a social end (Seers 1972, Sen 1999).

Third, demographic transitions underway in SSA are uneven both within and across countries. For instance, Shapiro and Tambashe (2001) find evidence that fertility transition are occurring in a staggered fashion whereby middle class women reduce their fertility at a faster rate than their poorer counterparts. The implications of uneven fertility are two-fold. Within countries, uneven fertility transitions result in placing the greatest child-rearing burden poor families who do not have sufficient economic resources to raise them. Uneven fertility transitions between countries suggest a divergence in child dependency ratios. In essence, it is likely that vanguard countries (such as Kenya, Zimbabwe, Ghana, South Africa, Mauritius, and Botswana) where fertility has now declined by about 30% now carry a lower relative share of the continent's children while countries where fertility transitions stalled (like Congo, Niger) will carry a heavier relative child rearing burden in future. In short, if one assumes unchanging distribution of income across countries, then uneven fertility transitions will work to increase inequality among children through its effect on relative child dependency ratios. In the absence of dwindling international donor support, this effect will be even greater if the countries with unchanging fertility rates tend to be countries that also have limited economic resources.

Fourth, understanding inequality patterns among children is extrinsically important in its own right. Yet, as Eloundou-Enyegue and Rehman (2009) argue, inequality among children is also important because it foretells future patterns of inequality because the momentum for inequality among tomorrow's adults is built in within the current cohorts of children. Inequality among children, they submit, is like an "entry point in the process of stratification".

[3]The continent has experienced civil wars in Liberia, Angola, Uganda, the Democratic Republic of Congo, Sudan, and Niger; yet at the same time, new mineral resources such as oil (Ghana, Angola, and Gabon) and diamonds (Botswana and Zimbabwe) continue to redefine economic trajectories .

Fifth, while it is important to understand the levels and trends in inequality among children, it is equally imperative to evaluate how these compare with those of other demographic groups such as adults. Similarly, given that global inequality studies always single out SSA as a distinctive continent, it is helpful to quantify to what extent the continent itself differs and how children's wellbeing varies across the sub region.

Overall, inequality among children in SSA assumes greater significance because divergence is occurring in a context where basic needs are not yet met. Therefore, not only are children growing up poor, they also are witnessing unprecedented levels of inequality in the distribution of material and other social resources. At a time when the world has standardized expectations for children's welfare including their rights to education (UN 1948, UN 1960; UN 1989, UN 2000), it is important to continually check how well political commitment is matched by substantive progress, especially how the social progress equalizes the playing field for children across countries.

Previous Studies

Previous studies on inequality among children across countries focused either on a global scale (Eloundou-Enyegue and Rehman 2009), or on Europe (Shavit and Blossfeld 1993; Breen *et al* 2009) Other studies focused primarily on individual countries in Latin America (Sahn and Younger 2005) or on United States (Lichter and Eggebeen 1993; Ozawa and Lum 1996; Ozawa and Kim 2000; Mayer 2001; Blake 1981; McLanahan 2004) or on the United States compared to Europe (Chen and Corak 2008). I am unaware of any study that attempts to estimate levels or trends in income or health inequality among children across countries in SSA. That does not suggest that researchers are not paying attention to children, or to inequality in SSA. Rather, past research examines inter-country poverty dynamics (see for instance UNAIDS 2004, UNDP 2009, Ahmed *et al* 2007 or Mishra and Bignami-Van Assche 2008 for recent treatments) or investigates the link between inequality and economic growth (Nel 2003), corruption (Gyimah-Brempong 2002), democracy (Muller 1988), institutions (Chong and Calderon 2000) institutions and colonial experience (Van de Walle 2009). Other studies determine overall income inequality trends and determinants (Kandiwa 2006) or explore the determinants of healthy inequality among adults across countries in SSA (Moradi and Batten 2005).

Additionally, studies that evaluate inequality among children do so at national or sub national levels. For good reasons, within-country inequality among children has drawn much academic scholarship in recent times. In particular, researchers seek to put a face on who is vulnerable and draw implications for overall children's welfare especially educational achievement. As such, research examined instances when social class or gender shape educational achievement among African children (Eloundou-Enyegue 2004; Eloundou-Enyegue *et al* 2009), investigated the continuing significance of race or social class location on children's welfare (Giroux 2008; Nielsen and Nielsen 2001; Buchmann 1999; Buchmann and Hannum 2001; Case and Deaton 1999; Madhavan and Thomas 2006; Chilisa 2002; Fiske and Ladd 2004; Reschovsky 2006), or noted the exceptionalism of HIV/AIDS orphans (Lloyd and Blanc 1996; Ainsworth and Filmer 2007; Case *et al* 2004; Kendall 2007; Case and Ardington 2006; Evans and Miguel 2007; Beegle et al 2010). Together, this body of literature illuminates the locus of disadvantage among African children whether it is pregnancy related dropouts, rural disadvantage, socio-economic status, race, or orphanhood. Yet, they do not provide a hawk's eye on the transformations across African children located in the various states and territories. At a time when the UN has taken great strides to standardize welfare benchmarks for children (UN 1948, UN 1960; UN 1989, UN 2000), it is important to investigate how equitably African resources are flowing to children in a way that makes it possible for them to "plug and play" both within and outside the continent. The value of inter country comparisons, therefore, lies in the potential to delineate how circumstances for children are diverging or converging over time across countries.

In light of the dearth of literature on cross country socio-economic inequality among children in SSA, this study builds on studies focused on other world regions. For instance, in their recent study on global inequality among children, Eloundou-Enyegue and Rehman (2009) caution against inferring children's inequality trends from observed adult trends. They find evidence that resource inequality among children declined by about 25 percent between 1980 and 2005, a trend that mirrors the decline in global income inequality (27 percent for the same time period). Notably, children's resource inequality trends, even though they followed a downward trend, were consistently higher than the estimates for the global populations. Further, even as resource inequality declined, substantive outcomes such as child survival went in the opposition direction. For example, if one takes the Mean Logarithmic Deviation, global inequality in infant mortality went up by as much as 53% between 1980 and 2005 suggesting that economic convergence may not always work in tandem with improvement of social outcomes for children. Further, this study identified SSA as the region which fostered increase in global inequality

through its changes in population size and age structure. In contrast, Asia's demographic and economic factors tended to foster convergence in inequality. The question that arises is to what extent these global trends mirror what is occurring within individual continents or countries?

Shavit and Blossfeld (1993) find evidence for divergence in educational outcomes for children in Europe. However, Breen and colleagues (2009) challenged the methodological premise for the Shavit-Blossfeld divergence story. They employ an alternative meta-analytical frame and conclude that in fact, over time, educational outcomes for children in Europe converged. Sahn and Younger (2005) use 22 DHS surveys from seven Latin American countries to examine levels and changes in health inequality among children. Specifically, they derive Gini coefficients for standardized heights of 24 months old children. They find significant declines in inequality in health inequalities in Bolivia, Brazil, Colombia, Dominican Republic, Guatemala, and Peru and increases in Nicaragua. Their methodology involves within country changes in inequality. In other words, they do not pool the data for all the children to evaluate how the heights of each child in Latin America compared to the regional mean—which is the value of between country evaluations.

Lichter and Eggebeen (1993) examine levels and trends in income inequality among children. Further, they explore the role of family structure in influencing observed changes in inequality. Using Public Use Microdata Samples of US population (1960, 1970 and 1980) they divide children into five income categories and derive income to poverty ratios, indices of dissimilarity, as well as coefficient of variation measures. They find growing levels of inequality among children and worsening outcomes for African American children. They attribute the latter to changes in family structure where a growing number of African American children are growing up in poor, single parent households and attribute the growth in income inequality to labor force participation of women in dual earner couples. This seminal work set the groundwork for the analysis of inequality among children in America. However, it was based on data for three decades up to 1980 suggesting that estimates on more recent data are needed.

Ozawa and Lum (1996) evaluate the effects of alternative social transfer programs on income inequality among children. Drawing from the Survey of Income and Program Participation, the study examines three distinct groups; children, elderly, and adults. The evidence shows a very high inequality level (Ginis) among children (.581) which reduce to .198 after social transfers. The study concludes that welfare payments are more effective than social insurance benefits in reducing the Gini coefficient for children. In another study, Ozawa and Kim (2000) evaluate the changes in income inequality among children from 1969 to 1979, 1979 to 1989 and finally between 1969 and 1989. They use data from the

Current Population Survey to estimate inequality among three subgroups; children, adults and the elderly (disaggregated by race). They estimate Gini coefficients before and after social transfers and determine the ameliorative effectiveness of social transfer payments. Their findings suggest that children lost ground in the three decades between 1969 and 1989. For instance, after accounting for social insurance benefits and welfare payments, the Gini coefficient for children increased 11% between 1969 and 1979, followed by a 10.2% increase between 1979 and 1989. Within the two decades between 1969 and 1989, income inequality among children increased by 22.4%. They also find a gradient among racial groups with income inequality among Hispanic children increasing at a faster rate than among any other racial group between 1979 and 1989.

Overall, studies that focused on other world regions provide useful empirical and theoretical perspectives on the pathways through which inequality among children gets reproduced over time and offer methodological innovations[4] upon which this study is built.

Data

This study draws data sources from three main sources; the Penn World Tables (PWT) and the World Banks World Development Indicators (WDI). PWT 6.3 developed by Heston et al (2009) at the University of Pennsylvania's Center for International Comparisons contain economic and demographic data on about 30 variables for about 167 countries (including about 48 SSA countries) spanning the 1950-2007 period. PWTs are especially suitable for inter country comparison because they adjust national accounts data to their purchasing power parity values (Firebaugh 1999, and Firebaugh and Goesling 2004). On the other hand, WDIs contain data from 210 countries including 48 SSA countries spanning the 1960-2009 period. This dataset is ideal because it contains information on population age structure, school enrollments, and government expenditure on education. Finally, DHS are drawn from nationally representative samples of between 3000 and 30000 households in 83 developing countries,

[4] In a classic study (Firebaugh 1999) recommends the use of purchasing power parity adjusted income data, as well as population weighting when deriving indices of inequality. Eloundou-Enyegue and Rehman (2009) move beyond the "population size-income" decomposition in Firebaugh and Goesling (2004) to a more nuanced approach that takes into account not only population size and income, but also age structure (a more relevant variable in demography), and allocation effects (accounting for the differences that may arise when countries with the same income level may allocate resources to children at different rates).

collected at five year intervals starting the mid 1980s to present day. So far, over 97 DHS surveys were collected in about 39 SSA countries of which 25 countries have two or more countries. Data on child health and nutrition, fertility, and household characteristics are gathered from women of reproductive age (15-49).

An elaborate description of specific variables employed in this study is necessary. In order to estimate levels of inequality, one requires data on each country's child population, and educational resources allocated per child per given year. Ideally, if the goal is to determine resources available for school going child, the relevant age group lies between 6 and 19. Unfortunately, no dataset contains information on this population range. Rather, WDIs capture information on population aged 0-14. This window misses the 15-19 age groups and yet captures the non school going ages of 0-5. I therefore assume that the irrelevant age group (0-5) captured by WDI data at the front end of the (0-14) category offsets the data that is missed at the tail end of my preferred distribution (15-19). If one accepts this assumption, the next step is to derive the size of child population that is in school. For each index country and for each respective year I use gross primary school enrollment ratios to determine the approximate number of "children in school"[5]. Further, in order to derive estimates of resources available to children, I take the proportion of each country's national income that is allocated to education. Specifically, I use government allocation to education as a proxy for "resources available to children". I am fully aware that this figure, while being a best estimate, is crude for a number of reasons. It underestimates actual resources that governments spend on their youth including expenditures on health, and other social services. Second it assumes that the full amount allocated to education goes to key sectors such as teacher training, infrastructure, teacher salaries, supplies and there is no filtrage through corrupt practices. Also, this figure does not make it possible to determine uneven distribution of resources within countries. These limitations notwithstanding, this measure provides the best estimate for allocation of resources to a sector that is clearly targeted towards children and provides a relatively unambiguous platform for cross country comparisons. The data on resources per child, and size of each country's child population serve as a platform for determine relating resource ratios, and population shares – which in turn help to compute Ginis and other inequality indices.

[5] Deriving child population this way gets at an accurate figure for countries with higher to total levels of child enrollments. Conversely, it captures a smaller proportion of children in countries with lower enrollments. As a result, my inequality estimates are, at best, conservative rather than inflated. This is especially so if countries with larger child populations have lower enrollments or are poorer.

My inequality estimates cover 41 countries[6] representing about 84 percent[7] of the sub continent's children from 1960 to 2007. But generally, cross country studies are plagued by problems of missing data that could raise questions about bias. Data could be missing at the level of cases (countries), or years, or pertinent variables. Therefore, my sample is limited to the 1971-2007 periods because while income data is relatively complete, data on other variables such as government allocation to education is scant. Further, my sample excludes Cape Verde, Eritrea, the Democratic Republic of Congo, Mayotte, Sao Tome and Principe, Seychelles, Somalia, and Tanzania for incomplete data. Islands such as Seychelles, Sao Tome and Principe, and Mayotte contain very small populations and represent a very small proportion of African children therefore I do not expect their omission to have consequential implications on my findings. However, the omission of Somalia and the Democratic Republic of Congo is of concern because these countries are mired in long civil wars that not only make record keeping impossible, but raise questions about the welfare of children. I therefore submit that the findings herein represent what is occurring on the African continent given available data with an important caveat that perhaps the magnitude, and trends could be different if we data were available for all countries on the continent.

Measures

The first task is to estimate the levels and trends in income and health inequality. Following what is perhaps the best practice[8] in the measurement of inter country inequality, I apply four standard measures of inequality; the Gini Coefficient, the Thiel Index, The Mean Logarithmic Deviation (MLD), and the Squared Coefficient of Variation (CV^2). These inequality indices are a function of population shares (w), and resource ratios (r):

[6] Countries in sample; Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, the Republic of Congo, Cote d'Ivoire, Equatorial Guinea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Togo, Uganda, Zambia and Zimbabwe.

[7] This estimate is based on population figures for 2007 where sub Saharan African population is estimated to be 800 224, 028 of which 43 percent (344, 096, 332) are below the age of 14 and of these, 84 percent (289,298,868) are in the study sample.

[8] See for instance Firebaugh (1999), Firebaugh and Goesling (2004), Kandiwa (2006), and Eloundou-Enyegue and Rehman (2009).

Inequality (I_R) = fn (r, w) [1]

Specifically, the functional forms of the four respective indices are:

MLD = $\sum_j w_j \log(1/r_j)$, Gini Coefficient = $\sum_j w_j r_j (q_j - Q_j)$, [2]

Theil = $\sum_j w_j r_j \log r_j$, CV^2) = $\sum_j w_j (r_j - 1)^2$

Where: qj and Qj represent the share of the region's children living in countries poorer (or richer, respectively) than the index country

I deliberately apply multiple indicators to test robustness of results, and also because each is sensitive to changes in resources shares at different points of the population distribution. The Theil index, the Gini coefficient and the MLD are most sensitive to transfers from the top, middle, and bottom of resource distribution respectively. For interpretation, these indices are calibrated in such a way that a low figure suggests low inequality and a high figure suggests high inequality. For instance, the Gini Coefficient, Theil Index, and MLD vary between zero (point of total equality), and 1 (point where a resource is concentrated in one person/unit's hands). The Squared Coefficient of Variation ranges between zero and log (n) where "n" is the total number of units being compared. Thus, my CV ranges between zero and 3.71.

Methods

The second task is to account for the changes in inequality among children over discrete time periods of choice. For this, I apply standard decomposition techniques (see Kitagawa 1955; Firebaugh and Goesling 2004; and Chevan and Sutherland 2009). I especially follow the framework proposed by Eloundou Enyegue and Rehman (2009) in apportioning the change in income inequality among children to those due to population size, population age structure, and economic transformations as shown below:

Inequality (I_R) = fn (I_G, I_K, I_P) where, [3]

Inequality among African children in sub Saharan Africa (I_R) reflects inequality in national budgets (I_G), in total budget allocated to children (I_K), and in size of children's population reflects, (I_P). This inequality (I_R) can also be expressed as a function of resource ratios as in equation [1] above. Using the Mean Logarithmic Deviation, change in inequality among children between two time periods can be captured as:

$$\Delta \text{MLD}_{t1-t2} \cong [\sum_j \bar{r}_j - (\overline{\ln r_j})\Delta w_j\ ] - [\sum_j (\overline{w_j r_j} - \overline{w_j})\Delta \ln(p_j)\ ] + [\sum_j (\overline{w_j r_j} - \overline{w_j})\Delta \ln(g_j)\ ] + [\sum_j (\overline{w_j r_j} - \overline{w_j})\Delta \ln(k_j)\ ] \quad [4]$$

Pop Size Effect | Age Dependency | Income Effect | Allocation Effect

Where: r_j is resource ration of country j relative to population weighted regional average, w_j is share of African child population found in country j and r_j are dependent upon the country's GDP ratio (g_j) and public commitment ratio k_j, and child population ratio p_j. Therefore, change in income inequality among children ($\Delta I_{R,}$ or $\Delta \text{MLD}_{t1-t2}$) is driven by four respective influences; how much SSA countries vary in their share of the regional child population (population effect), how much they vary in their child dependency ratios (Age Dependency), how much they vary in national incomes (Income effect) and finally, by how much countries increasingly differ in their allocation of income to children (Allocation Effect).

Findings

Current Educational Resource Inequality

I begin by describing the current inequalities in childrearing across SSA countries. Figure 1 shows Lorenz curves for the distribution of the region's overall population and gross domestic product (Panel A), and for the distribution of the regions' children and resources available to children as at 2007, the most recent year for which data was available (Panel B). These curves are derived from ranking countries by their population sizes (*x*-axis) and then plotting the *y*-axis to represent the share of the region's population found in the bottom 5%, 10% etc. The same is done for regional income. Similarly, countries are ranked by the size of their economies (*x*-axis) and the *y*-axis plots the proportion of

resources found in say the bottom 5% or 10% of countries. The core idea is that if there is perfect equality, all observations will lie on the diagonal, that is, 5% of the countries control 5% of the population or resources respectively.

[Figure 1 about here]

The magnitude of inequality (which is also the basis for the derivation of the Gini index) equals the area between the Lorenz curve and the line of equality. Clearly, the Lorenz curves in Figure 1 depart significantly from the point of equality both for the overall population (Panel A) and for the children (Panel B). For instance, the bottom half (50%) of sub Saharan African countries contain 10% of the region's population and control only 8% of the region's income or GDP. Similarly, the burden of child rearing is not evenly spread across the African continent, neither are resources located in countries with proportionate child population sizes. Rather, the bottom 50% of countries contains 10% of the region's children and control only 7% of the region's resources allocated to children.

Another way to examine how the burden of child rearing is spread across sub Saharan Africa is to look at individual countries, and what proportion of the region's children are located therein compared to the proportion of the region's resources (education budgets) available in that respective country. Appendix A1 captures how the 41 study countries rank in terms of the size of the children's population as at 2007. Column 4 of this table ranks the region's countries according to their resource ratios – how an index country's resources per child differ from the region's average. A quick look at this table reveals striking dissimilarities. For instance, Nigeria contains a fifth of the region's child population yet its resource ratio (0.18) falls way below the region's population weighted average. Other countries that carry a heavier load of the region's children include Ethiopia (11.7%), Kenya (6.4%), Uganda (6.2%), South Africa (5.6%), and Madagascar (4.3%). Of these countries, Kenya's resource ratio is just over the region's average (1.1) and therefore it could work as a useful benchmark against which we can measure the performance of other countries. Unsurprisingly, South Africa spends over six times resources per each child compared to the region's average. Other countries that control fairly high resource ratios include; Mauritius (10.7), Botswana (7.5), Swaziland (4.9), Cape Verde (4.0) Namibia (3.3), Lesotho (2.7), Gabon (2.4), Angola (1.3). On the other hand some countries with a heavy child rearing burden have to educate their children using fairly modest resources. For instance, the resource

ratios for Ethiopia (0.53), Uganda (0.38), and Madagascar (0.16) fall way below the region's average. Conversely, other than South Africa and Angola, most of the countries with high resource ratios are raising a very small proportion of the sub continent's children; Mauritius (0.1%), Botswana (0.2%), Swaziland (0.1%), Cape Verde (0.07%), Namibia (0.3%), Lesotho (0.3%), Gabon, (0.2%).

Overall, the sub continent's children are concentrated in just a handful of countries. Specifically, over 55% of African children are located in just six countries (Nigeria, Ethiopia, Kenya, Uganda, South Africa, and Madagascar) out of the 41 in the study sample. On the contrary, almost 16 countries contain less than 1% each of the continent's children (Togo, The Republic of Congo, Liberia, Central African Republic, Mauritania, Namibia, Lesotho, Guinea Bissau, Gabon, Botswana, The Gambia, Swaziland, Mauritius, Comoros, Equatorial Guinea, and Cape Verde). Another ten countries each contain between 1 to 2% of the sub continent's children (Zimbabwe, Mali, Burkina Faso, Senegal, Burundi, Benin, Niger, Sierra Leone, Chad, and Guinea). Another handful of countries have between 2 and less than 4% each of the sub continent's children (Mozambique, Sudan, Ghana, Cameroon, Malawi, Zambia, Angola, Rwanda, and Cote d'Ivoire). Therefore, it is clear that the child population is very unevenly distributed and so are economic resources. This fact is further revealed by summary measures of inequality that I present below.

Levels and Trends in Educational Resource Inequality

This section addresses the two interrelated questions: how much resource inequality exists among African children, and have inequality levels changed over time? Figure 2 (top panel) shows the levels and trends in resource inequality. As at 2007, resource inequality among children was (0.63) for MLD, (0.7) for the Theil Index, (0.59) for the Gini Coefficient. The squared coefficient of variation stood at (2.37) (Figure 2 middle panel). However, if one excludes South Africa from the sample, the MLD for 2007 drops by 53% to (0.41), if one excludes Nigeria inequality drops by 16% (0.54), and finally if both South Africa and Nigeria are omitted, resource inequality among children located in the remaining 39 countries declines from 0.63 to 0.32 [Figure 2 lower Panel]. In other words, I still observe relatively high levels of income inequality among African children even after accounting for the influences of South Africa (large child population and immense resources), or Nigeria (20% of the region's child population and limited resources).

[Figure 2 about here]

How did income inequality among African children change over time? For the overall period (1971 to 2007), the MLD increased by 89% from 0.33 to 0.63; the Gini coefficient increased by 34% from 0.44 to 0.59, the Theil index increased by 79% from about 0.39 to about 0.70 and finally the squared coefficient of variation increased from about 1.22 to about 2.4%. Also, the data reveals a steep increase in inequality across all indices between 1971 and about the turn of the century (1999). The MLD more than doubled from its 1971 level of 0.33 to about 0.84 in 1999. In the same period, the Theil index also increased from 0.39 to 0.75, the Gini coefficient increased from 0.44 to 0.64 while the squared coefficient of Variation increased from 1.22 to 2.16. It is unclear if this sharp increase is real or could be a data artifact? Even if one takes the latter explanation, and considers inequality for the recent period (between 2000 and 2007) for which one can have higher comfort levels with data quality, one still observes very high levels of inequality in the distribution of resources among Africa children

Children versus Adult Trends

How do observed inequality trends among children compare with trends in adult income inequality? The top panel of Figure 3 shows the absolute values of resource inequality among the whole sub Saharan African population compared to the trends for children. The bottom panel shows the ratio of adult versus children's population. The data indicates that regardless of time period, resource inequality among children is about double the level observed for the rest of the population. Clearly, this evidence reflects how children's experiences are distinctive to those of adults and therefore it would be erroneous to draw inferences on inequality patterns without looking at children as a subgroup.

[Figure 3 about here]

Drivers of Resource Inequality

What factors drive the observed changes in inequality? I apply decomposition techniques to apportion the change in inequality into the influences changes in the child population size, child dependency ratios, size of each nation's GDP, and also to changes in the proportion of the GDP that is allocated to children. First, we know that sub Saharan African economies widely differ in size, as well as in the share of the sub continent's children located therein. What needs further elaboration is how nations differ in

terms of what proportion of their GDP they spend on children's education. Unsurprisingly, the data shows a clear gradient that ranges from the countries that spend high proportions (>5%) of their income on education (Lesotho, The Sudan, Botswana, Namibia, Swaziland, and Kenya) and those that spend low proportions -- less than 2% (Guinea, Central African Republic, Chad, Nigeria, and Equatorial Guinea). The rest of the sub continent lies between 2 and 5% in terms of average educational allocations in the last decade (Figure 4).

[Figure 4 about here]

What is profound, however, is the extent to which countries that are almost identical in the size of their economies, and the burden of child rearing may differ significantly in how much of their income is spent on children (Appendix A2). If one ranks African countries in order of the size of their economies, their child populations, and then their budgetary allocation to children, interesting similarities and striking differences can be observed. Take for instance Burkina Faso and Malawi. These have similar sized economies, child populations (6.7 million), and dedicate similar proportion of their national budgets to children (4.5% and 4.3% respectively). Yet, the reverse is true if one focuses on a different set of countries like Zimbabwe and Chad. Both countries have similar incomes, and similar child populations (about 5 million), but, Zimbabwe allocates 4.6% of its GDP to education compared to Chad (1.7). Assuming that these sets of countries are similar in all other dimensions, one would expect some level of divergence in the experiences of children. The question then becomes -- To what extent does the economic and or demographic differentials drive the observed changes in inequality among African children?

Table 1 shows results for inequality (MLD) decomposition for four distinct time periods: 1971-2007, 1980-1998; 1998-2003, and for 1980-2007. But, I limit my description for the overall period from 1971 to 2007. It appears that the increase in resource inequality among children was largely driven by both demographic and economic factors although the latter had a larger influence. Differential economic growth accounted for (152%) while changes in budgetary allocation to children accounted for (-129%) although these two worked in opposite directions. While economic growth tended to increase inequality, changes in budgetary allocation to children tended to reduce inequality. A significant component of the increase (103%) in inequality came about because of the changes in the distribution of child rearing across the continent while differentials in population size worked to reduce levels of inequality (-26%).

[Table 1 about here]

Discussion

Previous studies on the wellbeing of African children typically focused on poverty or on socio-economic inequality within countries. While these studies are needed and helpful, they provide an incomplete picture of the emerging differentiation of African countries. This study seeks to complement existing bodies of literature by placing inequality at the center of discourse on the wellbeing of African children across countries. Specifically, I document levels and trends in educational resource inequality, and account for factors that drive changes in resource inequality. First, my analysis shows that while at global level income inequality among children is converging (Eloundou-Enyegue and Rehman 2009), the opposite is true for African countries. Studies focused on other world regions, like the United States (Lichter and Eggebeen 1993; Ozawa and Lum 1996) found also high and worrisome divergence in economic resources and social outcomes among children. Second, while mortality inequality at global level diverged over time (Eloundou-Enyegue and Rehman 2009), my analysis shows very little inequality in child survival across African countries. Moreover, my analysis adds to existing literature that calls for examination of children as distinct demographic groups whose experiences may differ significantly to those of other sub populations such as adults or the elderly. Similar to observations at the global level and the United States (Ozawa and Lum 1996; Eloundou-Enyegue and Rehman 2009), my evidence shows substantially higher levels of inequality among children compared to other adults suggesting that it is erroneous to infer children's trends from adult trends. Last, most studies on global inequality highlight the exceptionalism of Africa, especially its tendency to drive levels and trends in overall income inequality or inequality among children (Svedberg 2004, Kenny 2005, Eloundou-Enyegue and Rehman 2009). While this recognition is critical, it leaves "Africa" as a black box. In other words, these studies do not go far enough to illustrate which African countries influence global trends in inequality, or shed light on internal differences among African countries themselves. Indeed, my analysis shows that sub Saharan Africa does not provide an even playing field, at least for children. Even after accounting for the influences of Nigeria and South Africa, substantial income inequality exists across sub Saharan African countries – largely driven by differential economic performance, uneven fertility transitions that shape child rearing burden across countries, and also government allocation to children's education. Overall, my study provides a nuanced lens through which the wellbeing of African children can be evaluated. Therefore, it is important to recognize how uneven

economic trajectories and demographic transition have begun to, and will likely continue to shape the size and changes in socio-economic inequality among African children.

Conclusion

As African nations celebrate half a century of independence from colonial rule and the world evaluates how well each country is marching towards achieving the 2015 Millennium Development targets, the discourse on children's wellbeing will likely center around issues of hunger, poverty, and access to schooling. A somewhat forgotten part of the puzzle is to what extent African countries themselves are becoming dissimilar economically over time (Kandiwa 2006), and much less on how children's economic resources and social outcomes could be diverging across countries. This study attempts to provide an alternative perspective to the experiences of African children. While the scope and drivers of poverty are well appreciated, I submit that resource inequality among children across sub Saharan Africa is not only high, but remains grossly underappreciated. Educational reource inequality among children increased from the 1970s before peaking around 1999 and tapering slightly thereafter. After accounting for the influences of Nigeria and South Africa, resource inequality among African children remains high. Notably, resource inequality among children is more than double the rates for adults and decomposition results reveal that differential economic growth, differences in budgetary allocation to children, and changes in child rearing burdens across countries drive observed trends in inequality while child population size per se has little effect. Overall, the extent to which these patterns will continue largely depends on the pace of ongoing demographic transitions which will in turn shape population age structure. Future inequality might also depend on economic factors such as GDP growth and the share of that amount which is allocated to children. Future research on structural factors that shape stratification patterns among African children estimate trends in inequality for other social outcomes such as educational attainment, or evaluate the effectiveness of existing public policies and private strategies aimed at buffering inequality among children.

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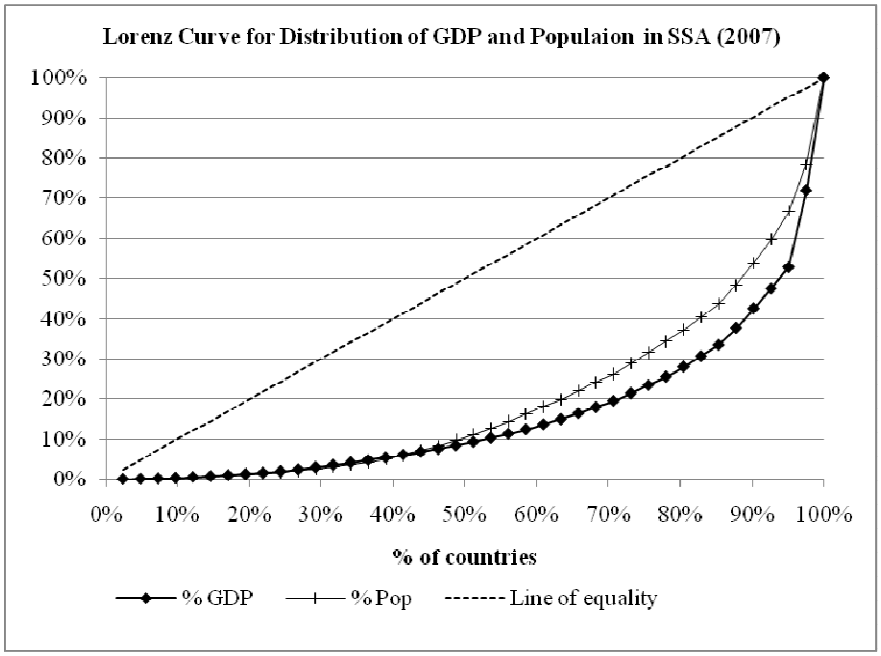
FIGURES AND TABLES

Panel A



Panel B

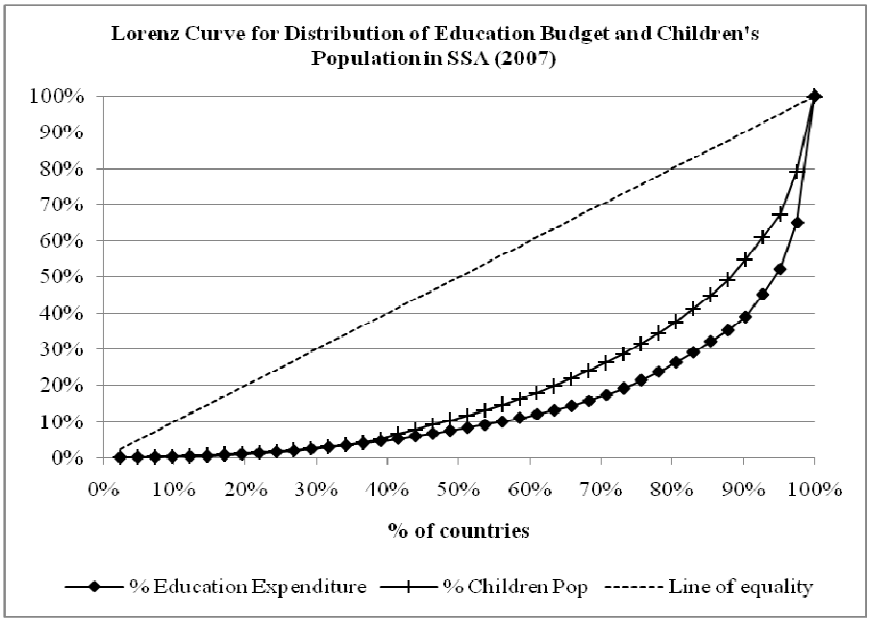


Figure 1. Lorenz Curves for the distribution of sub Saharan African Population and GDP (Panel A) and the distribution of sub Saharan African children, and resources for children (Panel B)

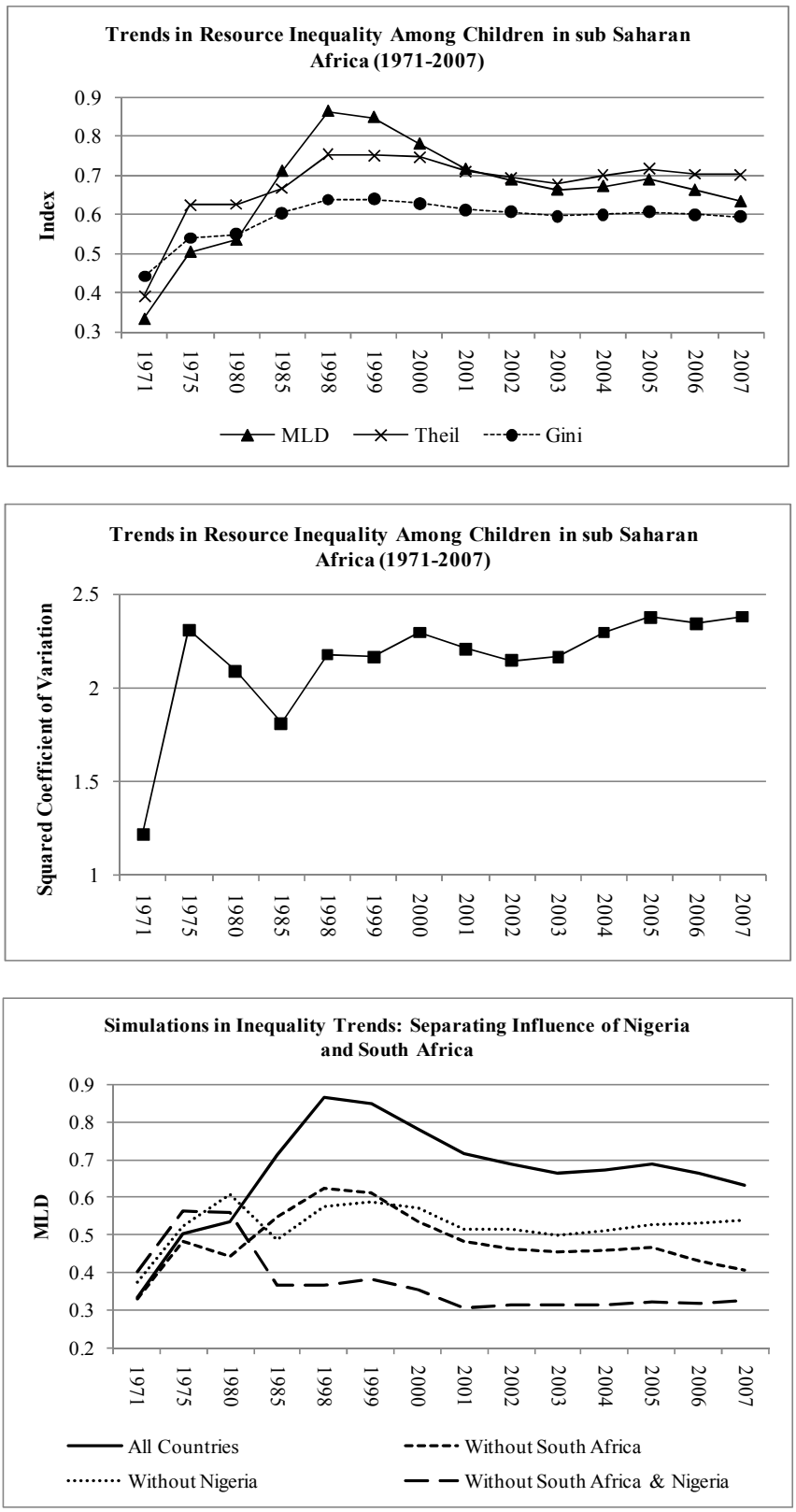
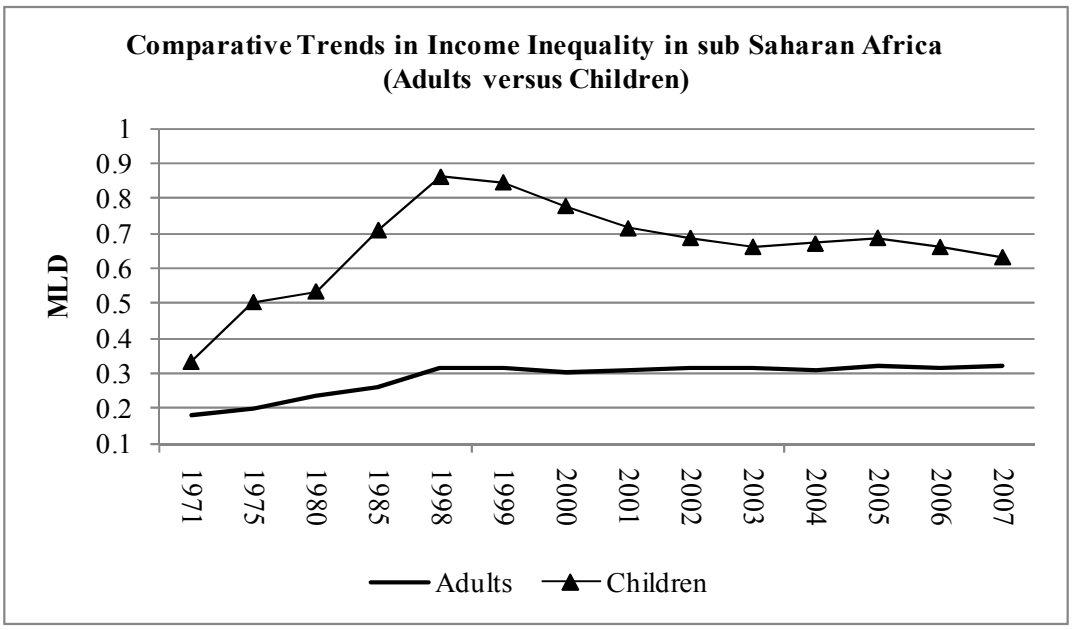


Figure 2: Trends in Resource Inequality Among Children (1971-2007)



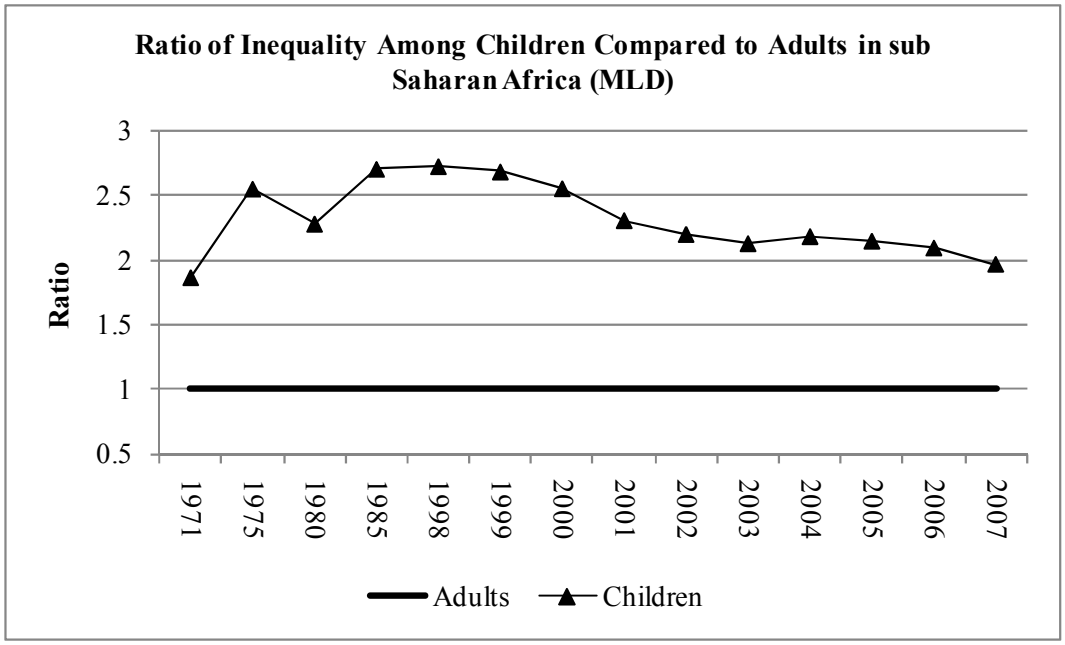


Figure 3: Comparing Adult and Children's Trends in Resource Inequality (1971-2007)

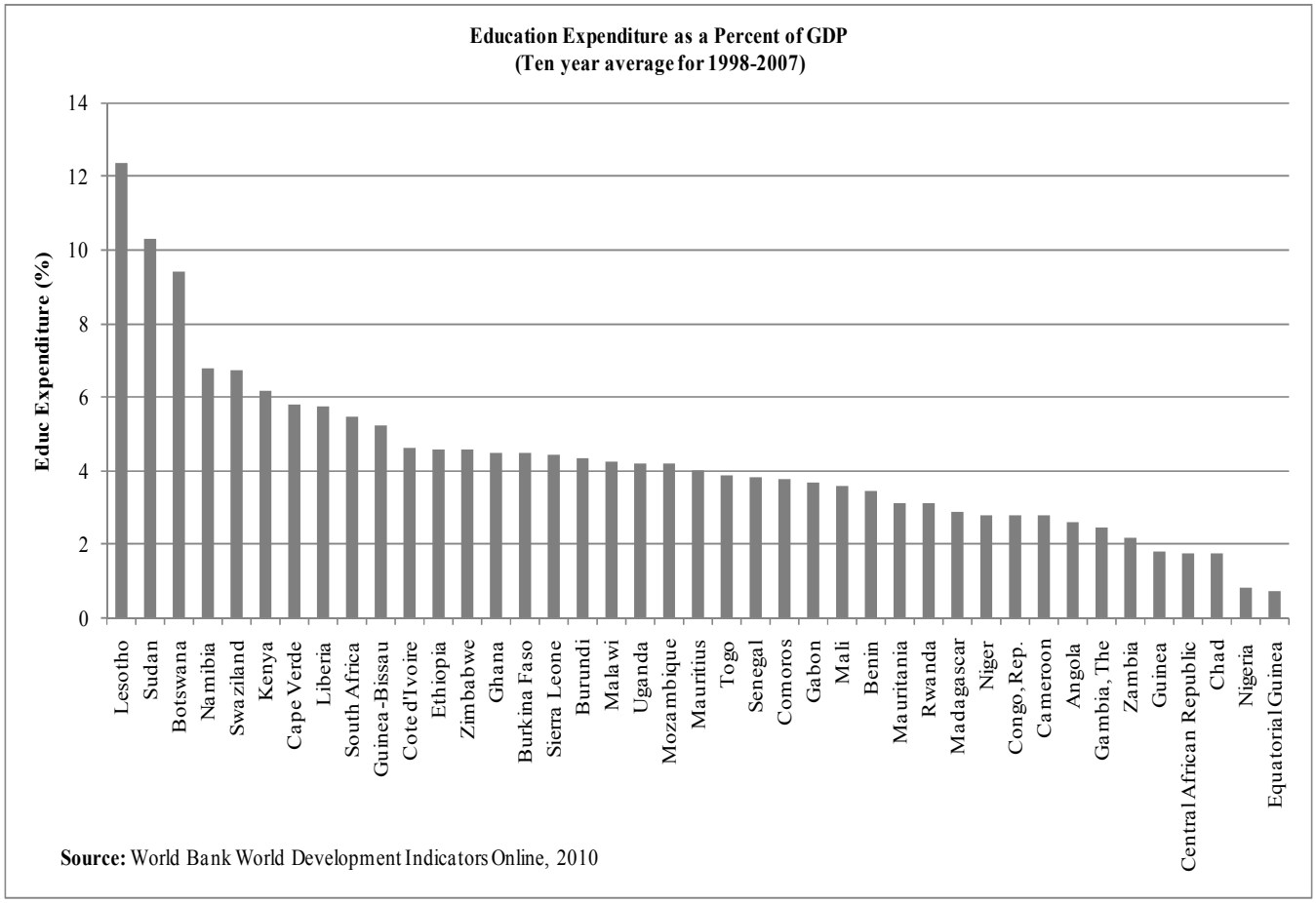


Figure 4. Comparative Education Expenditures in sub Saharan Africa (Average for 1998-2007)

Table 1: Decomposition Results for the Drivers of Resource Inequality Increase Among African Children

Period	Population Size	Age Structure	GDP per Capita	Allocation to Education	Total
1971-2007	-0.036	0.141	0.208	-0.177	0.137
	[-26%]	**[103%]**	**[152%]**	**[-129%]**	
1980-1998	-0.017	0.086	0.165	-0.073	0.160
	[-11%]	**[53%]**	**[103%]**	[9%]	
1998-2003	-0.007	0.039	-0.079	-0.126	-0.172
	[4%]	[-22%]	[46%]	[-30%]	
1980-2007	-0.035	0.164	0.161	-0.248	0.042
	[-82%]	**[387%]**	**[382%]**	**[-588%]**	

APPENDICES

Appendix A1. Population Shares and Resource Ratios Across sub Saharan African Countries (2007)

	Children in School (Total 282165307)	Population Shares	Resource Ratios	Rankings Size	Rankings Income
Nigeria	58887966	**20.87%**	**0.18**	1	39
Ethiopia	33050565	11.71%	0.53	2	22
Kenya	18013937	6.38%	1.10	3	12
Uganda	17643156	6.25%	0.38	4	29
South Africa	15660234	**5.55%**	**6.30**	5	3
Madagascar	11985544	4.25%	0.16	6	40
Mozambique	10595236	3.75%	0.81	7	17
Sudan	10221273	3.62%	3.56	8	6
Ghana	8845372	3.13%	0.86	9	16
Cameroon	8477225	3.00%	0.73	10	18
Malawi	7633764	2.71%	0.38	11	30
Zambia	6701203	2.37%	0.22	12	37
Angola	6517596	2.31%	1.32	13	10
Rwanda	6105218	2.16%	0.30	14	32
Cote d'Ivoire	5818840	2.06%	1.29	15	11
Zimbabwe	5225604	1.85%	0.90	16	13
Mali	4816668	1.71%	0.49	17	26
Burkina Faso	4565171	1.62%	0.72	18	19
Senegal	4323221	1.53%	0.90	19	14
Burundi	3929590	1.39%	0.24	20	35
Benin	3798851	1.35%	0.40	21	28
Niger	3724063	1.32%	0.45	22	27
Sierra Leone	3684473	1.31%	0.38	23	31
Chad	3679994	1.30%	0.53	24	23
Guinea	3662115	1.30%	0.56	25	21
Togo	2685146	0.95%	0.28	26	34
Congo, Rep.	1666040	0.59%	0.53	27	24
Liberia	1532271	0.54%	0.19	28	38
Centr. African Rep.	1309265	0.46%	0.13	29	41
Mauritania	1285157	0.46%	0.58	30	20
Namibia	895062	0.32%	3.25	31	7
Lesotho	863566	0.31%	2.66	32	8
Guinea-Bissau	786193	0.28%	0.23	33	36
Gabon	713964	0.25%	2.37	34	9
Botswana	709095	0.25%	7.49	35	2
Gambia, The	605550	0.21%	0.28	36	33
Swaziland	504517	0.18%	4.94	37	4
Mauritius	294029	0.10%	10.68	38	1
Comoros	291932	0.10%	0.50	39	25
Equatorial Guinea	263314	0.09%	0.88	40	15
Cape Verde	193327	0.07%	4.03	41	5

Appendix A2. Comparison of Countries for Education Expenditure

Country	Size of Economy (GDP)	Child Population	Education Expenditure (%)
South Africa	5.45642E+11	14980209	5.5
Nigeria	3.72217E+11	63258597	0.8
Sudan	1.03899E+11	16152405	10.3
Angola	95652692322	8009880	2.6
Ethiopia	94665130976	34759792	4.6
Kenya	82738753445	16125446	6.2
Cameroon	54824797797	7703549	2.8
Mozambique	50436444153	9643722	4.2
Cote d`Ivoire	47841390614	8260837	4.6
Ghana	41507236494	8924693	4.5
Uganda	39792837829	15051839	4.2
Guinea	36483426689	4143685	1.8
Zimbabwe	30481870250	5043916	4.6
Chad	30058399766	4874587	1.7
Zambia	28279126100	5690803	2.2
Mauritius	25553771206	299298	4.0
Senegal	23998617741	5232012	3.8
Burkina Faso	21251508303	6770902	4.5
Malawi	20177771432	6730976	4.3
Botswana	19245237197	646468	9.4
Madagascar	17082483506	8118276	2.9
Mali	16845227383	5499466	3.6
Namibia	14214232502	791978	6.8
Congo, Republic of	14081100727	1450474	2.8
Gabon	13050953888	531529	3.7
Benin	12516081777	3640591	3.5
Niger	12297803100	6989592	2.8
Rwanda	11499742755	3987352	3.1
Equatorial Guinea	11354316228	266681	0.7
Sierra Leone	10773954293	2335764	4.4
Swaziland	8918794420	467561	6.7
Mauritania	7589568595	1256642	3.1
Togo	5995835854	2557924	3.9
Burundi	5381822316	3111298	4.4
Lesotho	4927313641	802145	12.4
Cape Verde	4064675051	185511	5.8
Centr African Rep.	3934598252	1751823	1.8
Gambia, The	2511238093	688684	2.5
Liberia	1482524100	1564724	5.8
Comoros	1136358845	240227	3.8
Guinea-Bissau	1014051708	657009	5.2