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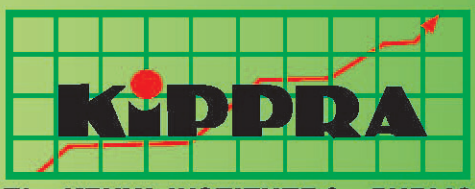

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Evolution and Decomposition of Income Inequality in Kenya

Boaz Munga

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Evolution and Decomposition of Income Inequality in Kenya

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Kenya Institute for Public Policy
Research and Analysis

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Abstract

This study traces the evolution of income inequality in Kenya and also decomposes income inequality. Various inequality measures are computed using the 1994 Welfare Monitoring Survey and the Kenya Integrated Household Budget Survey 2005/6, which are both nationally representative datasets. The estimations were performed using the Distributive Analysis for Stata Package. A key finding is that income inequality is sensitive to the part of the income distribution given more weight and there is no correspondence in the changes in inequality over time between urban and rural regions. If more weight is given to high incomes, rural inequalities actually worsened while urban inequalities improved. On the other hand, if more weight is given to the bottom of the distribution, urban inequality worsened while rural inequality eased. Even though more urbanized regions have higher incomes, they also exhibit relatively higher levels of income inequality. Decomposition of inequality by locality (urban versus rural) indicates that about 78 per cent of inequality can be attributed to inequality within urban and within rural areas. Decomposition by level of education suggests that the more educated group has a more unequal income distribution. Two broad conclusions emerge: the first is that measures to reduce the rural-urban income gap would have relatively limited impact in reducing total inequality, and the second is that interventions to enhance access to education would require other contemporaneous interventions to reduce inequality.

Abbreviations and Acronyms

BPO)	Business Process Outsourcing
CDF	Constituency Development Fund
CPI	Consumer Price Index
CV	Coefficient of variation
DASP	Distributive Analysis for Stata Package
ECA	Economic Commission for Africa
GDP	Gross Domestic Product
GE	Generalized Entropy
ILO	International Labour Organization
KIHBS	Kenya Integrated Household Budget Survey
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
LATF	Local Authority Transfer Fund
SAM	Social Accounting Matrix
SID	Society for International Development
SSA	Sub Saharan Africa
WMS	Welfare Monitoring Survey

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1. Introduction

Kenya aspires to attain middle income status by the year 2030; an aspiration which is anchored on the achievement and sustenance of high economic growth over the period.[1] The Kenya Vision 2030, which espouses Kenya's aspirations to be a middle income country, underscores the importance of equity for long term development prospects. Although equity is recognized as important in overall development, high inequality, in form of incomes and other observable outcomes such as health and education, present challenges that Kenya faces in its development process (Government of Kenya, 2008).

High income inequality may undermine development objectives such as the attainment of high economic growth rates through a number of channels. One of the broad channels is that high income inequality is expected to make collective actions more difficult. Specifically, in a context marked by high income inequalities, there is likely to be: a propensity for populist redistributive policies, a greater volatility of policies, and a greater likelihood of socio-political unrest and instability – all of which may undermine physical investment and economic growth (Alesina and Perotti, 1996, Benhabib and Rustichini, 1996, and Odedokun and Round, 2001).

High inequality may also undermine economic growth through stifling of human capital investments. This channel works through increasing the number of people who cannot afford human capital investments therefore, undermining economic growth by lowering the stock of human capital in the economy (Galor & Zeira, 1993, Romer, 1994, Aghion, Caroli and Garcia-Penalosa, 1999). These aforementioned channels (and others) would suggest that reducing income inequality may lead to better socio-economic performance.

There has been an increasing interest in measuring and examining inequality at both the global, regional and national levels. With respect to the measurement of the level of inequality in Kenya, there are several studies that have estimated inequality levels at a point in time or across time. In the Kenyan inequality studies, such as Bigsten (1986) and World Bank (2009), focus has been on the use of the Gini index to measure inequality.

The use of the Gini as a measure of inequality may present some limitations. One of the limitations of the Gini index is that it does not distinguish dissimilar kinds of inequality. The Gini index is also more responsive to changes in the middle of

[1] World Bank (http://data.worldbank.org/about/country-and-lending-groups#Low_income) classifies Kenya as a low income country. Low income countries are defined as those with a GNI per capita of US$ 1,045 or less in 2013 while middle-income economies are those with a GNI per capita of more than US$ 1,045 but less than US$ 12,746.

the income distribution. This study contributes to the Kenyan inequality debate by focusing on additional measures of inequality. The Atkinson index, generalized entropy index and the coefficient of variation are measured and interpreted alongside the Gini index. This approach facilitated an examination of changes in the middle, the top and bottom ends of the income distribution.

1.1 Evolution of Inequality in Kenya

This subsection discusses the evolution of inequality as documented by various studies. Focus of most studies has been on the Gini index. A brief global picture is presented before focusing on the Kenyan context.

The global inequality in the mid-2000s, by some accounts is about the same as it was in the late 1980s (World Bank, 2012). Until the late 1990s, it was assumed that inequality is Sub Saharan Africa (SSA) was relatively lower than that of other regions. Much of the focus was on inequality in Latin America. Nevertheless, inequality in Africa was found to be one of the highest in the world by a number of studies including Deininger and Squire (1998). As summarized in Table 1.1, inequality is quite large in South Africa. In addition, the Kenyan inequality is relatively higher than in most of her east African neighbours as well as other countries within the globe (Table 1.1).

Table 1.1: Income inequality in selected countries

Country	Gini	Reference year
Brazil	52.9	2013
Burundi	33.4	2006
Egypt	30.8	2008
Ghana	42.8	2005
Ethiopia	33.2	2010
Rwanda	51.3	2010
South Africa	63.4	2011
Tanzania	37.8	2011
Uganda	42.4	2012
Kenya	48.5	2005

Source: World Development Indicators, 2015 (accessed fromhttp://wdi.worldbank.org/table/2.9)

Comparisons of the Gini indices across time as measured by Bigsten (1986) suggest that income inequality in Kenya was high in the 1960s, 1970s and 1980s–with the Gini index exceeding 0.63. Estimates based on recent household surveys (in 1992, 1994, 1997 and 2005) suggest relatively lower but still substantial income inequality. As an example, the World Bank estimated a Gini index of 0.443 (World Bank, 2002) and 0.419 (World Bank, 2004) using survey data for 1994 and 1997 respectively.[2]

Table 1.2 summarizes estimates of inequality in Kenya from various studies. Some of the earliest evidence is provided by Vandemoortele (1982) and Bigsten (1986). Income inequality measures suggest inequality was quite high (even in relative terms) in the 1960s and 1970s. The estimates in the 1990s suggest a decline even though the measured inequality is still substantial; relative to performance of other countries.

Table 1.2: Trends in income inequality estimates for Kenya and economic growth 1964 to 2005/06

Author	Reference year	Data source	Gini Coefficient	Economic growth (%)
Bigsten, 1986	1964	-	0.630	5.0
Lecaillon et al.	1969	-	0.604	8.0
Bigsten, 1986	1974	-	0.690	4.1
ILO, 1984	1976	Based on National Accounts	0.599	2.2
Vandemoortele, 1982	1976	1976 (SAM and population census)	0.59	2.2
Van Ginneken and Park	1977	Social Accounting Matrix (synthetic data)	0.570	9.5
Milanovic, 1994	1981-83	Chen, Datt and Ravallion, 1993	0.573	2.1
Lecaillon et al.	1984	-	0.604	0.8
Jain	1985	ILO, 1972	0.481	4.8
Deininger& Squire, World Bank, 2004	1992	Welfare Monitoring Survey I	0.599	0.5

[2] An ECA (1999) study estimated an African average Gini coefficient of 0.44 for the 1990s. Kenya's Gini coefficient of 0.45 in 1994 was just about equal to this average.

World Bank Poverty Monitoring Database, 2002	1992	Social Dimensions of Adjustment Survey	0.569	0.5
World Bank Poverty Monitoring Database, 2002	1994	Welfare Monitoring Survey II	0.443	3.0
World Bank, World Development Indicators, 2004	1997	Welfare Monitoring Survey III	0.419	2.4
Society for International Development, 2004	1999	Integrated Labour Force Survey	0.556	1.4
World Bank estimates	2005/06	Kenya Integrated Household Budget Survey	0.452	6.1

Source: World Income Inequality Database V2.0c May 2014. Economic growth data is from KNBS (various, 1963-2009) Economic Survey.

Bigsten (1986) offered some explanations on the changes observed for inequality in Kenya. In his study, Bigsten (1986) presents estimates of per capita income, income distribution and poverty in Kenya for the period 1914 to 1976. Table 2.2 reproduces some of his results. Between 1914 and 1950, inequality increased. In the earlier period, 1914 to 1921, the rise in inequality was attributed to the increasing economic differentiation. In the latter period 1946 to 1950; the rise in inequality was attributed mainly to the restraints or neglect imposed on the "traditional sector" by the government. Thereafter, inequality stayed below the 1950 level through to 1971. The fall in inequality in the 1950s was attributed to a booming economy (resulting from rising demand in the agricultural sector including the traditional agriculture) as a result of the Korean War. The government also introduced favourable policies for small holders (such as growing cash crops) following the Mau Mau struggle of 1950-1955 (Bigsten, 1986).

Table 1.3: Trends in income/expenditure inequality estimates for Kenya 1914 to 1976

Year	1914	1921	1927	1936	1946	1950	1955	1960	1964	1967	1969	1971	1974	1976
Per capita income	296	214	402	609	629	862	1177	1165	1365	1451	1568	1636	1665	1618
Inequality (Gini)	0.50	0.57	0.58	0.63	0.64	0.70	0.63	0.68	0.63	0.66	0.68	0.70	0.69	0.68
Poverty (Sen's index)	0.57	0.75	0.56	0.46	0.48	0.43	0.23	0.31	0.21	0.23	0.24	0.25	0.25	0.25

Source: Bigsten (1986)

Bigsten (1986) also notes that inequality and poverty rose between 1964 and 1971. Among the expanding African labour, per capita incomes rose especially within the public sector following a rise in demand for skilled labour. There was also a large group of Africans who did not benefit including those with little or poor land, the landless and the pastoralists. Rapid expansion of the economy in the 1970s explains the fall in inequality during the period. A further fall could have been envisaged but for the effects of the oil price shocks. Bigsten (1986) found that there was a strong correlation between a change in the Gini coefficient and a change in the urban rural income gap. He concludes that measures that decrease the urban-rural income gap would promote equity.

Income inequality in the 1990s to the present

Based on the computations of the Gini index, income inequality in Kenya has risen only slightly by some accounts. World Bank measures based on the WMS of 1994 and 1997 data and the KIHBS 2005/06 indicate a larger Gini index of 0.452 in 2005/06 relative to the estimates of 0.443 and 0.419 in 1994 and 1997 respectively (Table 1.2). It should be noted that these Gini estimates are lower than those provided by SID (2004) of 0.556 – perhaps resulting from the differing definitions (say of income measure) and/or methodologies.

Besides other objectives, World Bank (2009) attempted to address what could have happened to poverty and inequality over time in Kenya. With respect to inequality, the study centres compared inequality from 1997 to 2005/06 – years for which national survey data were available. Their findings indicate that "inequality is large and growing" in Kenya. The study also finds that the "national consumption decile ratio rose from 13 to 19 between 1997 and 2005/06." This is

interpreted as suggesting a large and growing inequality (World Bank, 2009: pp. 11 and pp. 15).

Bigsten et al. (2014) examined incomes, inequality and poverty in Kenya over a 100 year period. Their study compared inequality in 1994 and 2005 using per adult equivalent expenditures. Their findings on inequality suggest that overall, inequality increased between 1994 and 2005/06 – with reported Gini coefficients of 0.428 and 0.516 respectively. A dichotomy between rural and urban inequality finds that overall inequality is higher in urban areas. Inequality between rural and urban areas widened in 2005, relative to its 1994 measure.

Until the late 1990s, it was assumed that inequality is Sub-Saharan Africa (SSA) was relatively lower. Inequality in the continent was found to be one of the highest in the world by a number of studies including those of Deininger and Squire (1998). In addition, Kenya inequality is relatively high compared with the East African countries as well as other countries within the globe (Table 1.4).

1.2 Factors Driving Inequality in Kenya

Inequalities in income may result from a number of circumstances and changes. Some of these factors have been briefly outlined in the preceding background discussions. Franzini and Pianta (2011) suggest that income inequalities may result from the overall relationships between capital and labour. Moreover, they may result from changes in production systems, labour markets, government activities related to distributive roles, social variables including race and gender and the like. In the subsequent discussion, we shall discuss the role of each of these broad factors in Kenya.

To begin with, the real average wage in formal employment in the public and private sector experienced moderate growth in the period from 1965 to 1973. Thereafter, there was a declining real wage from 1973 to 1993 (Mule, Ryan and Ndii, 2004). The post 1993 period was characterized by a rapid wage growth regime that extended to 2003. Average real wage earnings in both the public and private sectors declined in the 2006-2010 period (KIPPRA, 2012). These real wage declines are often associated with productivity increases. This implies that the labour share of GDP in Kenya could have been falling and worsening inequality in favour of owners of capital. This is consistent with the rise in the share of expenditure of the highest quintile (usually the main owners of capital).

In the context of a globalizing world, skill biased technological change in an environment with abundant unskilled labour could also have heightened inequality.

This is captured aptly by Manda (2004) who analyses the effects of globalization on labour market outcomes. Partly as a result of globalization, there was increased unemployment and expansion of the informal sector due to retrenchment in the civil service and the collapse of some private firms. The reforms also resulted in a shift in labour demand from less skilled labour to more highly skilled labour. The labour market also experienced a decline in permanent full time workers and an increase in casualization. Moreover, less skilled workers experienced loss in earnings compared with the highly skilled workers. This combination of factors may have worsened inequality.

Other important factors are unionization and regulations. Manda, Bigsten and Mwabu (2005) get a significantly positive effect of unionism on earnings. They observe that it is primarily the less advantaged groups that make use of the unions. These unions thus primarily benefit the less skilled sections of the labor force, a finding that suggests that unionization may have a dampening effect on inequality between the skilled and less skilled groups.

The World Bank (2009) also isolates land, access to financial services, shocks and corruption as key drivers of inequality (and poverty) in Kenya. The publication suggests that corruption tends to be regressive and is an opportunity cost in terms of public expenditure. In cases of misappropriation or wasteful spending, there is a tendency to crowd out spending that would otherwise benefit the poor. These factors may have worsened inequality in Kenya.

1.3 Government Efforts to Tame Inequality

Government efforts to tame inequality encompass policy and program interventions. These are numerous and are usually intertwined with poverty reduction efforts. At the turn of the century, Kenya made efforts to stem out poverty and inequality. This was through; The introduction of universal free primary education (FPE),

1. Increase in share of resources allocated towards priority sectors in agriculture and rural development as well as enhanced investments in infrastructure development,
2. Efforts towards enhancing the business climate and environment and reducing the cost of doing business,
3. The introduction of decentralized funds such as the constituency development fund (CDF) and the local authority transfer fund (LATF).

Even though the Kenya Vision 2030 notes that as a result of these and other interventions, per capita incomes increased between 2002 and 2006, the impact of these interventions on income inequality is not clear. It is also likely that the effects of the global financial crisis in 2008, combined with the post-election violence of 2007/08, may have dampened some of the gains achieved in poverty and inequality reduction during the early part of 2000s.

In 2007, the government anchored its development plan on the overarching economic blueprint; Kenya Vision 2030. The Vision provides the broad inequality interventions by the government. "Poverty reduction and reduced income disparities" is one of the identified flagship projects in Vision 2030. The aim is to reduce not only income opportunities across gender, social status and regions but also access to public services.

The specific goal of the Vision is to uplift the status of the disadvantaged groups and regions. Six growth sectors are identified as key including: tourism, agriculture, wholesale and retail trade, manufacturing, business process outsourcing (BPO) and financial services. The enabling sectors, including transport, communication and energy, are also earmarked for increased investments especially within disadvantaged regions. In addition to these efforts, the country promulgated a new constitution in 2010. The hallmark of this major reform was the introduction of a less centralized system of governance. Hitherto, centralization was thought to be a major contributor of persistent regional inequalities in Kenya. The impact of these interventions on income inequality shall be evident as more data on income distribution becomes available. On the whole, it may be cryptic to unearth the effects of the interventions on income inequality.

1.4 Objectives of the Study

The overall objective of this study is to trace how income inequality has evolved in Kenya in the recent past. The specific objectives are:

- To estimate the levels of income inequality among Kenyan households over time using various inequality measures and
- To decompose the total income inequality by population subgroups; these include region and education.

1.5 Significance of the Study

This study proposes to contribute to the inequality debate by tracing the evolution of income inequality in Kenya. It will also decompose total income inequality by population subgroups, including locality (rural versus urban), region (counties

and the former provinces) and education level. As elaborated in the preceding sections, there are many studies that have estimated inequality levels across distinct time periods and using varying sources of data and methods. Some of these studies include International Labour Organisation (ILO) (1984), Bigsten (1986), Society for International Development SID (2004), World Bank (2009) and Bigsten, Manda, Mwabu and Wambugu (2014).

An examination of the evolution of income inequality relying on separate distinct studies may be misleading and/or complex. This is because separate studies often use dis-similar definitions or formulations for computing measures of income inequality (Xu, 2004). Besides the definitional issues, another source of complexity in comparing separate studies across time is that these studies may examine inequality at different levels, for example, at the individual or household levels. These complexities may make trend assessments of inequality based on separate studies inaccurate or misleading. This difficulty in comparing levels of the Gini index across various studies in time is perhaps overcome by Bigsten (1986) who applies a consistent method in analysing Kenyan inequality from 1914 to 1976. Bigsten et al., (2014) extends the earlier study by Bigsten (1986) to analyse the evolution of inequality in Kenya.

However, most of the previous studies on inequality in Kenya focused on measuring inequality using the Gini index. This is despite the fact that the Gini index does not differentiate dissimilar kinds of inequality. As an example, Lorenz curves may intersect, reflecting diverse patterns of income distribution but resulting in similar Gini coefficient values (Fernando, 2007). In addition, the Gini index estimates are more responsive to transfers in the middle of the distribution. The Gini index may thus fail to unearth the inequality dynamics at the top and bottom ends of the income distribution. To overcome these challenges, this study, besides estimating the Gini index, also measures income inequality using the Atkinson index, the coefficient of variation and the Theil index. The value addition of this study's approach is that the use of several inequality measures allow for a deeper assessment of inequalities in different parts of the income spectrum (Jenkins, 1999).

Besides measuring inequality, this study also aims to decompose inequality by subgroups of the population. Decomposing inequality enables an isolation of the main determinants of inequality by isolating how various components (e.g. sub-groups) contribute to the total inequality (Araar, 2006). This will address a key gap in previous studies on inequality in Kenya.

2. Literature Review

2.1 Measurement of Income/Expenditure Inequality

The term inequality is used in a variety of ways and may focus on one or more of observable outcomes such as inequalities in income, wealth, employment and/or education. There are a number of indices developed to measure and/or represent inequality in the society. They include the Gini index, the Atkinson index and the Generalized Entropy indices.[3] The Gini index is perhaps the most popular measure used. There are in fact numerous ways to compute and interpret the Gini index. Some of the computational methods of the Gini index include the geometric approach, Gini's mean difference approach, covariance approach and the matrix form approach (Xu, 2004). The Gini index varies between zero (perfect equality) and one (perfect inequality).

Inequality can also be measured using other indices including the Atkinson index. The Atkinson index is an attempt to improve on the weaknesses of the Gini index and it too varies between zero and one. When the Atkinson index is zero, we have no inequality. Unlike the Gini index, the Atkinson index allows for varying sensitivity by the introduction of a sensitivity parameter or income aversion parameter commonly denoted by epsilon ($\mathcal{E}$). Epsilon ($\mathcal{E}$) can be fixed at zero through to infinity. If $\mathcal{E}$ is fixed at zero, it means there is no aversion to inequality. When $\mathcal{E}$ is larger and approaching infinity, it implies the society is more concerned about inequality (Xu, 2004; Araar, 2006). A society is averse to inequality if individuals are willing to give up some material payoffs to achieve more equitable outcomes (Montero, 2007).

The generalized entropy (GE) indices also incorporate sensitivity parameters (theta) that typically vary from one to two in most studies. When the sensitivity parameter (theta) is equal to one, the measure is equally sensitive to changes across the distribution. On the other hand, when theta is close to zero, these measures are sensitive to changes at the lower tail of the distribution. Higher values of the parameter are associated with more sensitivity of the index at the top of the income distribution. The GE indices vary from zero to infinity, with larger values associated with greater inequality while zero being a state of equal distribution (Litchfield, 1999, Xu, 2004).

Vandemoortele (1982), in his paper addresses the relationship between income distribution, regional and sector income disparities and poverty in Kenya. Using the Social Accounting Matrix (SAM) of 1976, the Gini index for income (proxied

[3] Includes the Theil Index.

by consumption) is estimated at about 0.59. In his estimations, three different household groups were distinguished: urban households, small holders and other rural families. The intra-group Gini index ratios of these clusters were estimated to be 0.45, 0.35 and 0.62 respectively. Vandemoortele concludes that there is a disparity between urban and rural regions, and that there is a marked dualism within rural Kenya (i.e. between smallholders and other rural families). This dualism suggests that the separation of households by income groups in studying inequality would offer a more comprehensive analysis of the changes in inequality.

2.2 Decomposition of Inequality Indices

One of the main reasons for decomposing inequality is to understand the main determinants of inequality by isolating how each component (of say income) contributes to the total inequality (Araar, 2006). Income inequality can be studied by separating the total income as the sum of several components.

Earlier studies on the decomposition of income inequality were mainly based on the analysis of the mathematical properties of inequality indices, for example studies by Shorrocks (1982). This earlier or traditional approach to inequality decomposition was criticised on a number of fronts. The key criticisms were that the formal requirements for exact decomposition are too demanding for some practical applications, and that the approaches do not allow for a causal analysis (Fiorio and Jenkins, 2007).

More recent works suggest that the aforementioned weaknesses can be overcome by use of regression-based approaches. These works include the contributions of Fields (2000) and Morduch and Sicular (2002). In particular, the advantages of some of the variants of the regression based methods are that the method yields (or are thought to yield) an exact allocation of contributions to the identified variables and it can be used with a variety of inequality indices. In addition, it provides a simple procedure of deriving standard errors and confidence intervals for estimated components of inequality.

Some of the variants of the regression-based methods of inequality decomposition have faced a number of criticisms too. Cowell and Fiorio (2011), in reference to the Morduch and Sicular (2002) approach, assert that the regression-based approach used lacks the purported attributes of being “exact”, since there is always a residual. They also demonstrated that the method reveals substantial variability in results across various inequality indices. Therefore, it fails the “generality” test and does not present a simple procedure of estimating the standard errors and confidence intervals as purported.

The key message in Cowell and Fiorio (2010) is that the various decomposition methods could be integrated in a complementary manner. In their work, they attempt to reconcile the decomposition of inequality by source of income and by sub-groups with regression-based methods. On the whole, regression based methods could be viewed as useful approaches in isolating the contribution of income covariates to total inequality (Araar, 2006).

Inequality decomposition may shed some light on key patterns of inequality or its determinants. However, there appears to be only a few studies on Kenya on the decomposition of income inequality. Ndirangu and Mathenge (2010), in one of the few studies on Kenya, note that "there is little analytical work in patterns of inequality in Kenya." In their study, they attempt to determine the contribution of different income sources to overall income inequality. However, their work is restricted to a rural sample.

In yet another Kenyan study, Nafula, Ndirangu and Onsomu (2013) aim at determining the contribution of growth and inequality components in poverty reduction. The study decomposed inequality by expenditure components. A key finding was that a rise in non-food expenditure is associated with an increase in inequality whereas a rise in food expenditure is associated with a decrease in inequality.

3. Methodology

As is now evident, there are potential limitations of using separate studies across time to pick a trend on income inequality. To begin with, the results of any given study would be sensitive to the definition of income and income unit as well as the method of estimation used. As an example, some of the estimations of inequality in Kenya reviewed above relied on national accounts data and population census data, for example Vandemoortele (1982). This complicates any attempt to forge a trend for evolution of income inequality across time using various studies. Bigsten (1986), World Bank (2009) and Bigsten et al. (2014) remain to be quite useful studies in analysing inequality trends in Kenya. Part of the limitation of these studies is their focus on only computing the Gini index and/or the decile ratios.

3.1 Estimation Procedures/Methods

In order to achieve the first objective, the Gini coefficient, the Theil index, the Atkinson index as well as the coefficient of variation was estimated. The estimation of the inequality indices was performed using the Distributive Analysis for Stata Package (DASP) (Araar and Duclos, 2009). The empirical processes of estimating the Gini index as well as the Atkinson and Theil indices in DASP are briefly outlined in what follows. Following Araar and Duclos (2009), DASP estimates the Gini index as: $\hat{I} = 1 - \frac{\hat{\xi}}{\hat{\mu}}$ where:

$$\hat{\xi} = \sum_{i=1}^{n} \left[\frac{(V_i)^2 - (V_{i+1})^2}{[V_1]^2} \right] y_i$$

and $V_i = \sum_{h=i}^{n} w_h$ and $y_1 \geq y_2 \geq y_3 \geq \ldots \geq y_n$

In turn, $w_h = hw_i * hs_i$, where î= the Gini inequality index

$\hat{\xi}$ = Equally distributed equivalent income, which was defined by Atkinson as that level of income that if obtained by every individual in the income distribution would enable the society to reach the same level of welfare as actual incomes

$\widehat{\mu}$ = Mean of the distribution (mean income)

hw_i = Sampling weight for observation *i* (this is usually used to correct imperfections in the sample)

hs_i = **Size** of observation *i* (e.g. size of household income)

y_i = **Income** of the household

n = **Number** of observations

The Atkinson index of social welfare can be expressed as:

$$\hat{I}(\varepsilon) = \frac{\hat{\mu} - \hat{\xi}(\varepsilon)}{\hat{\mu}} \text{ where } \hat{\mu} = \frac{\sum_{i=1}^{n} w_i y_i}{\sum_{i=1}^{n} w_i}$$

Where:

$$\hat{I}(\varepsilon) = \begin{cases} \left[\frac{1}{\sum_{i=1}^{n} w_i} \sum_{i=1}^{n} w_i (y_i)^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}} & \text{if } \varepsilon \neq 1 \text{ and } \varepsilon \geq 0 \\ Exp\left[\frac{1}{\sum_{i=1}^{n} w_i} \sum_{i=1}^{n} w_i \ln(y_i) \right] & \text{if } \varepsilon = 1 \end{cases}$$

The generalized entropy is estimated as:

$$\hat{I}(\theta) = \begin{cases} \frac{1}{\theta(\theta-1)\sum_{i=1}^{n} w_i} \sum_i w_i \left[\left(\frac{y_i}{\hat{\mu}} \right)^{\theta} - 1 \right] \\ \frac{1}{\sum_{i=1}^{n} w_i} \sum_i w_i \log(\ ) \\ - \end{cases}$$

Where: theta *(θ)* represents the weight given to the distances between incomes at different parts of the income distribution. For lower values of θ GE is more sensitive to changes in the lower tail of the distribution and for higher values GE is more sensitive to changes that affect the upper tail. A value of θ=1 applies equal weights across the distribution.

Following Litchfield (1999), the Atkinson class of measures has the general formula:

$$A_{\varepsilon} = 1 - \left[\sum_{j=1}^{K} \left[\frac{y_i}{\bar{y}} \right]^{1-\varepsilon} \right]^{1/1-\varepsilon}$$

Where ε is an inequality aversion parameter. The higher the value of ε the more the society is concerned about inequality.

The coefficient of variation (CV) index of inequality for the group k can be expressed as:

$$CV = \left[\frac{\sum_{i=1}^{n} w_i y_i^2 \Big/ \sum_{i=1}^{n} w_i - \hat{\mu}^2}{\hat{\mu}^2} \right]^{\frac{1}{2}}$$

Members of the generalized Entropy class of measures have the general formula as follows:

$$I_w = \sum_{j=1}^{K} w_j GE(\alpha)_j$$

For the second objective, i.e. decomposition of the inequality measures, focus was on decomposing the generalized entropy index by population subgroups. Following Araar and Duclos (2013) and Litchfield (1999), the generalized entropy indices of inequality can be expressed as a sum of within group inequality and between group inequalities. Within group inequality I_w is defined as:

$$I_w = \sum_{j=1}^{K} w_j GE(\alpha)_j$$

Where $w_j = v_j^{\alpha} f_j^{1-\alpha}$ f_j is the population share and v_j the income share of the k separate groups.

Between group inequality is computed as:

$$I_b = \frac{1}{\alpha^2 - \alpha} \left[\sum_{j=1}^{k} f_j \left(\frac{\bar{y}_j}{\bar{y}} \right)^{\alpha} - 1 \right]$$

It can be shown that total inequality (I) can be expressed as: $I=I_b+I_w$

3.2 Data

This study used several sources of data. The Kenya Integrated Household Budget Survey (KIHBS) 2005/2006 data was used to provide recent measures of income

inequality among households. The Welfare Monitoring Survey (WMS) of 1994 was used to provide past measures of inequality in Kenya.

There were a number of data manipulation procedures that merit a discussion. This is because inequality assessments are typically clouded by conceptual and methodological uncertainties. These are related to a number of factors that include the choice of well-being indicator, the control for differences in the cost of living, the treatment of household size and composition.

The choice of well-being indicator

The choice of well-being indicator used in the estimations was guided by availability of the data on the indicator. All the datasets had expenditure data and, therefore, expenditure was chosen as a convenient well-being indicator in the estimations. It is recognized that income typically varies more than expenditure from one period to another and is thus less preferred to expenditure. This is even more the case in economies dominated by self-employment in agriculture (Deaton, 1997). In the data sets used, expenditure was defined to include: food and non-food consumption, the purchase of durable goods, assets, repayment of loans, rents paid and imputed rent for occupying one's own dwelling.

The control for differences in cost of living

To compare distributions across different regions such as rural versus urban, spatial consumer price indices (CPI) should be applied to regional distributions prior to any distributional analyses. In our analyses, the data for 2005/06 was deflated using regional CPIs computed by the Kenya National Bureau of Statistics (KNBS). The CPIs were used to adjust expenditure in these regions for the cost of living differences.

The treatment of household size and composition

Households differ in size and composition, and this may require adjustments to improve the assessment of distributions. In related studies, it is recognized that there may be economies of scale in a household. This implies, for instance, that a household with three members may not necessarily consume thrice as much as that with one (Deaton, 1997). In addition, individuals within a household have different needs depending on a number of variables such as age and gender. A common practice to improve these household characteristics is to divide the total income by the number of equivalent adults living in the household. This is usually given by some equivalence scale in which each member of the household counts as some fraction of a reference person. The expenditure data used was adjusted

using the number of equivalent adults in a household. The head of the household received a weight of 1 while other adults were given a weight of 0.7. Children (defined as those aged 14 years or less) received a weight of 0.5.

4. Results and Discussions

Appendix tables 1a and 1b represent the summary statistics for the WMS 1994 data and the KIHBS 2005/06 data. The WMS 1994 data set had 10, 710 households. The mean household size is 5.4 and the mean number of adults (those aged above 14 years) and children (those aged 14 years or less) was 4.1 and 1.3, respectively. The mean of total annual household expenditure was about Ksh 52,000. Food expenditure is the highest expenditure item accounting for about 66 per cent of the mean annual expenditure. As presented in Appendix table 1b, the mean household size for the KIHBS 2005/06 data is 5.1.

4.1 Measures of Income Inequality

Table 4.1 summarizes various measures of inequality in 1994 and 2005/06. Per adult equivalent expenditures are used as income proxies. The overall Gini coefficient for 1994 is about 0.47. Urban inequality is higher than rural inequality estimated at about 0.45 and 0.40, respectively. In 2005/06 (using per adult equivalent monthly expenditure in regionally deflated prices) total inequality is estimated at 0.46 with urban and rural rates of 0.47 and 0.39, respectively. The estimates suggest that while urban inequality worsened, rural inequality eased.

Table 4.1: Measures of income inequality in Kenya 1994 and 2005/06

	1994			2005/06		
	Total	**Rural**	**Urban**	**Total**	**Rural**	**Urban**
Gini Index	0.4693	0.3995	0.4525	0.4637	0.3893	0.4725
	(0.0085)	(0.0044)	(0.0198)	(0.0059)	(0.0045)	(0.0112)
Atkinson Measure (epsilon = 0.5)	0.1905	0.1360	0.1797	0.1822	0.1244	0.1885
	(0.0082)	(0.0033)	(0.0168)	(0.0052)	(0.0028)	(0.0091)
Atkinson Measure (epsilon = 1.0)	0.3352	0.2609	0.3081	0.3141	0.2335	0.3211
	(0.0100)	(0.0057)	(0.0222)	(0.0068)	(0.0046)	(0.0125)
Atkinson Measure (epsilon = 2.0)	0.7616	0.7260	0.6287	0.5257	0.4433	0.5173
	(0.0457)	(0.0547)	(0.0689)	(0.0112)	(0.0130)	(0.0155)
Generalized entropy index (theta = 0)	0.4042	0.3023	0.3683	0.4052	0.2871	0.3887
	(0.0097)	(0.0031)	(0.0225)	(0.0103)	(0.0068)	(0.0177)
Theil Index (generalized entropy index, theta = 1)	0.4417	0.2725	0.4274	0.4426	0.2692	0.4580
	(0.0241)	(0.0036)	(0.0465)	(0.0175)	(0.0073)	(0.0270)
Generalized entropy index (theta = 2)	1.1163	0.3644	0.9955	1.0310	0.3813	0.9546
	(0.2328)	(0.0128)	(0.2572)	(0.0869)	(0.0185)	(0.0890)
Coefficient of variation	1.4942	0.8536	1.4110	1.4360	0.8733	1.3818
	(0.1757)	(0.0256)	(0.2033)	(0.0605)	(0.0212)	(0.0644)

Source: Computed from the WMS 1994, KIHBS 2005/06; Note: Numbers in brackets are standard errors.

The difference between the two overall Gini inequality indices was tested for significance and the results indicate that the null hypothesis "that the difference between the two measures is zero" cannot be rejected (p-value of 0.4929) (see Appendix Table 1c).

The Atkinson index (for income aversion parameter values ranging from 0.5 to 2 as used in practice) suggests a clear dichotomy between changes in rural versus urban inequality over the two periods (Table 4.1). Higher values of $\mathcal{E}$ are associated with more sensitivity of the Atkinson index to inequalities at the bottom of the distribution of income.[4] For epsilon values of 0.5 and 1.0, urban inequality worsened whereas rural inequality declined. An increase of the sensitivity of the measure to inequalities at the bottom (epsilon=2) suggests overall inequality. Both rural and urban inequalities worsened in 2005/06 relative to the mid-1990s. A corresponding interpretation of the Atkinson index (for epsilon = 1) of 0.3352 in 1994 and 0.3141 in 2005/06 is that in 1994, society could achieve the same level of social welfare with only 66 per cent of total income if the incomes were perfectly distributed (and this rises to nearly 69 per cent in 2005/06). The differences in the Atkinson indices for the two periods, that is 1994 and 2005/06 for $\mathcal{E}$ =1 and $\mathcal{E}$ =2, are both different from zero whereas that for $\mathcal{E}$ =0.5 is not statistically significant (Appendix Table 1c). The tests suggest that overall inequality changed significantly if more weight is placed at the bottom of the income distribution.

The measures of the general entropy (GE) class are computed for theta values of 0, 1 and 2. For theta = 1, i.e. when equal weights are applied across the income distribution, the index is slightly higher in 2005/06 and suggests a worsening distribution of per capita expenditure for the total population. Even so, the difference in this overall measure is not statistically significant. The measure supports the earlier observation of declining rural inequalities and worsening urban inequalities. If more weight is given to the bottom of the distribution (theta = 0), rural inequalities declined from about 0.30 to 0.29 while urban inequality increased (from about 0.37 to 0.39). Overall inequality increased slightly from about 0.404 to 0.405, and the difference was found to be statistically significant. If more weight is given to high incomes (theta=2), rural inequalities actually worsened while urban inequalities improved. Total inequality seems to have declined slightly and the difference is not different from zero.

Even though the coefficient of variation measure suggests an improvement in the overall inequality, the difference was not statistically significant. The results

[4] Atkinson values can be used to calculate the proportion of total income that would be required to achieve an equal level of social welfare as at present if incomes were perfectly distributed (Fernando, 2007)

indicate that there is no correspondence in the changes in inequality over time between urban and rural regions. What has not been investigated is whether there is a marked dualism within rural Kenya (i.e. between small holders and other rural families) as suggested by Vandemoortele (1982). The results also indicate that relying on the Gini index alone may fail to unearth the peculiar differences in the changes that occur if more weight is attributed to the bottom and top ends of the income distribution. To firm up these discussions, the next sub-section summarizes inequality measures using the decile and/or decile ratios.

4.2 Deciles of Income and Decile Ratios

To characterize inequality further, Tables 4.2 and 4.3 show the percentage of total per adult equivalent household expenditure by deciles of the population in 1994 and 2005/06. For the total population, the top 10 per cent of households controlled about 28 per cent of the total expenditure while the bottom 10 per cent controlled 1.5 per cent of the total expenditure in 1994. The share of expenditure of the top 10 per cent of households was larger in 2005/06 at about 45 per cent, reflecting a less egalitarian or less equal society.

Table 4.2: Household per adult equivalent expenditure shares by deciles, 1994

	Total population (n = 10,710)		Rural (n = 9,031)		Urban (n = 1,679)	
Decile	Expenditure Share (%)	Cumulative Share	Expenditure Share (%)	Cumulative Share	Expenditure Share (%)	Cumulative Share
1	1.52	1.52	1.58	1.58	2.45	2.45
2	3.18	4.71	3.30	4.88	4.96	7.41
3	4.35	9.05	4.60	9.49	5.99	13.40
4	5.69	14.74	5.46	14.95	6.71	20.11
5	7.26	22.00	7.22	22.17	8.13	28.24
6	8.48	30.48	8.60	30.77	9.77	38.00
7	10.63	41.11	10.09	40.86	9.75	47.75
8	13.37	54.48	12.53	53.39	13.28	61.04
9	17.14	71.63	16.84	70.24	15.65	76.68
10	28.37	100.00	29.76	100.00	23.32	100.00

Source: Computed from the Welfare Monitoring Survey 1994 data

Table 4.3: Household per adult equivalent expenditure shares by deciles, 2005/2006

	Total population (n = 13,155)		Rural (n = 8,475)		Urban (n = 4,683)	
Decile	Expenditure Share (%)	Cumulative Share	Expenditure Share (%)	Cumulative Share	Expenditure Share (%)	Cumulative Share
1	1.70	1.70	2.99	2.99	2.41	2.41
2	2.70	4.39	4.66	7.65	3.56	5.97
3	3.33	7.72	5.74	13.39	4.08	10.05
4	4.11	11.84	6.42	19.82	5.59	15.64
5	5.06	16.90	7.76	27.58	6.12	21.76
6	6.22	23.12	8.73	36.31	5.73	27.49
7	7.79	30.91	10.71	47.02	7.52	35.01
8	10.50	41.41	12.02	59.04	8.97	43.98
9	13.73	55.14	15.36	74.40	14.08	58.06
10	44.86	100.00	25.60	100.00	41.94	100.00

Source: Computed from the KIHBS 2005/06 data

The top 10 per cent of rural households controlled about 30 per cent of income in 1994 and about 26 per cent in 2005/06. On the other hand, the top 10 per cent of urban households controlled 23 per cent of the total income in 1994 and this rose to nearly 42 per cent in 2005/06. This indicates that the distribution of income among urban households worsened, with the richest decile gaining a larger proportion of the total income at the expense of the other income groups in 2005/06 relative to 1994.

4.3 Graphical Analyses

The empirical results provided above have their own limitations and can be complemented by graphical analyses. The numbers aggregate a distribution to a single figure whereas graphs can depict the whole distribution or part of the distribution, thus overcoming the limitations. In addition, there is usually some uncertainty about how to weight people at different income levels.

Figures 4.1 and 4.2 represent the Lorenz curves for the distributions of per adult equivalent expenditures for 1994 and 2005/06, respectively. In both graphs, the rural Lorenz curve dominates the urban and the overall population Lorenz curves. The distribution for the urban population is more unequal than the total population at parts of the higher income levels in 1994.

Figure 4.1: The Lorenz curve of the distribution of expenditure for total, rural and urban population, 1994

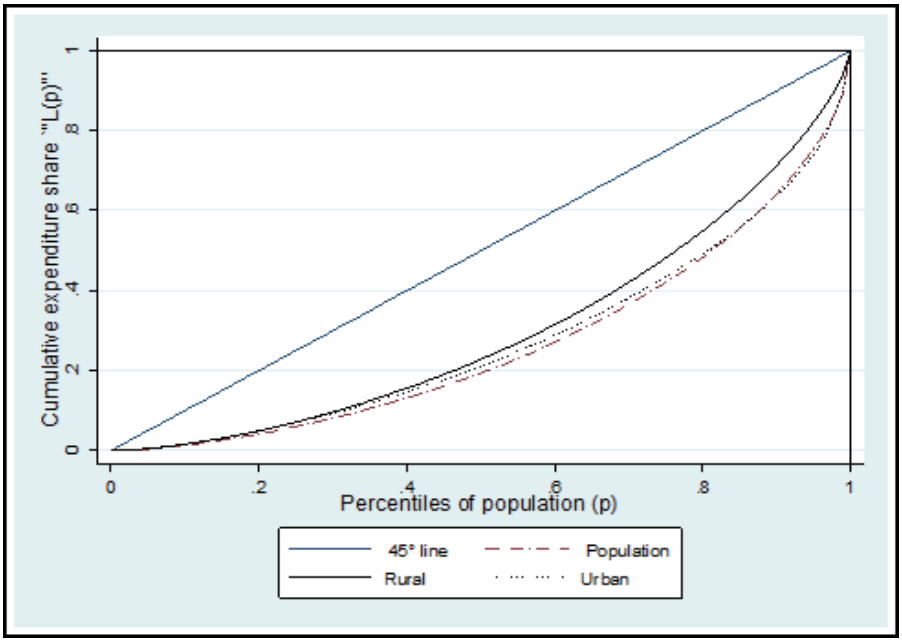
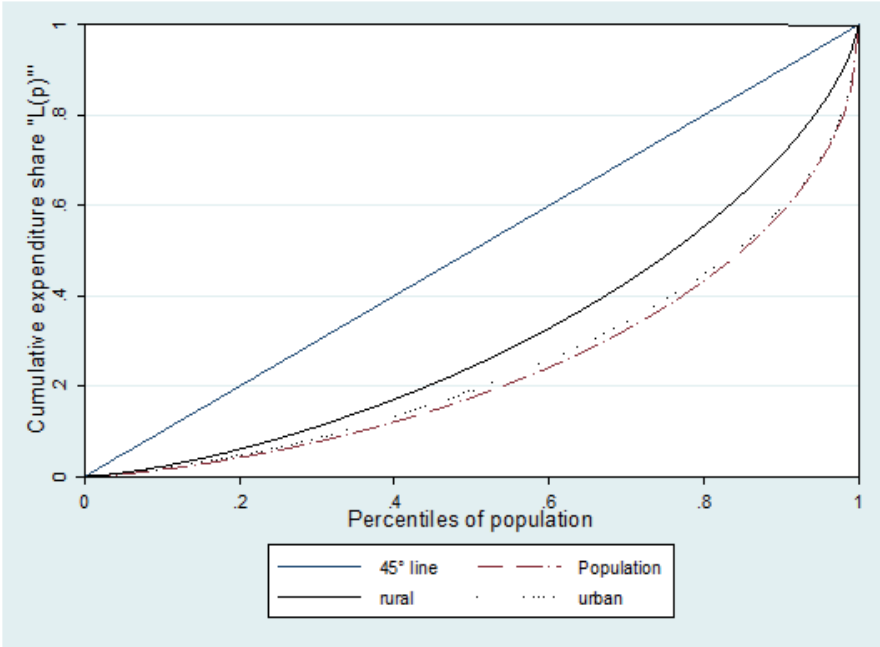


Figure 4.2: The Lorenz curve of the distribution of expenditure for total, rural and urban population, 2005/06



4.4 Decomposition of Inequality by Population Sub-Groups

The decomposition examines the contribution of locality (rural versus urban), region (both county and former provinces) and education in overall per adult equivalent expenditure inequality in Kenya. The generalized entropy index is decomposed with theta set to 1 and 2, respectively. The result of the decomposition of per capita expenditure by locality (i.e. rural or urban) is summarized in Table 4.4.

The per capita total consumption expenditure, in regionally deflated prices for urban areas is about 2.5 times greater than that in rural areas in 2005/06. This compares to nearly three times for the 1994 distribution (Appendix Table 2).

The results of the Theil index decomposition (for theta=1) show that about 22 per cent of inequality in 2005/06 could be attributed to the differences between rural and urban areas. Most of the inequality (about 78%) can be attributed to inequality within these localities. The 1994 distribution had approximately similar decomposition results (Appendix Table 2). The figures in parentheses are percentage contributions of inequality within each locality to aggregate inequality. The contribution of urban areas to total inequality rises with the increase in the weighting parameter from 1 to 2, or as more weight is given to incomes at the top end.

Table 4.4: Measurement and decomposition of inequality by locality, Kenya 2005/06

	Population share	Per capita expenditure of the group	Gini Index	Atkinson Index (2)	Theil Index (1)	Theil Index (2)
Locality						
Rural	0.7930	22,693.43	0.3893	0.4433	0.2692 (0.3640)	0.3813 (0.1670)
Urban	0.2070	57,282.72	0.4724	0.5173	0.4580 (0.4155)	0.9546 (0.7212)
Total	1.0000	31,510.90	0.4637	0.5257	0.4426	1.0310
Within groups component of inequality					0.7795	0.8882

Between groups component of inequality					0.2205	0.1118

Note: The figures in parentheses are percentage contributions of inequality within each locality to aggregate inequality

These results suggest that measures to reduce the rural-urban income gap would have relatively limited impact in promoting equity, since most of the inequality is explained by the within component.

Table 4.5 provides measures and decomposition of inequality by education level of the household head. Two groups are isolated; individuals with at least Form IV level of education (12 years) and those with less than 12 years of education. The more educated group form a smaller proportion of the overall population (about 23%). The distribution of income for the more educated group is more unequal (Gini index of 0.47) and this group (despite their lower population proportion) contributed about 44 per cent of overall inequality (for theta=1) and about 74 per cent (for theta=2) or when more weight is attached to higher incomes. Most of the inequality (about 69% to 86%) is explained by the within component of inequality.

Table 4.5: Measurement and decomposition of inequality by education level, Kenya 2005/06

	Population share	Gini Index	Atkinson Index (2)	Theil Index (1)	Theil Index (2)
Education level					
Less than form IV*	0.5351	0.3778	0.3750	0.2519 (0.2454)	0.3541 (0.1194)
Form IV and above	0.2351	0.4707	0.4970	0.4555 (0.4452)	0.9607 (0.7418)
Total	1.0000	0.4637	0.5257	0.4426	1.0310
Within groups component of inequality				0.6907	0.8612

Between groups component of inequality				0.2248	0.1088

Note: The figures in parentheses are percentage contributions of inequality within each education level to aggregate inequality

** includes those with no education or cases of non-response.*

In analogous results, Table 4.6 provides measures and decomposition of inequality across major regions in Kenya using the 2005/06 data. These regions correspond to the former 8 provinces of the country, including Nairobi.

Table 4.6: Measurement and decomposition of inequality across regions, 2005/06

	Population share (%)	Per capita expenditure of the group	Gini Index	Atkinson Index (2)	Theil Index (1) (Relative contribution)	Theil Index (2) (Relative contribution)
Region						
Nairobi	8.19	70,374.41	0.4860	0.5297	0.4735 (0.2259)	0.9113 (0.4817)
Central	12.84	33,681.45	0.3917	0.4128	0.2711 (0.0887)	0.4084 (0.0647)
Coast	9.19	29,844.50	0.4364	0.4524	0.3457 (0.0606)	0.5374 (0.0342)
Eastern	16.50	24,566.57	0.4011	0.4253	0.3017 (0.0896)	0.6266 (0.0637)
North Eastern	2.92	14,488.30	0.3707	0.4067	0.2325 (0.0075)	0.2887 (0.0020)
Nyanza	14.13	24,269.92	0.3914	0.4047	0.2814 (0.0758)	0.4353 (0.0426)
Rift Valley	24.30	28,956.24	0.4445	0.5751	0.4076 (0.1991)	0.9203 (0.1717)
Western	11.93	21,375.11	0.3724	0.3650	0.2540 (0.0487)	0.3978 (0.0233)

Within groups component of inequality					0.7962	0.8839
Between groups component of inequality					0.2038	0.1161
Kenya	100.00	31510.90	0.4637	0.5257	0.4426 (1.0000)	1.0310 (1.0000)

Note: The figures in parentheses are percentage contributions of inequality within each region to aggregate inequality

Based on the Gini index estimates, a measure that is responsive to transfers in the middle of the distribution, inequality is highest in the most urbanized region in Kenya, Nairobi. Inequality is also relatively higher in the Coast region – a region with the second largest urban centre, Mombasa. These estimates are largely consistent with earlier findings that associate urban regions with higher levels of inequality (e.g. World Bank, 2009). Inequality is lowest in Western and North Eastern regions with Gini indices of about 0.37. There is a relatively clear positive relationship between inequality (as measured by the Gini index) and per capita regional consumption expenditure. Inequality is observably higher in the regions with higher per capita total consumption expenditure.

If more weight is given to inequalities at the bottom of the distribution (measure based on the Atkinson index), overall results change slightly. The Rift Valley (which encompasses Baringo, Bomet, Elgeyo-Marakwet, Kajiado, Kericho, Laikipia, Nakuru, Nandi, Narok, Samburu, Trans Nzoia, Turkana, Uasin Gishu and West Pokot counties) emerges as the most unequal region – moving from its former rank of second under the Gini measure). The regions with the lowest inequalities with the Atkinson indices are Western, Nyanza and North Eastern regions.

The decomposition of the Theil index (theta = 1) indicates that the "within regions" inequality contributes about 80 per cent to aggregate inequality. This implies that the contribution of between regions inequality to total inequality is only about 20 per cent. When more weight is given to the incomes at the higher end of the distribution (theta = 2), the "within regions" contribution increases to about 88 per cent.

The figures in parentheses are percentage contributions of inequality within each locality to aggregate inequality. When the inequality measure is equally sensitive to incomes across the distribution (theta =1), the figures suggest that Nairobi with a "population share" of about 8 per cent contributes about 23 per cent to the aggregate inequality. The Rift Valley region, with a population share that is nearly three times larger than Nairobi's, contributes about 19 per cent to aggregate inequality. When more weight is given to incomes at the higher end of the distribution (theta=2), the contribution of Nairobi region to overall inequality rises to about 48 per cent while that of the Rift Valley falls slightly to about 17 per cent. The contribution of each of the other regions to overall inequality is less than 9 per cent for theta values of 1 and 2 (i.e. when more weight is given to higher incomes or otherwise).

Table 4.7 provides measures and decomposition of inequality across counties. The table reproduces the counties with the largest and lowest inequality measures. The full list of county results is summarized in Appendix Table 3 and Figure 4.3. With respect to the level of inequality, Turkana, Uasin Gishu and Marsabit counties exhibit the highest Gini measures of 0.58, 0.57 and 0.49, respectively. The top rankings do not change much when more weight is given to higher incomes (using the Atkinson index with theta = 2). Nairobi and other relatively more urbanized counties are also observed to have relatively high rankings. Based on the Gini measure, the least unequal counties are Garissa, Wajir and Bomet with Gini indices of 0.32, 0.29 and 0.28, respectively.

Figure 4.3: Gini Inequality Index across counties in Kenya, 2005/06

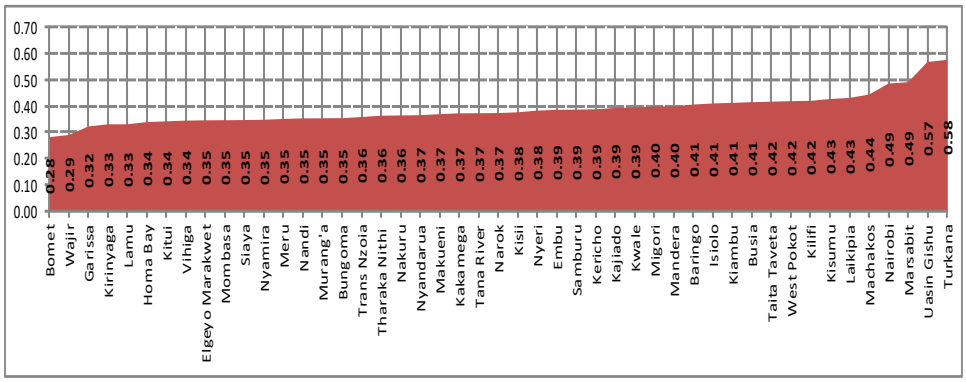


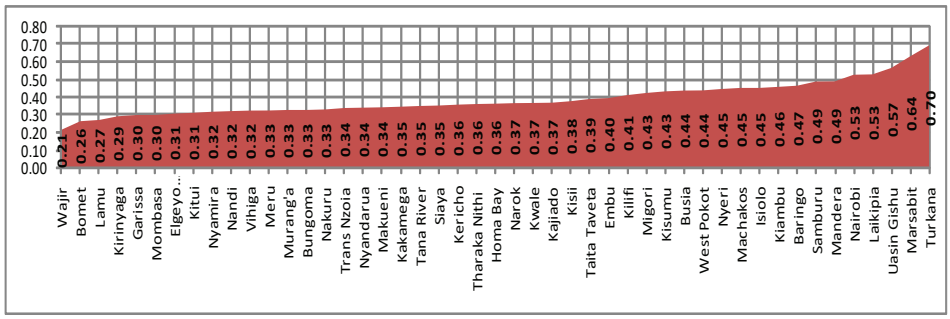
Table 4.7: Measurement and decomposition of inequality across counties, 2005/06

	Population share (%)	Gini Index	Atkinson Index (2)	Theil Index (1) (Relative contribution)	Theil Index (2) (Relative contribution)
County					
Turkana	1.47	0.5761	0.6978	0.7329 (0.0058)	1.9784 (0.0016)
Uasin Gishu	2.19	0.5681	0.5685	0.7580 (0.0558)	1.9800 (0.0930)
Marsabit	0.58	0.4907	0.6352	0.4515 (0.0028)	0.7236 (0.0009)
Nairobi	8.19	0.486	0.5297	0.4735 (0.2259)	0.9113 (0.4817)
Machakos	3.41	0.4436	0.4539	0.4138 (0.0257)	1.4618 (0.0313)
Laikipia	1.22	0.4311	0.5316	0.3338 (0.0096)	0.4852 (0.0063)
Kisumu	2.84	0.4267	0.4342	0.3416 (0.0257)	0.5458 (0.0206)
Kilifi	2.74	0.4199	0.4131	0.3354 (0.0133)	0.5672 (0.0062)
West Pokot	1.02	0.4186	0.4400	0.3077 (0.0043)	0.4149 (0.0015)
Taita Taveta	0.9	0.4165	0.3909	0.3465 (0.0060)	0.5959 (0.0038)
Siaya	2.27	0.3466	0.3531	0.2061 (0.0093)	0.2599 (0.0045)
Mombasa	2.59	0.3459	0.2994	0.2202 (0.0175)	0.3228 (0.0149)
Elgeyo Marakwet	1.04	0.3456	0.3070	0.2382 (0.0038)	0.4200 (0.0019)
Vihiga	1.74	0.3445	0.3241	0.2261 (0.0072)	0.3668 (0.0041)
Kitui	2.82	0.3418	0.3116	0.2091 (0.0079)	0.3084 (0.0029)
Homa Bay	2.4	0.3392	0.3640	0.2068 (0.0084)	0.2864 (0.0037)
Lamu	0.22	0.3307	0.2706	0.2094 (0.0010)	0.3271 (0.00067)
Kirinyaga	1.61	0.3305	0.2916	0.1923 (0.0077)	0.2534 (0.0048)
Garissa	1.06	0.3223	0.2987	0.1691 (0.0028)	0.1917 (0.0009)
Wajir	1.04	0.29	0.2144	0.1555 (0.0014)	0.2159 (0.0003)
Bomet	1.27	0.2816	0.2634	0.1492 (0.0026)	0.2033 (0.0009)
Within component of inequality				0.7314	0.8598
Between component of inequality				0.2686	0.1402
Kenya	100.00	0.4637	0.5257	0.4426 (1.0000)	1.0310 (1.0000)

Note: The figures in parentheses are percentage contributions of inequality within each education level to aggregate inequality

Decomposition results indicate that the within component of inequality accounts for 73 per cent of the total inequality when theta is fixed at 1. Note that the within component increases to nearly 86 per cent when more weight is given to the higher incomes. When incomes are equally weighted, Nairobi County contributes by far the largest share (nearly 23%) of the overall inequality among the counties. It is followed by Uasin Gishu County with 5.6 per cent, Kiambu County with about 4.4 per cent, Kisumu and Machakos with 2.6 per cent each and Meru with 2.4 per cent. The relative contributions of the other counties are below 2 per cent, with relatively higher values observable for the more urbanized counties such as Nakuru and Mombasa.

Figure 4.4: Atkinson Inequality Index across counties in Kenya, 2005/06



5. Findings and Conclusions

Inequality has remained relatively high in Kenya since the pre-independence period. Even so, analyses of inequality using per adult equivalent expenditures (and using various indices) for 1994 and 2005/06 data suggest that inequality is sensitive to the part of the income distribution given more weight. The results that emerge from inequality measurements are that:

(i) Based on the Gini index and general entropy index for epsilon = 0.5, i.e. application of equal weights across the income distribution, per adult equivalent expenditure inequality may not have increased to any significant degree in 2005/06 relative to the mid-1990s.

(ii) The results suggest that the evolution of inequality varies by locality and analyses of total inequality ought to be firmed up by careful analyses of not only rural versus urban inequality, but also the income distribution weightings. Based on the Atkinson measure, and if more weight is given to the bottom of the distribution, total per adult equivalent expenditure inequality (urban plus rural) improved to a significant degree whereas urban inequality actually worsened while rural inequality improved. In analogous results, if more weight is given to high incomes (theta=2), rural inequalities actually worsened while urban inequalities improved. Total inequality declined but the difference is not different from zero.

(iii) Even though more urbanized regions (including counties) have higher incomes, they also exhibit relatively higher levels of income inequality.

Suffice to say that there is no correspondence in the changes in inequality over time between urban and rural regions. In addition, relying on the Gini index alone may fail to unearth the peculiar differences in the changes that occur if more weight is attributed to the bottom and top ends of the income distribution. Studies on the evolution of inequality should perhaps use diverse measures that may provide varying trends of inequality at different parts of income distribution.

The key results of the decomposition of inequality by locality, education and region are:

(i) Decomposition of inequality by locality (urban versus rural) indicates that most of the inequality (about 78%) can be attributed to inequality within urban and within rural areas. These results are interpreted to suggest that measures to reduce the rural-urban income gap would have relatively limited impact in reducing total inequality, since most of the inequality is explained by the "within component." The contribution of urban inequality to the overall

inequality is large and the implication is that reduction of urban inequalities would be significant in the reduction of overall inequality.

(ii) Decomposition by level of education of the head of the household suggests that the more educated group have a more unequal income distribution. Despite their lower population proportion, this group contributed about 44 per cent to 74 per cent of the overall inequality if more weight is attached to low and high incomes, respectively. These results are interpreted to suggest that while higher levels of education move households to higher income levels, it does not in itself have an inbuilt mechanism to reduce inequality within the relatively more educated. Interventions to enhance access to education would require other contemporaneous interventions to reduce inequality among the relatively more educated.

(iii) Decomposition results indicate that when incomes are equally weighted, Nairobi County contributes by far the largest share (nearly 23%) to the overall inequality among the counties. Other more urbanized counties such as Uasin Gishu, Kiambu, Kisumu and Machakos also have large contributions. Overall, decomposition results suggest that inequality between regions play a less important role in the determination of aggregate inequality. The large contribution of Nairobi and other more urbanized counties to overall inequality would suggest that urbanization in Kenya is associated with growing inequalities and underpins the need to tame urban inequalities.

There is marked dualism between urban and rural areas. There is also a marked dualism in evolution of inequality between more urbanized and less urbanized regions. An examination of possible dualism within rural areas of Kenya (as an example between small holders and other rural families) as suggested by Vandemoortele (1982) could form an interesting area for further research.

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Appendix

Appendix Table 1a: Summary statistics for the WMS 1994 data

Variable	Mean	Std. Dev.	Minimum	Maximum
Household size	5.4	2.80	1	27
Number of children (those aged less than 15)	1.30	1.46	0	10
Number of adults (aged 15 and above)	4.05	2.08	1	22
Adult equivalent	3.79	1.77	1	18.2
Total household expenditure per annum	51,955.56	48,883.99	0	1,283,336
Urban rural dummy (1 = urban)	0.21	0.41	0	1
Sex of household head (1 = female)	0.24	0.43	0	1
Per capita expenditure per annum (welfare)	19,209.31	36,109.38	0	1,047,830

Number of observations = 10,866

Appendix Table 1b: Summary Statistics for the KIHBS2005/06 data

Variable	Mean	Std. Dev.	Minimum	Maximum	Observations
Household size	5.1	2.8	1	29	13,155
Education of household head (years)	8.4	3.7	0	21	13,155
Monthly per adult equivalent total household expenditure	3,839.276	6,661.6	499.2*	191,733.5	12,708

Number of observations = 13,155

*A number of outliers removed from the original data.

Appendix Table 1c: Test of difference between Gini, Atkinson, Theil and coefficient of variation – 1994 and 2005/06

Index	Estimate	Std. error	t	p-value
1994 Gini index	0.4693	0.0055	85.1354	0.0000
2005 Gini index	0.4637	0.0059	78.2901	0.0000
Diff	0.0055	0.0081	0.6856	0.4929
Atkinson index (e=0.5)				
1994	0.1905	0.0058	32.9017	0.0000
2005	0.1822	0.0052	34.9478	0.0000
Diff	0.0083	0.0078	1.0706	0.2844
Atkinson index (e=1.0)				
1994	0.3352	0.0064	52.1854	0.0000
2005	0.3141	0.0068	46.2965	0.0000
Diff	0.0210	0.0093	2.2515	0.0244
Atkinson index (e=2)				
1994 Gini index	0.7616	0.0172	44.3273	0.0000
2005 Gini index	0.5257	0.0112	47.0943	0.0000
Diff	0.2359	0.0205	11.5137	0.0000
Theil index (theta=0)				
1994	0.4082	0.0097	42.2563	0.0000
2005	0.3771	0.0099	38.1149	0.0000
Diff	0.0312	0.0138	2.2528	0.0243
Theil index (theta=1)				
1994	0.4417	0.0241	18.3062	0.0000
2005	0.4426	0.0175	25.3521	0.0000
Diff	-0.0010	0.0298	-0.0325	0.9741
Theil index (theta=2)				
1994	1.1163	0.2328	4.7963	0.0000
2005	1.0310	0.0869	11.8628	0.0000
Diff	0.0853	0.2484	0.3435	0.7312
Coefficient of variation				
1994	1.4942	0.1558	9.5925	0.0000
2005	1.4360	0.0605	23.7256	0.0000
Diff	0.0583	0.1671	0.3486	0.7274

The null is that the estimated difference is not equal to zero.

Appendix Table 2: Measurement and decomposition of inequality by locality, Kenya 1994

	Population share	Mean expenditure of the group	Gini Index	Atkinson Index (2)	Theil Index (1)	Theil Index (2)
Locality						
Rural	0.8443	11,487.08	0.3995	0.7260	0.2725 (0.4002)	0.3643 (0.1627)
Urban	0.1557	33,745.07	0.4525	0.6287	0.4274 (0.3402)	0.9955 (0.7069)
Within groups component of inequality					0.7404	0.8696
Between groups component of inequality					0.2603	0.1304
Kenya	1.0000	14,950.19	0.4693	0.7616	0.4417 (1.0000)	1.1163 (1.0000)

Appendix Table 3: Measurement and decomposition of inequality across counties, 2005/06

	Population share (%)	**Gini Index**	**Atkinson Index (2)**	**Theil Index (1) (Relative contribution)**	**Theil Index (2) (Relative contribution)**
County					
Baringo	1.59	0.4056	0.4668	0.3558 (0.0092)	0.8089 (0.0065)
Bomet	1.27	0.2816	0.2634	0.1492 (0.0026)	0.2033 (0.0009)
Bungoma	3.88	0.3538	0.3280	0.2135 (0.0134)	0.2715 (0.0052)
Busia	2.12	0.4149	0.4390	0.3087 (0.0089)	0.4437 (0.0033)
Elgeyo Marakwet	1.04	0.3456	0.3070	0.2382 (0.0038)	0.4200 (0.0019)

Embu	1.69	0.3858	0.3957	0.2695 (0.0093)	0.3951 (0.0053)
Garissa	1.06	0.3223	0.2987	0.1691 (0.0028)	0.1917 (0.0009)
Homa Bay	2.40	0.3392	0.3640	0.2068 (0.0084)	0.2864 (0.0037)
Isiolo	0.31	0.4100	0.4543	0.2722 (0.0012)	0.3104 (0.0004)
Kajiado	1.33	0.3927	0.3696	0.2960 (0.0136)	0.4912 (0.0149)
Kakamega	4.19	0.3723	0.3464	0.2707 (0.0186)	0.4937 (0.0106)
Kericho	2.43	0.3880	0.3583	0.2685 (0.0138)	0.3709 (0.0077)
Kiambu	4.91	0.4120	0.4602	0.2996 (0.0438)	0.4752 (0.0394)
Kilifi	2.74	0.4199	0.4131	0.3354 (0.0133)	0.5672 (0.0062)
Kirinyaga	1.61	0.3305	0.2916	0.1923 (0.0077)	0.2534 (0.0048)
Kisii	2.94	0.3763	0.3782	0.2403 (0.0107)	0.3083 (0.0039)
Kisumu	2.84	0.4267	0.4342	0.3416 (0.0257)	0.5458 (0.0206)
Kitui	2.82	0.3418	0.3116	0.2091 (0.0079)	0.3084 (0.0029)
Kwale	1.99	0.3948	0.3678	0.2967 (0.0076)	0.4520 (0.0028)
Laikipia	1.22	0.4311	0.5316	0.3338 (0.0096)	0.4852 (0.0063)
Lamu	0.22	0.3307	0.2706	0.2094 (0.0010)	0.3271 (0.00067)
Machakos	3.41	0.4436	0.4539	0.4138 (0.0257)	1.4618 (0.0313)
Makueni	2.81	0.3691	0.3432	0.2415 (0.0099)	0.3358 (0.0038)
Mandera	0.82	0.3988	0.4918	0.2820 (0.0019)	0.3779 (0.0004)

Marsabit	0.58	0.4907	0.6352	0.4515 (0.0028)	0.7236 (0.0009)
Meru	4.55	0.3510	0.3250	0.2255 (0.0240)	0.3354 (0.0159)
Migori	2.06	0.3985	0.4254	0.2834 (0.0101)	0.4102 (0.0048)
Mombasa	2.59	0.3459	0.2994	0.2202 (0.0175)	0.3228 (0.0149)
Murang'a	2.50	0.3534	0.3279	0.2110 (0.0122)	0.2621 (0.0066)
Nairobi	8.19	0.4860	0.5297	0.4735 (0.2259)	0.9113 (0.4817)
Nakuru	3.75	0.3642	0.3308	0.2276 (0.0186)	0.2969 (0.0101)
Nandi	2.17	0.3532	0.3212	0.2158 (0.0084)	0.2832 (0.0038)
Narok	1.77	0.3736	0.3670	0.2734 (0.0099)	0.4883 (0.0069)
Nyamira	1.61	0.3478	0.3178	0.2168 (0.0062)	0.3040 (0.0030)
Nyandarua	1.56	0.3652	0.3410	0.2285 (0.0063)	0.2965 (0.0028)
Nyeri	2.27	0.3827	0.4478	0.2629 (0.0146)	0.3562 (0.0091)
Samburu	0.53	0.3864	0.4907	0.2451 (0.0012)	0.2714 (0.0002)
Siaya	2.27	0.3466	0.3531	0.2061 (0.0093)	0.2599 (0.0045)
Taita Taveta	0.90	0.4165	0.3909	0.3465 (0.0060)	0.5959 (0.0038)
Tana River	0.74	0.3728	0.3505	0.2632 (0.0022)	0.4292 (0.0008)
Tharaka Nithi	0.33	0.3631	0.3617	0.2405 (0.0012)	0.3935 (0.0006)
Trans Nzoia	2.52	0.3582	0.3389	0.2233 (0.0101)	0.2957 (0.0046)
Turkana	1.47	0.5761	0.6978	0.7329 (0.0058)	1.9784 (0.0016)

Uasin Gishu	2.19	0.5681	0.5685	0.7580 (0.0558)	1.9800 (0.0930)
Vihiga	1.74	0.3445	0.3241	0.2261 (0.0072)	0.3668 (0.0041)
Wajir	1.04	0.2900	0.2144	0.1555 (0.0014)	0.2159 (0.0003)
West Pokot	1.02	0.4186	0.4400	0.3077 (0.0043)	0.4149 (0.0015)
Within groups component of inequality				0.7314	0.8598
Between groups component of inequality				0.2686	0.1402
Kenya	100.00	0.4637	0.5257	0.4426 (1.0000)	1.0310 (1.0000)

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