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Mapping Spatial Inequalities in Eastern Africa

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Abstract

This paper provides a novel assessment of spatial inequalities in Eastern Africa. For that purpose, we draw on sub-national data from Demographic and Health Surveys (DHS) for Ethiopia, Kenya, Tanzania and Uganda. The study sample comprises 31 regions from these four countries, which are tracked over three survey waves – covering the period from 1998 to 2011. We compare the levels and trends of several indicators pertaining to population, health, education, living standards and employment. More importantly, we assess whether regional disparities have increased in a period characterised by strong economic growth – as the theory predicts. Our analysis suggests that most regions have recorded improvements, especially with regard to health, although there remains considerable scope for further progress. Inequality between regions has declined in some dimensions, most notably in education. However, spatial disparities remain high, thus calling for policy measures to ensure that economic growth in Eastern Africa is more inclusive.

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1. Introduction

Most countries in Eastern Africa have experienced strong economic growth since the early 2000s. Several factors have been attributed for this positive development, including better macroeconomic management, improved governance, a conducive external environment, and stronger domestic demand. Structural change has also played a crucial role, especially through productivity gains accruing from labour shifts and a growing demographic dividend (Martins, 2015).

However, economic gains are rarely evenly distributed among the population. Some groups tend to benefit more than others, while a few may even be left behind. Therefore, it is important to look beyond national averages to assess whether growth has led to broad-based improvements in living conditions. In this paper, we use sub-national data for several socio-economic indicators with a view to scrutinising recent progress, as well as investigate trends in regional inequality – i.e. whether there is regional convergence or divergence.[1] Spatial inequality is a topic of considerable and increasing importance, since rising geographical disparities may fuel social and political instability – as well as economic inefficiency – especially if they are a consequence of ethnic, religious or political discrimination (Stewart et al, 2010).

The potential relationship between (income) inequality and economic development (as proxied by income per capita) is often depicted by the Kuznets curve. Its inverted-U shape implies that inequality increases in the early stages of development, reaches a peak, and then declines as the economy matures (Kuznets, 1955). Low-income countries tend to have relatively low levels of inequality because the majority of their population is poor and depends on low-productivity agriculture. As workers move away from subsistence agriculture and into higher-productivity sectors – such as manufacturing and/or modern services – income inequality is expected to increase. However, inequality may subsequently decline as the majority of workers are employed in high-productivity sectors. There is some empirical evidence supporting this hypothesis for 19th-20th century Europe, although the evidence base is weaker for Latin America and Asia (Acemoglu and Robinson, 2002). The reasoning above may also apply to non-income dimensions, such as education and health– see Morrisson and Murtin (2013).

[1] In this paper, the term 'region' is used to mean a sub-national division, which may or may not coincide with a country's administrative divisions.

The inverted-U hypothesis has been extended to the spatial context, where it is known as the Williamson curve. In the early stages of development, economic growth tends to be concentrated in a few regions or urban centres, which may lead to higher (income) disparities between spatial areas (Williamson, 1965). However, inequality may subsequently fall as economic gains spread to the most deprived regions. Regional convergence may also occur if leading regions suffer from rising factor costs (e.g. labour) and diseconomies of scale, thus encouraging a shift of resources (e.g. capital) towards lagging regions – where returns to investment might be higher. Empirical evidence for China, India, Mexico and Russia and South Africa seems to support the theory that spatial inequality of incomes and social outcomes increases as a country develops (Kanbur and Venables, 2005).

The remainder of this paper is organised as follows. Section 2 provides an overview of key inequality concepts and measures. Section 3 presents the data source, country and region samples, as well as the variables to be analysed. Section 4 offers a brief context by tracking recent developments at the national level. Section 5 is the core of the paper, as it tracks progress and spatial inequalities across a range of indicators. Section 6 concludes.

2. Concepts and measurement

The term 'inequality' is widely used to denote observed disparities in a given dimension within a population. In order to clearly define and measure it, two critical questions need to be answered: 'Inequality of what?' and 'Inequality between whom?' (McKay, 2002).

Inequality of what? It is possible to assess inequality in terms of income, asset ownership, health status, educational achievements, employment characteristics, political rights, and many other economic, social and political dimensions. In fact, these are often interdependent and mutually reinforcing. For instance, income inequality may be responsible for inequalities in health and education, and vice-versa. Asset inequality may arise from (and contribute to) inequality in political power. Moreover, some of the literature distinguishes between 'inequality of opportunity' and 'inequality of outcomes'. Inequality of opportunity emanates from factors outside a person's control – i.e. circumstances – and is often the focus of public policy, since it is seen as the bad type of inequality (Kanbur and Wagstaff, 2015).[2]

[2] Conversely, 'equality of opportunity' entails 'a level playing field' to ensure every person has an equal chance of succeeding.

Some examples include unequal access to employment opportunities, education and health services, which often result from some form of discrimination (e.g. gender, age or ethnic). In contrast, inequality of outcomes emerges from different choices and levels of effort. It follows that equality of outcomes – e.g. income – may not be desirable nor fair, since it undermines individual efforts. In practice, however, it is very difficult to disentangle these two sources of inequality. Although outcomes do (to some extent) reflect a person's effort, they may also be influenced by luck, innate talent, and other people's efforts (e.g. parents) – all of which are outside the individual's sphere of control. It is therefore conceptually and empirically challenging to isolate the contributions of effort and circumstance to observed inequalities. While this paper does not attempt to explicitly distinguish between these two concepts, they remain important to bear in mind.

Inequality between whom? Inequality can be assessed across individuals, households or population groups within a given population (e.g. a continent, a country or a province). In this regard, it is important to distinguish between 'vertical inequality' and 'horizontal inequality'. Vertical inequality relates to disparities between individuals or households, and is the most common approach used to study inequality. In contrast, horizontal inequality refers to disparities observed between population groups, as defined by region, ethnicity, class or religion (Stewart, 2000).[3]

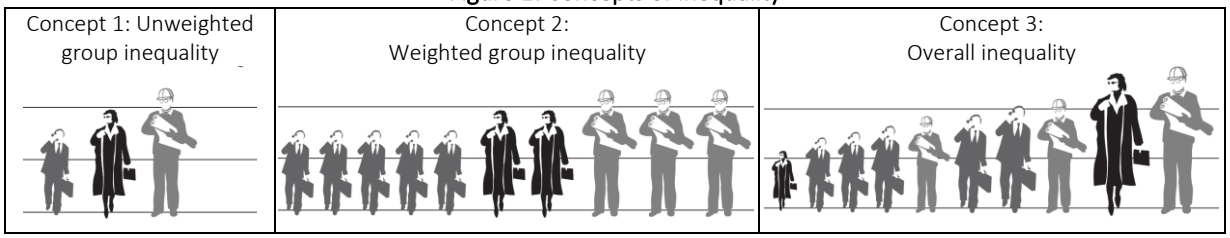
The main focus of this paper is on spatial inequality. The concept relates to differences emerging from geography (i.e. location), such as disparities across regions or the rural-urban divide. Spatial inequality can thus be seen as a type of horizontal inequality, since it offers a group-based perspective – where the group is defined by location. It may also relate to inequality of opportunity, especially if people are being discriminated by where they live – e.g. if they lack access to education, health services and employment opportunities because these are not available in their location.

When assessing group-based inequality, it is important to consider the unit of observation. Much of the data on the socio-economic characteristics of the population are collected through household surveys. These surveys provide household-level data (e.g. location and type of housing) and individual-level data (e.g. gender, education level and employment status). Aggregate indicators are then produced at the national level, but also at the sub-national level and for specific population groups (e.g. women).

[3] These two concepts are somewhat related, since overall (vertical) inequality can often be decomposed into inter-group (horizontal) inequality and intra-group inequality. However, it is possible to have high vertical inequality without horizontal inequality (e.g. if all groups have the same average but the distribution within each group is highly unequal). Similarly, it is possible to have high horizontal inequality and moderate vertical inequality if intra-group inequality is low (Stewart, 2000).

Comparing data across groups can thus be undertaken through individual/household data or the calculated group averages. This is intrinsically related to the three concepts of (income) inequality discussed in Milanovic (2005) – which are adapted here to the group/region context (Figure 1). Concept 1 takes the group as the unit of observation, which enables a straightforward comparison of data across relevant groups. However, it is not possible to assess inequality within groups, only between them. Concept 2 uses weighted data, thus giving more importance to groups that have larger populations. However, this implies that certain groups matter less because they are a small. Concept 3 uses individual or household level data, which enables a decomposition of overall inequality into inter-group inequality and intra-group inequality.[4]

Figure 1: Concepts of inequality



Source: Adapted from Milanovic (2005)

The traditional approach to inequality measurement places a strong focus on the individual. This implies that changes in a small group (e.g. region) do not have a significant impact on (overall) inequality. However, this may not be how inequality is actually perceived or experienced. Small regions, which can be very poor (e.g. a marginalised rural region) or very rich (e.g. a predominantly-urban region), may nonetheless have a large impact on a country's economic, social and political stability. Therefore, unweighted group averages can be more meaningful in some cases, especially if regional boundaries are broadly aligned with ethnic, religious or political divides (Kanbur, 2006). For instance, the Afar, Somali and Tigray regions have relatively small populations – together they account for less than 15 percent of Ethiopia's total population. However, these regions are predominantly inhabited by ethnic minorities at the national scale. The social and political importance of these regions is thus likely to go well beyond their population size. In fact, spatial disparities may have much more socio-political significance than what inequality decompositions seems to suggest.[5] It is for these reasons that we focus on unweighted group means (i.e. Concept 1).

[4] However, results might be sensitive to the number of sub-groups, since further disaggregation (e.g. assessing inequality at the district level, rather than at the regional/provincial level) will increase the relative contribution of inter-group inequality.

[5]Empirical studies tend to suggest that inter-group inequality only accounts for a small proportion of overall inequality.

Inequality can be measured through a wide range of metrics. Since inequality essentially refers to observed dispersion/variability, standard measures of statistical dispersion can be used – such as the range, variance and coefficient of variation. Among these, the coefficient of variation is often preferred, since it is mean-independent and robust to outliers – i.e. extreme values. Inequality indices are also widely used in the literature, especially when assessing income disparities. The most common are the Gini coefficient and the Theil index. Many inequality measures conform to a basic set of desirable properties (i.e. axioms), such as the (Pigou-Dalton) principle of transfers, scale invariance, symmetry, and decomposability. However, the conclusions regarding the level and trend of inequality may vary depending on the index utilised. This is because they are often built on different value judgements, such as the relative weight given to those at the bottom of the distribution.[6] Finally, graphs are a powerful tool to scrutinise inequality, particularly through scatter plots, box plots and frequency distributions.

In this paper, we aim to uncover and track spatial inequalities through graphic presentations of the data, as well as through more formal measures. Among the most common group-based measures of inequality are the coefficient of variation and the Theil index (Stewart et al, 2010):

$$Coefficient\ of\ variation = \frac{1}{\bar{y}}\left[\sum_{g=1}^{G} p_g(\bar{y}_g - \bar{y})^2\right]^{\frac{1}{2}}$$

$$Theil\ index = \sum_{g=1}^{G} p_g \frac{\bar{y}_g}{\bar{y}} \log \frac{\bar{y}_g}{\bar{y}}$$

Both measures can be weighed by population, where p_g is the population share of each group ($g = 1, \dots, G$), $\bar{y}$ is the average of the variable of interest (y), and $\bar{y}_g$ is the value for the specific group. For the reasons discussed above, however, we decide to use the unweighted version of these measures. Both the coefficient of variation and the Theil index compare group values (e.g. group means) with the overall average.

[6] Quantiles and shares are also commonly use – e.g. the income share accruing to the bottom quintile (i.e. 20 percent) of the population. However, this type of measures have limited applications beyond income.

3. Data considerations

This paper uses data from Demographic and Health Surveys (DHS), which are nationally-representative household surveys that cover a wide range of topics – often beyond population, health and nutrition. The surveys have large sample sizes and are also representative at the sub-national level. They are usually conducted every five years. A standardised methodology – especially in terms of survey instruments and sample design – ensures that data is highly comparable across countries and through time. Surveys are available for most countries in Africa and often in multiple waves.[7]

The selection of countries for this study was driven by two key considerations. First, there was desire to ensure that the study sample was fairly representative of Eastern Africa – at least in terms of total population and gross domestic product (GDP). Ethiopia, Kenya, Tanzania and Uganda together account for over 60 percent of the sub-region's population and about two-thirds of the GDP.[8] Second, it was important to ensure that countries had conducted surveys at similar periods in time in order to facilitate comparisons. Table 1 illustrates how the surveys for the four countries enable a trend assessment of three key periods, or waves. The first wave (1998-2000) relates to the late 1990s and early 2000s, which was broadly characterised by low economic growth. The second wave (2003-2006) covers the mid-2000s, shortly after economic growth started to accelerate in most Eastern African countries. Finally, the third wave (2009-2011) is expected to show marked improvements in several socio-economic indicators – as a result of the improved economic conditions.

Table 1: DHS availability

DHS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Kenya	O					O					O			
Tanzania		O					O						O	
Ethiopia			O					O						O
Uganda				O					O					O
	Wave 1					Wave 2						Wave 3		

Note: Uganda DHS 2000-01 fieldwork ran fromSep'00 to Mar'01; Kenya DHS 2008-09 ran from Nov'08 to Feb'09.

The DHS data is sometimes available for more than one level of sub-national representation. For instance, Tanzania's DHS 2010 and DHS 2004-05 are representative at two levels: 26 regions, which

[7] For more information, see http://dhsprogram.com.

[8] The UN Statistics Division defines Eastern Africa as a macro-geographical (continental) sub-region comprising 20 countries (including Malawi, Mozambique, Zambia and Zimbabwe), while the definition of the UN Economic Commission for Africa comprises 14 countries (including Congo, D.R.). Nonetheless, the population share turns out to be similar for both definitions, while the GDP share varies from about 60 percent (UNSD) to over 70 percent (UNECA).

correspond to the administrative sub-divisions at the time of the surveys; and 8 zones, which are groups of the 26 regions. For both Tanzania and Uganda, the higher level of aggregation was chosen to improve comparability across countries (see Table 2), as well as enable comparisons through time – e.g. Uganda's DHS 1999 only provides data at the higher level of aggregation. For the remainder of this paper, we will refer to these sub-national divisions as 'regions'. Therefore, our sample includes 31 regions: eleven in Ethiopia, eight in Kenya, eight in Tanzania, and four in Uganda (Figure 2). It should be noted that four regions are predominantly urban areas or even cities: Addis Ababa (ET), Dire Dawa (ET), Harari (ET) and Nairobi Area (KE). While their land areas are the lowest within the sample, that is not necessarily the case in terms of population. Nonetheless, any potential (urban) bias will be scrutinised during the analysis.

Table 2: Land area and population

Ethiopia (2015)	Area (km²)	Pop. ('000)
Addis Ababa	527	3,273
Afar	72,053	1,723
Amhara	154,709	20,401
Benishangul-Gumuz	50,699	1,005
Dire Dawa	1,559	440
Gambela	29,783	409
Harari	334	232
Oromia	284,538	33,692
SNNP	105,476	18,276
Somali	279,252	5,453
Tigray	84,722	5,056
Total	1,063,652	90,078
Average (11)	96,696	8,189

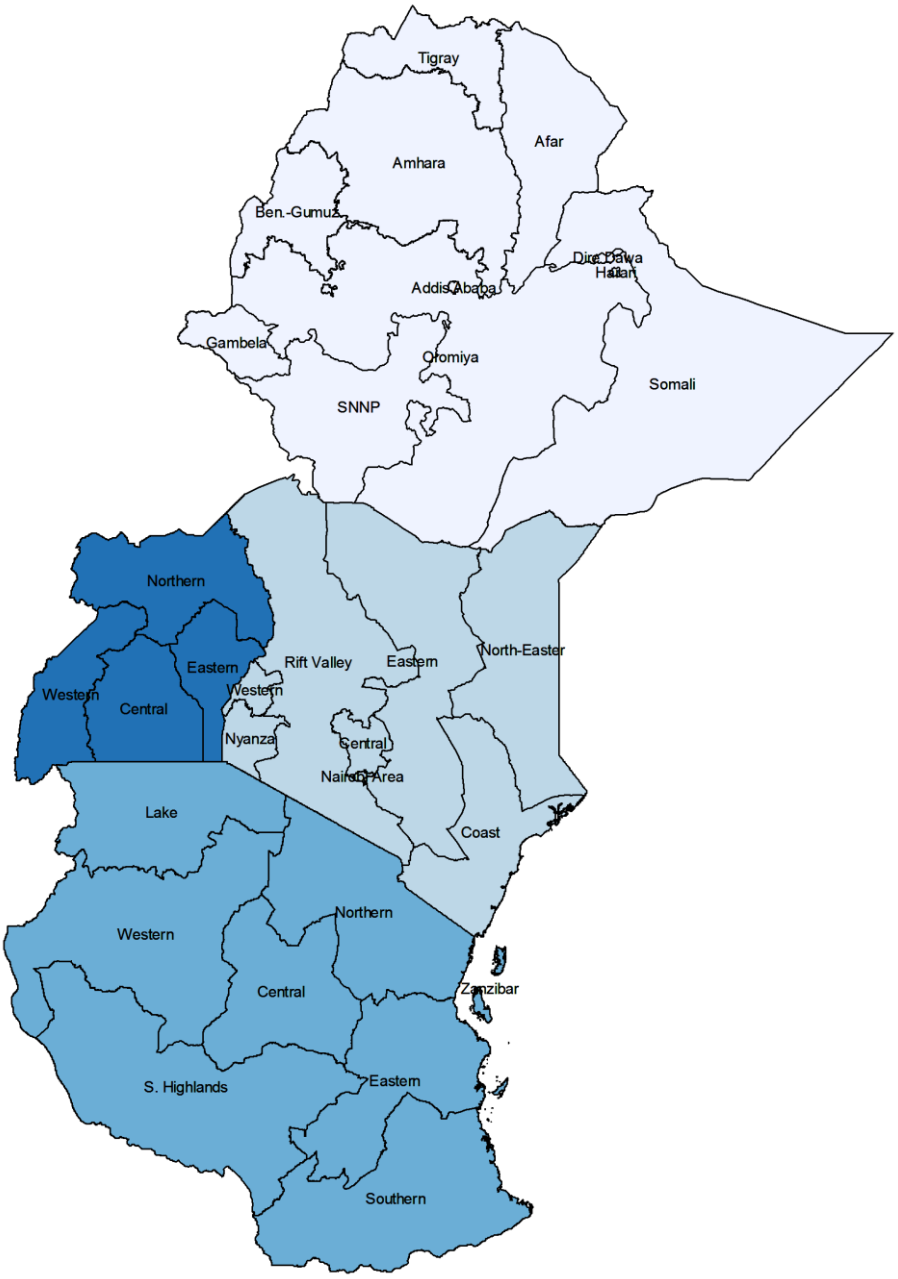
Kenya (2009)	Area (km²)	Pop. ('000)
Central	13,164	4,384
Coast	82,893	3,325
Eastern	153,404	5,668
Nairobi	695	3,138
North Eastern	126,852	2,311
Nyanza	12,613	5,443
Rift Valley	183,383	10,007
Western	8,309	4,334
Total	581,313	38,610
Average (8)	72,664	4,826

Tanzania (2012)	Area (km²)	Pop. ('000)
Central	90,651	3,454
Eastern	104,564	7,682
Lake	56,492	6,974
Northern	122,025	6,805
Southern	146,419	3,512
Southern Highlands	185,835	5,920
Western	177,357	9,278
Zanzibar	2,460	1,304
Total	885,803	44,929
Average (8)	110,725	5,616

Uganda (2014)	Area (km²)	Pop. ('000)
Central	61,403	9,579
Eastern	39,479	9,095
Northern	85,392	7,231
Western	55,277	8,939
Total	241,551	34,857
Average (4)	60,388	8,714

The data compiled presented some challenges. For instance, the Tanzania DHS 1999 had a small sample and was thus only designed to be representative of three regions: Mainland, Pemba and Unguja – the latter two being part of Zanzibar. In order to overcome the lack of sub-national data, the (larger) Tanzania DHS 1996 was used to interpolate the data for the eight regions. Moreover, the Kenya DHS 1998 did not present results for North Eastern (KE). Since the earlier survey (Kenya DHS 1993) did not produce this data either, it was decided to set the values equal to 2003. This caveat will be recalled during the analysis whenever relevant.

Figure 2: The 31 regions



In this paper, we highlight sub-national trends and disparities in the following key domains: population, health, education, living standards and employment (Table 3). For population, we assess total fertility rates, which is a key demographic indicator. For health, we investigate early childhood malnutrition and mortality. Anthropometric measures of malnutrition include stunting (chronic malnutrition), wasting (acute malnutrition) and underweight. Measures of mortality include the infant mortality rate (0-1 years old) and the under-five mortality rate (0-5 years old). The child mortality rate (1-5 years old) can be easily derived from these two measures, and is therefore not discussed in this paper.

With regard to education, we assess literacy and advanced education levels for both women and men. As a proxy measure for living standards, we look at the share of households that have electricity. Finally, we scrutinise two employment indicators disaggregated by gender: the percentage of people who did no work in the previous year, and the percentage of workers in agriculture.

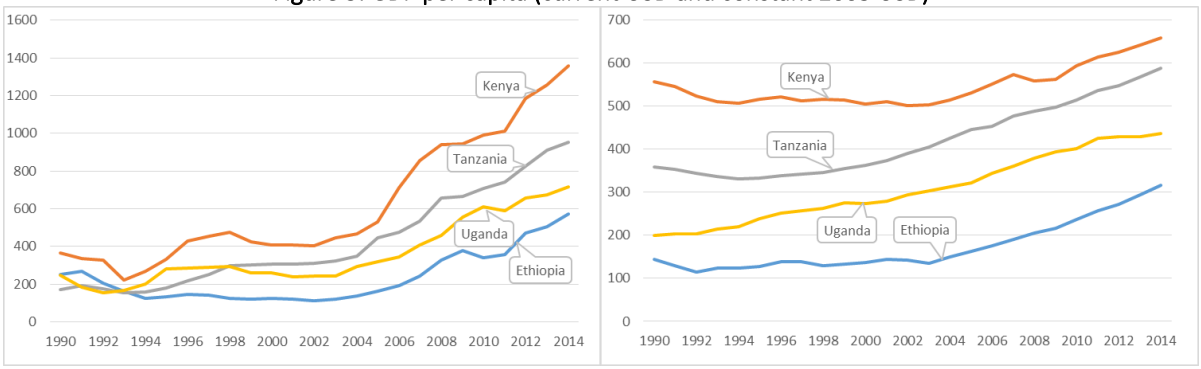
Table 3: DHS indicators

Dimension	Sub-dimension	DHS indicators
Population	Fertility	Total fertility rate (births per woman aged 15-49)
Health	Malnutrition	Children stunted (height-for-age below -2 SD)
		Children wasted (weight-for-height below -2 SD)
		Children underweight (weight-for-age below -2 SD)
	Mortality	Infant mortality rate (0-1 years old)
		Under-five mortality rate (0-5 years old)
Education	Literacy	Women/Men who are literate
	Education level	Women/Men with secondary or higher education
Living standards	Living conditions	Households with electricity
Employment	Work status	Women/Men who did no work in the last 12 months
	Occupation	Women's/Men's occupation: Agriculture

4. Developments at the national level

Tracking economic and social performance at the national level provides a critical background for the sub-national analysis. Gross domestic product (GDP) per capita is an indicator often utilised to assess changes in living standards. GDP per capita has steadily increased in all four countries, especially since the early 2000s (Figure 3). In 2014, nominal GDP per capita ranged from about $1,360 in Kenya to about $575 in Ethiopia. Assuming a positive relationship between average income levels and social outcomes, we expect Kenya to have the highest levels of human development, followed by Tanzania, Uganda and Ethiopia – respectively. Even if that were to be the case, we anticipate significant variations within each country – e.g. the most deprived regions in Kenya might be worse off than some regions in poorer countries.

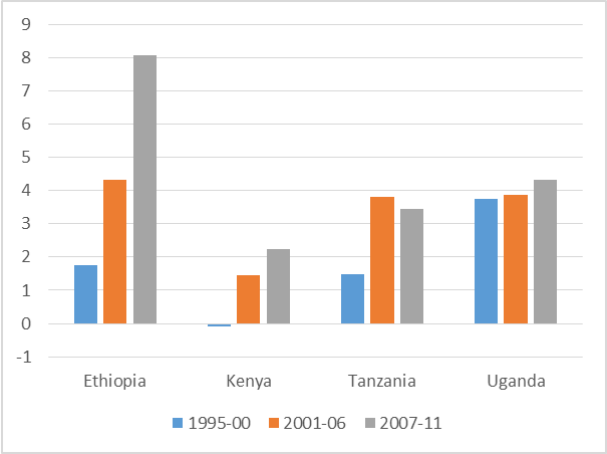
Figure 3: GDP per capita (current USD and constant 2005 USD)



Source: World Bank (2015)

Real GDP per capita growth has accelerated considerably in Ethiopia over the period of interest – from an annual average of 1.8 percent in 1995-2000 to 8.1 percent in 2007-2011 (Figure 4). Recent growth in Kenya remains subdued at just above 2 percent, despite a gradual improvement over time. In Tanzania, per capita growth has been relatively solid since the early 2000s, while economic performance in Uganda has been strong since the mid-1990s. This paper implicitly investigates whether improvements suggested by national accounts data are compatible with the information obtained from household surveys. Assuming that faster economic growth leads to accelerated improvements in social outcomes, we expect stronger social achievements across the board – but especially in Ethiopia.

Figure 4: Real GDP per capita growth (%, annual average)



Source: World Bank (2015)

The national-level DHS data points to improvements in a number of areas (Table 4). Ethiopia and Uganda reduced total fertility by 0.7 percentage points, although it remains extremely high in Uganda (6.2 children per woman). The majority of the declines were accomplished between the second and third waves. Tanzania recorded the largest (absolute and relative) decline in infant mortality, followed by Ethiopia and Uganda. The latest estimates on infant mortality are broadly similar across all countries – ranging from 51 to 59 deaths per 1,000 live births. Ethiopia nearly halved under-five mortality (to 88 deaths per 1,000 live births), while reductions in the remaining countries were also remarkable. Stunting declined in Ethiopia and Uganda by 13 and 11 percentage points, respectively. Wasting declined by 20 percent in Ethiopia, although it remains significantly above the values for other countries. Worryingly, wasting recently increased in Kenya and Tanzania. Tanzania and Ethiopia registered the strongest declines in children underweight – with the bulk of the reduction taking place

between the first and second waves – although the levels recently observed in Ethiopia are nearly double those of the remaining countries.

Table 4: DHS data at the national level

	Ethiopia			Kenya			Tanzania			Uganda		
	W1	W2	W3	W1	W2	W3	W1	W2	W3	W1	W2	W3
Total fertility rate 15-49	5.5	5.4	4.8	4.7	4.9	4.6	5.6	5.7	5.4	6.9	6.7	6.2
Infant mortality rate	97	77	59	74	77	52	99	68	51	88	71	54
Under-five mortality rate	166	123	88	111	115	74	147	112	81	151	128	90
Children stunted	57.7	50.8	44.4	33.0	35.7	35.3	43.8	44.3	42.0	44.8	38.1	33.4
Children wasted	12.2	12.2	9.7	6.1	6.0	6.7	5.4	3.5	4.8	4.9	6.1	4.7
Children underweight	41.2	32.9	28.7	22.1	15.8	16.1	29.4	16.4	15.8	18.4	15.9	13.8
Women who are literate	24.4	29.2	38.4	..	78.5	84.9	..	67.3	72.2	57.8	56.3	64.2
Men who are literate	55.3	61.4	66.5	..	88.9	91.5	..	80.0	82.1	80.8	82.8	77.5
Women with secondary or higher education	9.1	11.9	11.2	29.2	29.3	34.3	5.3	8.6	16.2	18.4	21.3	27.7
Men with secondary or higher education	16.4	21.2	17.4	41.5	37.3	44.8	7.5	11.2	22.9	29.0	30.1	35.6
Households with electricity	12.7	14.0	23.0	14.5	16.0	23.0	8.0	11.4	14.8	8.6	9.0	14.6
Women who did no work	36.6	61.2	42.2	45.5	37.9	41.0	19.6	17.2	19.7	20.5	13.5	26.4
Men who did no work	8.1	13.2	5.3	32.5	24.1	11.4	10.5	16.5	14.6	19.7	4.8	6.2
Women's occupation: Agriculture	58.4	51.5	45.9	47.1	48.7	39.0	69.8	78.2	68.5	76.9	75.4	68.1
Men's occupation: Agriculture	82.9	83.5	72.7	35.3	41.4	39.4	67.3	71.2	62.3	62.3	67.8	75.0

Source: DHS

Literacy levels are very low in Ethiopia – 38 percent for women and 66 percent for men –despite recent improvements. Kenya has the highest levels of literacy, for both women and men. The gender gap in literacy is particularly high in Ethiopia. In terms of educational achievements, women and men in Kenya are more likely to completed secondary or higher education, although Uganda is not very far behind. The share of households with electricity is higher in Ethiopia and Kenya, mostly due to improvements achieved between the second and third waves. Women are much more likely to not work than men, especially in Ethiopia but also in Kenya. We observe a U-shape trend for women in Kenya, Tanzania and Uganda – i.e. initial drop followed by a recent increase – and an inverted U-shape pattern in Ethiopia. For men, we note strong overall reductions in Kenya and Uganda. Finally, the share of women and men in agriculture remains relatively high in all countries, although Ethiopia recorded strong reductions – 13 percentage points for women and 10 percentage points for men.

Overall, Kenya tends to have the best socio-economic indicators, followed by Tanzania and Uganda. Ethiopia has the highest levels of deprivation in health and education, but it has recorded the strongest improvements. This provides some support to the assumptions made earlier with regard to the relationship between income and social outcomes – both in terms of levels and trends.

5. Mapping spatial inequalities

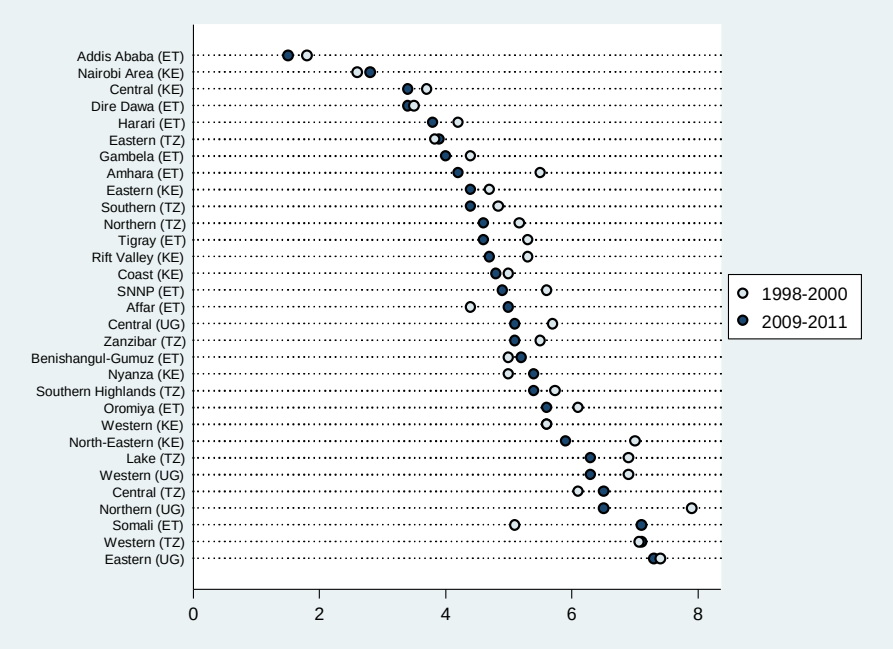
5.1. Population

Eastern African countries are undergoing a 'demographic transition', which entails a shift from high to low birth and death rates. This process can yield a significant demographic dividend, especially through its impact on the age structure of the population. Demographic change can reduce the burden on the working-age population – as dependency ratios decline – and potentially raise living standards.[9] Falling birth rates also lead to a slower (natural) increase in population, thus easing population pressures. In Eastern Africa, death rates have been declining swiftly in most countries, mostly due to improvements in medical care, disease control, diets, water supply and sanitation. However, birth rates have been falling at a much slower pace. Moreover, famines and armed conflicts often cause setbacks to this demographic process.

In 2009-2011, total fertility rates ranged from 1.5 to 7.3 children per woman aged 15-49 (Figure 5). Four of the five regions with the lowest fertility rates are predominantly-urban areas or cities. Fertility rates are particularly low in Addis Ababa (ET) and, to a lesser extent, in Nairobi Area (KE). Eastern (UG), Western (TZ) and Somali (ET) have the highest fertility rates. In fact, out of the seven regions with fertility rates above 6 children per woman, six of them are either in Tanzania or Uganda. On the whole, total fertility rates have declined in the 2000s – although at a different pace across regions. The largest reductions were observed in Northern (UG), Amhara (ET) and North Eastern (KE) – see Annex for largest changes. Nonetheless, some regions have actually recorded considerable increases – especially Somali (ET) and Afar (ET).

[9] The (age) dependency ratio measures the number of children and elderly supported by each person of working age – usually persons between the ages of 15 and 64.

Figure 5: Total fertility rates (births per woman)



The unweighted average of the 31 regions was broadly unchanged between the first two waves (about 5.2 children per woman), but declined in the latter period to 5 children per woman. The coefficient of variation and the Theil index – applied to the unweighted sub-national data – remained broadly constant, suggesting that disparities in total fertility rates did not change significantly. To conclude, we note that total fertility rates vary considerable across regions, and are particularly high in a few regions in Tanzania and Uganda. For instance, the total fertility rate in Eastern (UG) was nearly five times higher than in Addis Ababa (ET).

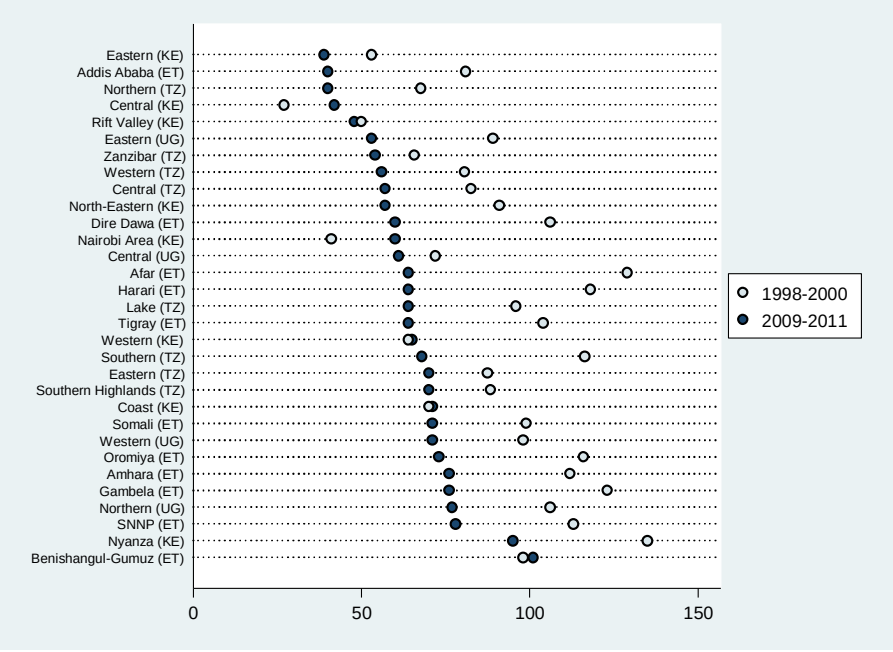
5.2. Health

A long and healthy life is a basic dimension of human development, which directly enhances human abilities. In fact, a healthy workforce is central to expand human capital and accelerate structural change. In this sub-section we focus on early childhood mortality and malnutrition. Mortality can be seen as an extreme case of poor health, while malnutrition is known to have long-term impacts on physical health and cognitive functions.

Early childhood mortality

The infant mortality rate measures the probability of a child dying before her first birthday – expressed per 1,000 live births. Most regions significantly reduced mortality rates for this age group (Figure 6). Four of the top-5 absolute declines were recorded in Ethiopian regions. The notable exceptions to this encouraging trend where Nairobi Area (KE) and Central (KE). Meanwhile, Nyanza (KE) and Benishangul-Gumuz (ET) are lagging significantly behind the remaining regions. The unweighted average dropped from 90 deaths per 1,000 live births in 1998-2000, to 77 deaths in 2003-2006, and to 64 deaths in 2009-2011. Nonetheless, infant mortality rates remain unacceptably high. For instance, 1 in 10 children born in Benishangul-Gumuz (ET) is expected to die before her first birthday. Measures of regional inequality suggest that there has been some convergence in infant mortality rates. The coefficient of variation gradually fell from 0.29 in 1998-2000 to 0.23 in 2009-2011, while the Theil index also recorded a decline. This trend is partly a result of the strong declines observed in regions with high infant mortality rates, especially in Ethiopia. However, regional disparities remain high. For instance, a child born in Benishangul-Gumuz (ET) is still about 2.5 times more likely to die before her first birthday than a child born in Eastern (KE).

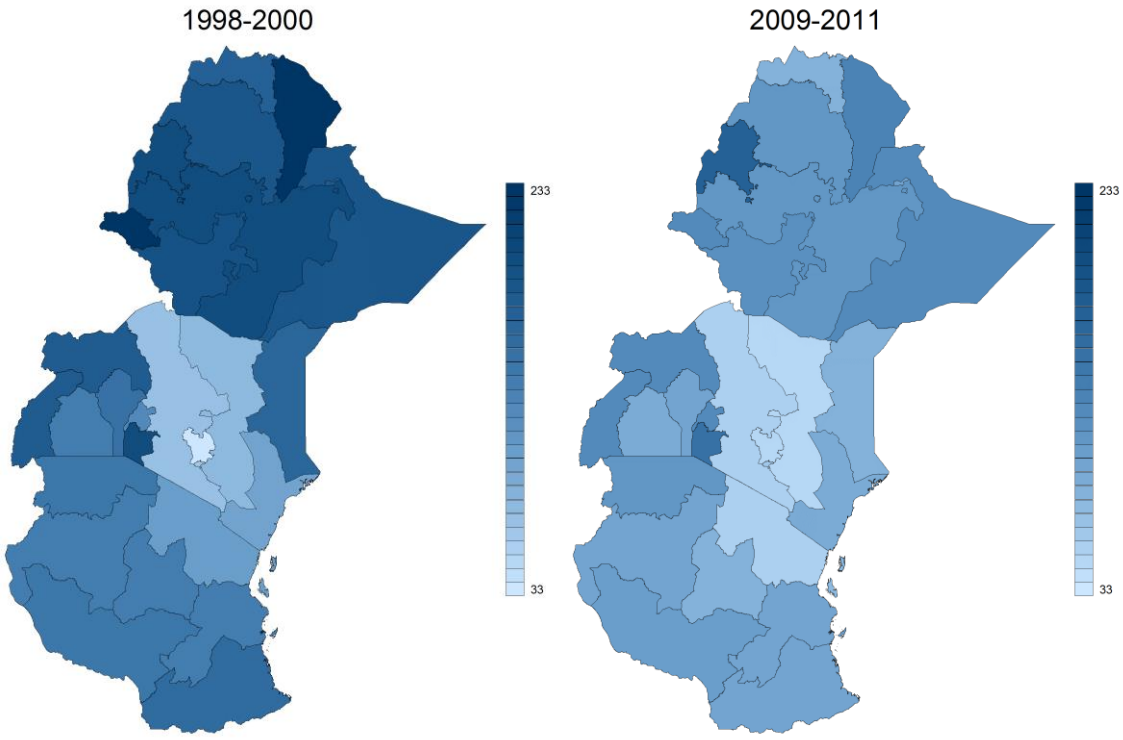
Figure 6: Infant mortality rates (per 1,000 live births)



The under-five mortality rate measures the probability of a child dying between birth and her fifth birthday – expressed per 1,000 live births. There were clear improvements over the past decade (Figure 7).

Under-five mortality rates have declined in all regions during the period under consideration, with the exception of Central (KE). The largest absolute declines were recorded in Gambela (ET), Afar (ET) and Harari (ET) – although these regions had high starting points. The average decline was stronger between the second and third waves – in both absolute and relative terms – while progress accelerated in about two-thirds of the regions. The unweighted average dropped from 148 deaths per 1,000 live births in 1998-2000, to 126 deaths in 2003-2006, and to 97 deaths in 2009-2011. However, mortality rates for this age group remain very high. With regard to regional inequality, the coefficient of variation and the Theil index indicate that disparities were considerably reduced in the first period, but subsequently increased – albeit to a lesser extent. In fact, regional disparities remain high. For example, a child born in Benishangul-Gumuz (ET) is over three times more likely to die before the age of five than a child born in Central (KE).

Figure 7:Under-five mortality rates (per 1,000 live births)



In sum, most regions have registered considerable declines in both infant and under-five mortality rates, although a few regions are still lagging behind. Despite these broad improvements, early childhood mortality rates in Eastern Africa are still very high. Regional disparities in infant mortality have gradually declined, but inequality in under-five mortality rates seems to have increased recently. Overall, spatial inequalities remain high.

Early childhood malnutrition

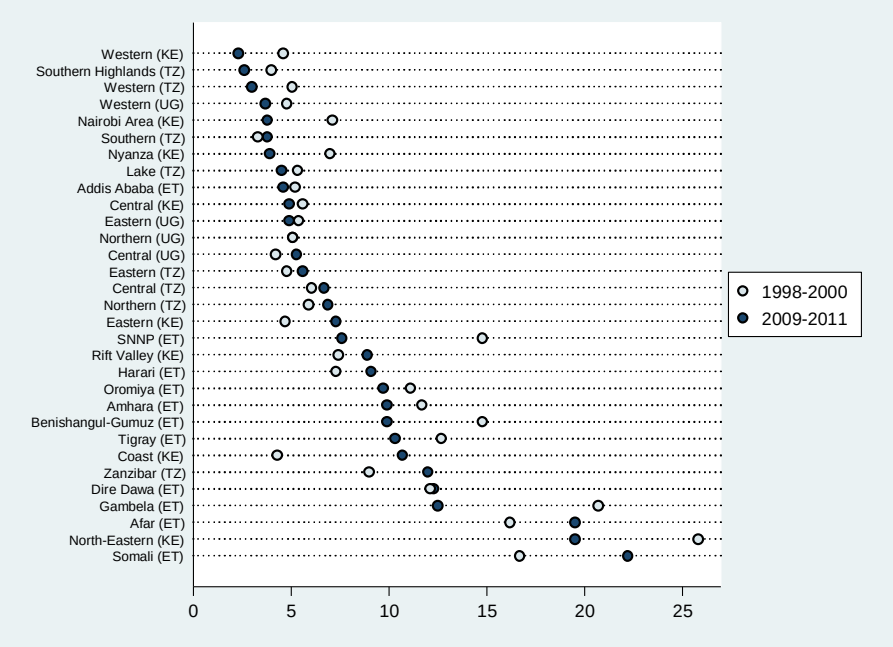
In order to measure early childhood malnutrition, the DHS programme calculates three anthropometric indicators: stunting (height-for-age), waste (weight-for-height) and underweight (weight-for-age). These are expressed as standard deviation (SD) units from the median for the reference population. Children that are below two standard deviations (-2 SD) from the median are considered to be 'moderately' malnourished, while those below three standard deviations (-3 SD) from the median are 'severely' malnourished. In this paper, we focus on moderate malnutrition.

Stunting (or low height-for-age) is caused by long-term insufficient nutrient intake and/or repeated infections. It is a gradual and cumulative process that usually occurs between conception and age two, and that often has long-term consequences beyond the shortness of stature – including delayed motor development, cognitive impairment, as well as increased morbidity and mortality. Stunting is measured by comparing the height of a child against the WHO international growth reference for a child of the same age. Overall, there have been some achievements in reducing stunting (Figure 8). The largest reductions were registered in Somali (ET), SNNP (ET) and Gambela (ET). However, there were several increases in Kenyan regions – albeit from relatively low levels. The unweighted average has steadily declined over the period, from 43 percent to 38 percent, but stunting levels remain unacceptably high. For example, more than half of children in Afar (ET), Amhara (ET), Southern Highlands (TZ) and Tigray (ET) are stunted. Disparities across regions have been slightly reduced over the period – as measured by the coefficient of variation and the Theil index. Nonetheless, these levels remain high. For instance, the proportion of stunted children was 52 percent in Amhara (ET) compared to 22 percent in Addis Ababa (ET) – a 30 percentage point difference.

Figure 8: Children stunted (%)

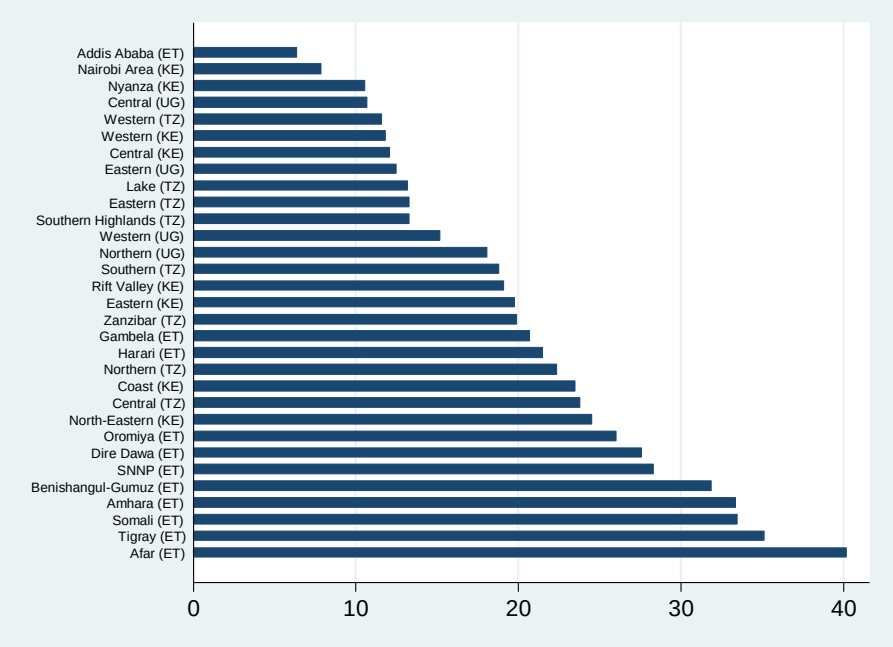
Wasting (or low weight-for-height) is caused by rapid weight loss or a failure to gain weight, and is usually the result of acute significant food shortage and/or disease. Wasting, also known as acute malnutrition, is a strong predictor of mortality among children under the age of five. Wasting is often assessed by comparing weight-for-height to the WHO international growth reference. Achievements on wasting have been relatively disappointing over the last decade (Figure 9). The unweighted average has only declined from 8.8 percent in 1998-2000 to 8.2 percent in 2009-2011. The bottom three regions – Afar (ET), North Eastern (KE) and Somali (ET) – are lagging significantly behind, possibly due to the droughts that affected these areas. The largest declines were seen in Gambela (ET), SNNP (ET) and North Eastern (KE), while there were significant increases in Coast (KE), Somali (ET) and Afar (ET) – among others. Regional disparities increased considerable in 2003-2006, although they subsequently returned to their initial levels. Nonetheless, spatial inequality is still very high. In fact, it is nearly three times higher than for stunting – according to the coefficient of variation. The percentage of children wasted in Somali (ET) is 10 times larger than in Western (KE) – 22 percent and 2 percent, respectively.

Figure 9: Children wasted (%)



Underweight (or low weight-for-age) is measured by comparing the weight-for-age of a child with the WHO international growth reference. This indicator can reflect the long-term nutritional status of children (stunting), the short-term nutritional status of children (wasting), or both. The bottom eight regions are all in Ethiopia, although many Ethiopian regions were among the top performers (Figure 10). Dire Dawa (ET), Zanzibar (TZ) and Northern (TZ) actually recorded increases. Most of the improvements were achieved between the first and second wave – with the unweighted average declining from 26 percent to 21 percent – while there were a significant number of reversals in the third wave. The proportion of children that are underweight varies considerable across regions – from 6 percent in Addis Ababa (ET) to 40 percent in Afar (ET). Regional inequality increased significantly in the first period, although it subsequently declined.

Figure 10: Children underweight (%, 2009-2011)



Malnutrition in children remains a key concern for all regions. There have been some improvements in stunting – with spatial disparities also declining – although levels remain quite high. Progress in wasting and underweight has been more disappointing. These two measures relate to a child's weight, which can be quickly affected by a shock – such as a famine. Droughts in Eastern Africa might have been responsible for setbacks in some of the 31 regions. In fact, the correlation between wasting and underweight is higher than the correlation between stunting and underweight, suggesting that underweight may be predominantly reflecting the short-term nutritional status of children. Finally, the trends on regional disparities show some variability. For wasting and underweight, spatial inequalities increased in the first period but subsequently declined.

5.3. Education

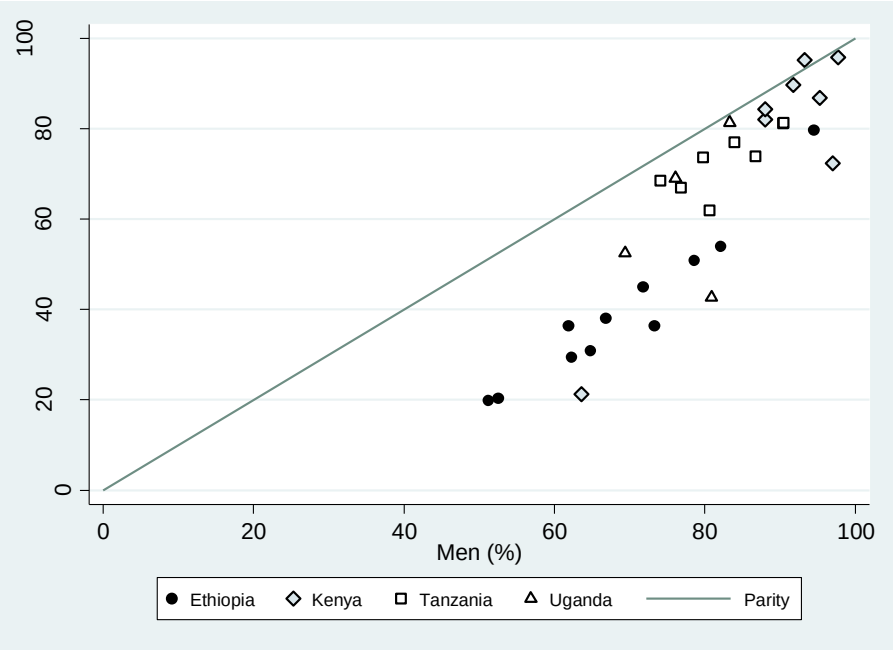
Knowledge is another basic dimension of human development, which also directly enhances human abilities. An educated workforce is critical to accelerate structural change and, more broadly, to raise labour productivity. In this sub-section, we investigate literacy rates and educational achievements.

Literacy

The lowest levels of literacy are often found in Ethiopian regions – for both women and men (Figure 11). Most Kenyan regions have high literacy levels, with the striking exception of North Eastern (KE).

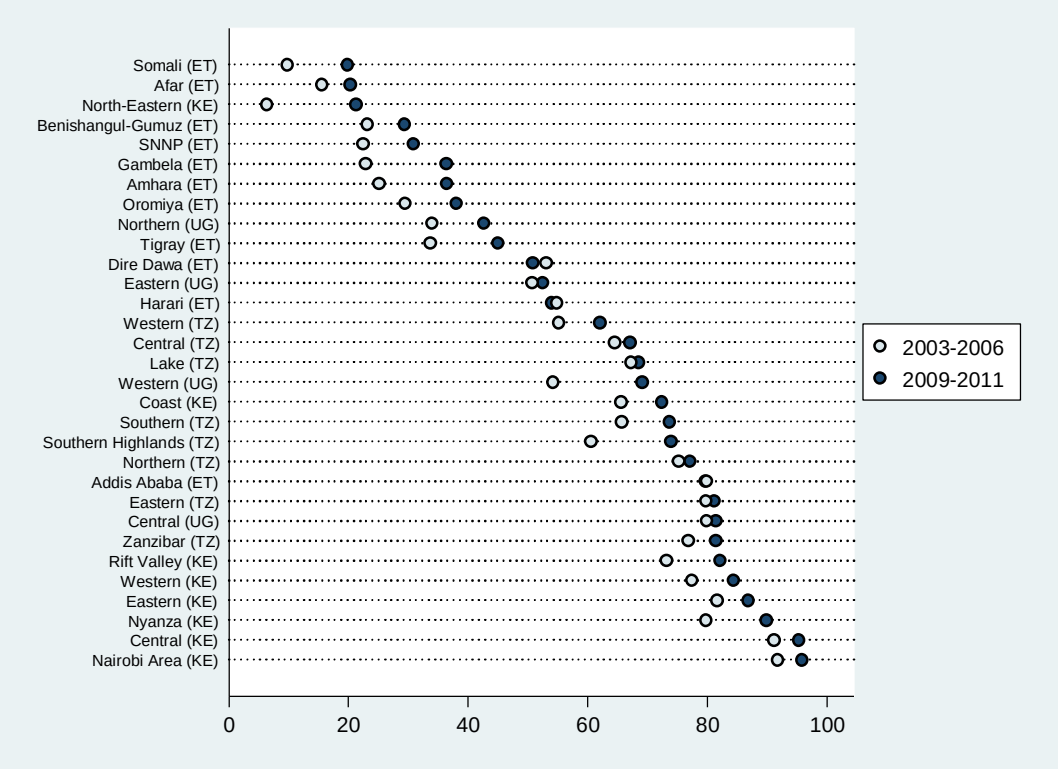
Moreover, the largest gender gaps tend to be observed in Ethiopia – since most Ethiopian regions are far from the 90 degree line that represents gender parity. Other regions with large gender gaps in literacy include North Eastern (KE), Northern (UG) and Coast (KE).

Figure 11: Literacy rates (%, 2009-2011)



In terms of trends, there has been a marked improvement in literacy levels for both women and men. Since there is no data for the first wave in Kenya and Tanzania, we restrict the analysis to the second and third waves. For women, the unweighted average increased from 55 percent in 2003-2006 to 64 percent in 2009-2011 (Figure 12). Literacy rates for men also improved in the same period, albeit to a lesser extent – the unweighted average grew from 74 percent in 2003-2006 to 79 percent in 2009-2011. There were very large gains in Somali (ET), Afar (ET) and North Eastern (KE) – above 20 percentage points – although from low starting points. Regional disparities are significantly larger for women than for men. With regard to regional inequality, the coefficient of variation and the Theil index point to significant declines. However, the disparities across regions remained very stark in 2009-2011 – with literacy rates for women ranging from 20 percent in Somali (ET) to 96 percent in Nairobi Area (KE).

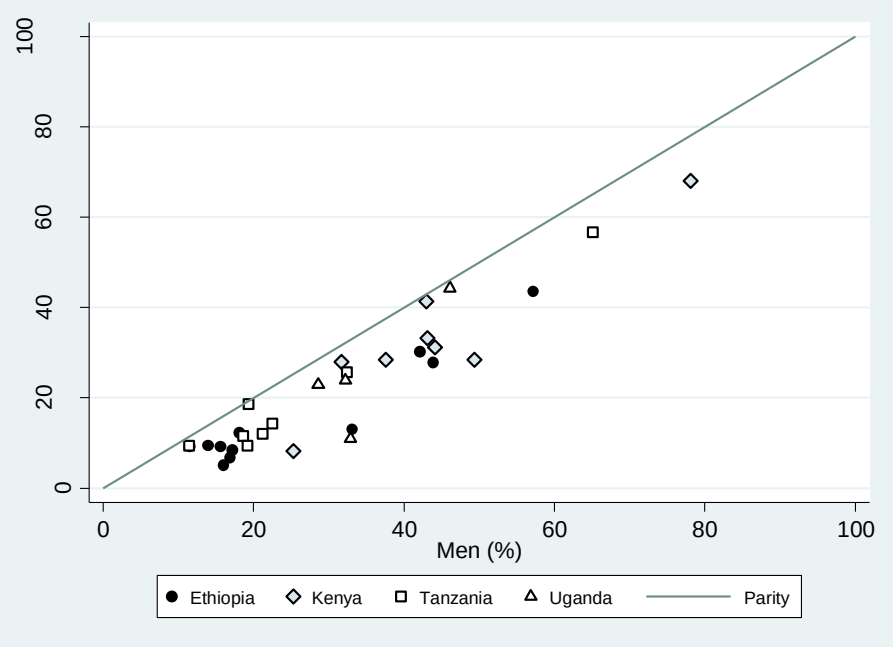
Figure 12: Women who are literate (%)



Education level

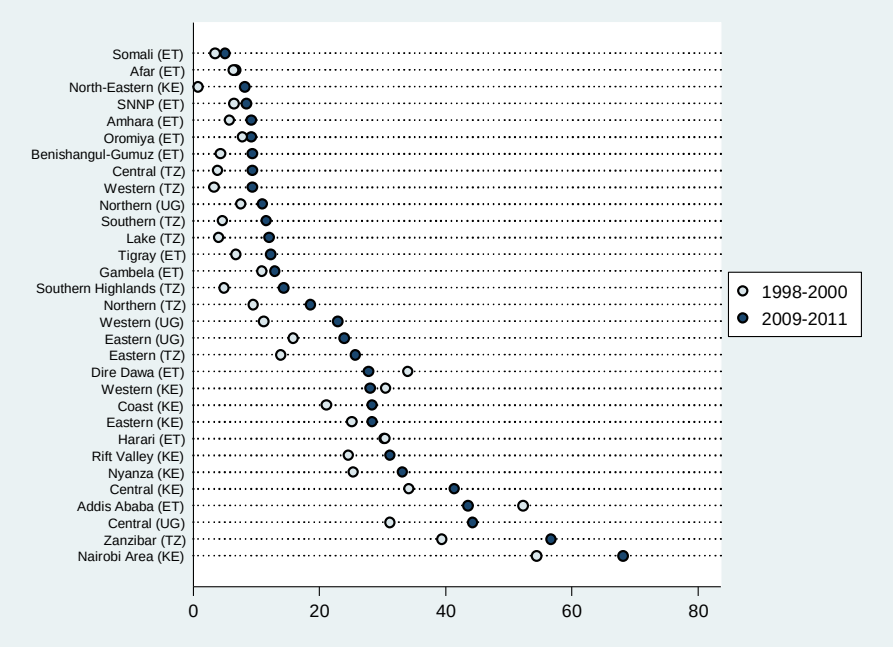
There are also significant gender disparities in education levels (Figure 13). The gender gap was largest in Northern (UG) and Gambela (ET), with a difference of over 20 percentage points. Many of the regions with the lowest percentage of women with secondary or higher education are in Ethiopia. Meanwhile, Nairobi Area (KE) and Zanzibar (TZ) have the highest education levels by a significant margin – more than half of women and men have secondary or higher education.

Figure 13: People with secondary or higher education (%, 2009-2011)



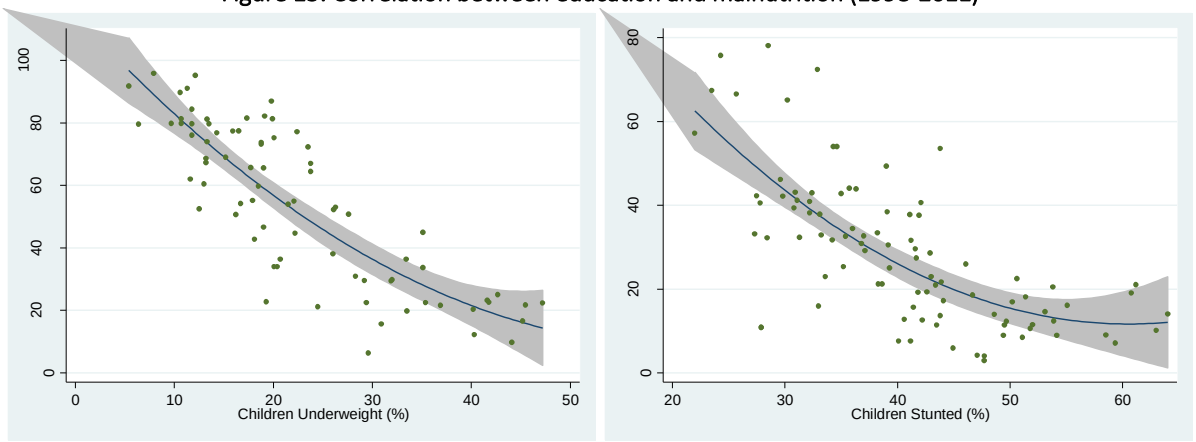
Most regions have recorded improvements, but only five regions have a share of women in secondary or higher education that is higher than 40 percent (Figure 14). In fact, many regions in Tanzania recorded considerable improvements. For instance, Zanzibar (TZ) displayed the largest absolute improvements for both women and men, while Addis Ababa (ET), Dire Dawa (ET) and Western (KE) has significant reversal for both sexes. The unweighted average for women has gradually increased from 17 percent in 1998-2000 to 23 percent in 2009-2011, while for men it increased from 26 percent in 1998-2000 to 32 percent in 2009-2011. The coefficient of variation and the Theil index suggest that regional disparities in education have been considerably reduced for both women and men – mostly since 2003-2006. However, inequality levels in education remain very high – especially for women. In 2009-2011, the proportion of women with secondary or higher education ranged from 5 percent in Somali (ET) to 68 percent in Nairobi Area (KE), while for men it ranged from 11 percent in Central (TZ) to 78 percent in Nairobi Area (KE).

Figure 14: Women with secondary or higher education (%)



Empirical studies have often found a robust relationship between education and health outcomes – e.g. a mother's educational level and a child's nutritional status. Our data also points to a particularly strong negative correlation between education and malnutrition, especially between women's literacy and children underweight (Figure 15). There is also a fairly strong pair wise correlation between education and stunting, as well as between literacy and under-five mortality – albeit to a lesser extent (see Table 7 in the Annex).

Figure 15: Correlation between education and malnutrition (1998-2011)

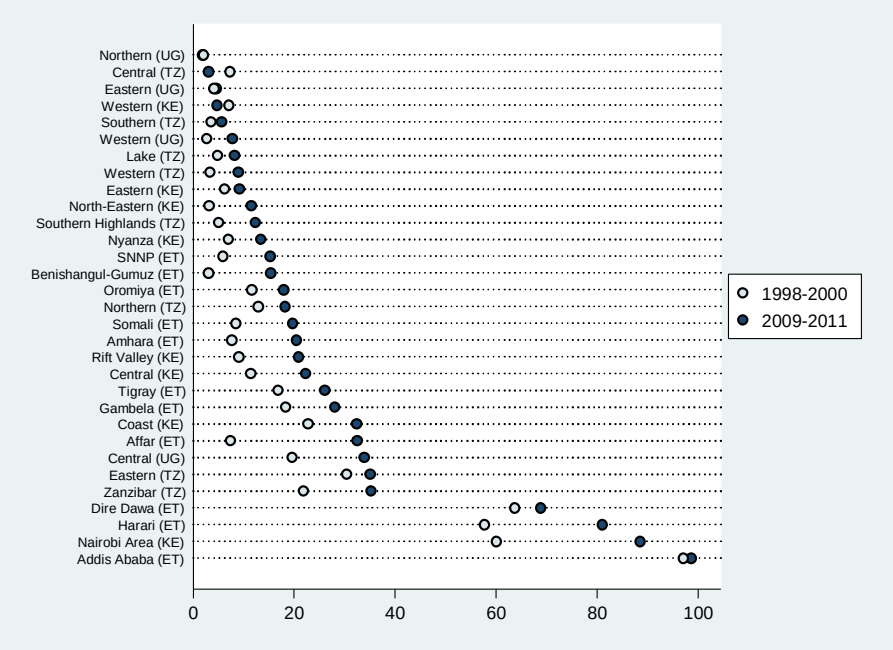


To conclude, there have been important accomplishments in the area of education. Overall, literacy levels have increased for both women and men, while the proportion of people with secondary or higher education is also on the rise. Spatial inequalities in education have declined considerably in recent years – much more than in health – but remain very large, especially for women.

5.4. Living standards

The DHS programme does not collect data on household incomes or consumption. However, it is possible to use proxy variables for living standards. A commonly-used indicator is the percentage of households that have electricity. The data shows that the four predominantly-urban regions have the highest proportion of households with electricity in their homes – all above 65 percent in 2009-2011 (Figure 16). The values for the other regions ranged from 2 percent in Northern (UG) to 35 percent in Zanzibar (TZ). Over the period of analysis, most regions recorded improvements – with the exception of Central (TZ), Western (KE) and Northern (UG). In fact, most of the gains were achieved in the most recent period. The unweighted average – excluding the top four regions – increased from 10 percent in 1998-2000 to 11 percent in 2003-2006, and then to 17 percent in 2009-2011. This seems consistent with the faster economic growth observed in the latter period. The coefficient of variation and the Theil index point to a very large decline in inequality, although regional disparities remain very high.

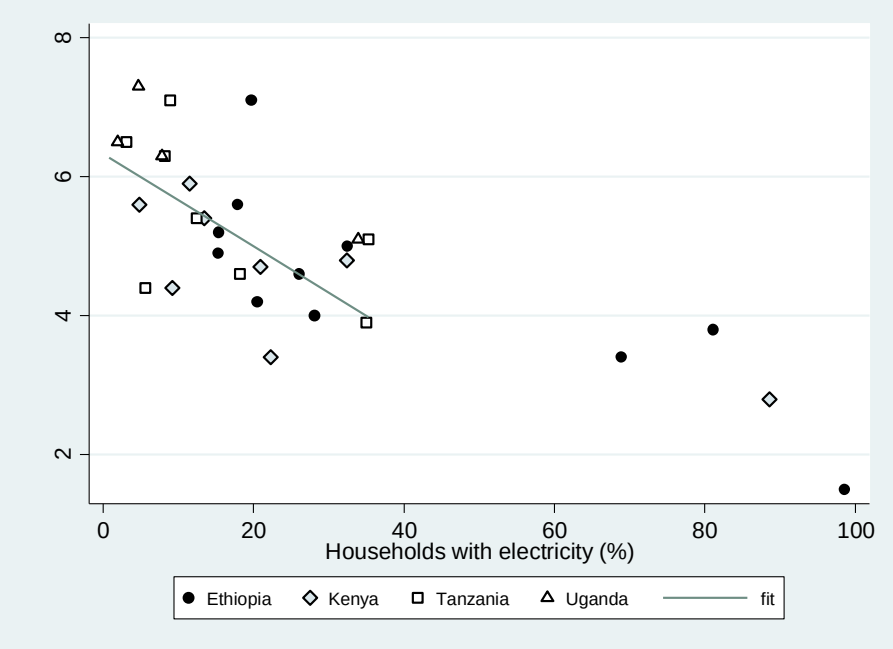
Figure 16: Households with electricity (%)



Household incomes are often strongly correlated with fertility rates – in the sense that richer households tend to have less children. Using the proportion of households with electricity as a proxy for household incomes, we note that there is a strong negative correlation between income and fertility – even if we exclude the four urban regions (Figure 17).

However, correlations with education and health indicators do not seem strong, probably suggesting that indicator is an imperfect proxy for income.

Figure 17: Households with electricity and total fertility rates (2009-2011)



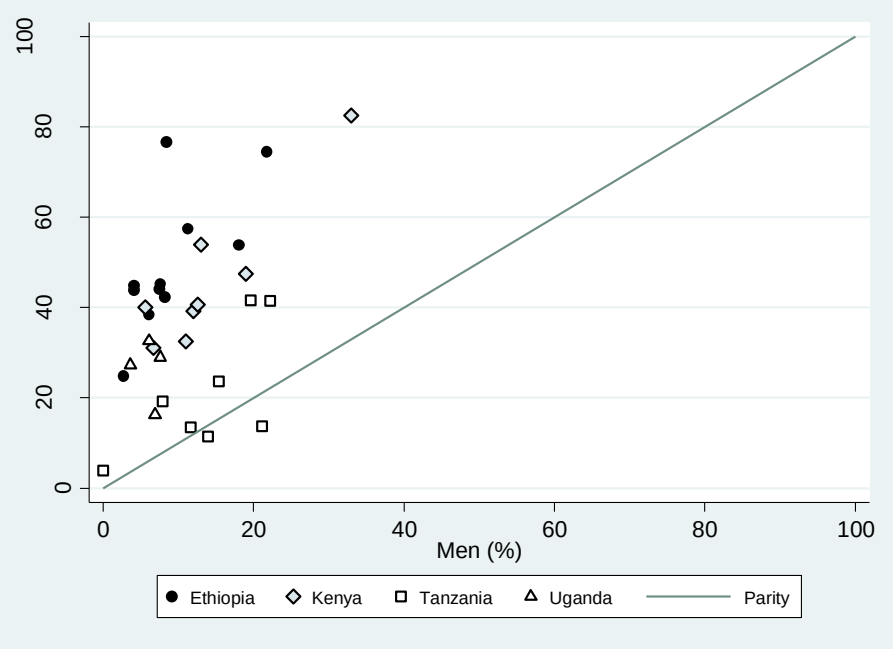
5.5. Employment

Employment dynamics are critical in any structural change narrative. In particular, we expect the share of workers in agriculture to decline as they move to better jobs in industry and/or services. In this sub-section, we start by analysing the proportion of people that did no work in the previous 12 months and then assess the share of people employed in agriculture. Both indicators are disaggregated by gender. The former is not a good proxy for unemployment, since it includes the economically inactive population.

Work status

In 2009-2011, women were much more likely to not work than men – especially in Ethiopian and Kenyan regions (Figure 18). For women, the maximum value observed was 83 percent, while for men it was 33 percent – both of which in North Eastern (KE). Six regions in Tanzania were very close to parity, and also recorded the lowest proportion of women that did no work.

Figure 18: People who did no work in the previous 12 months (%)

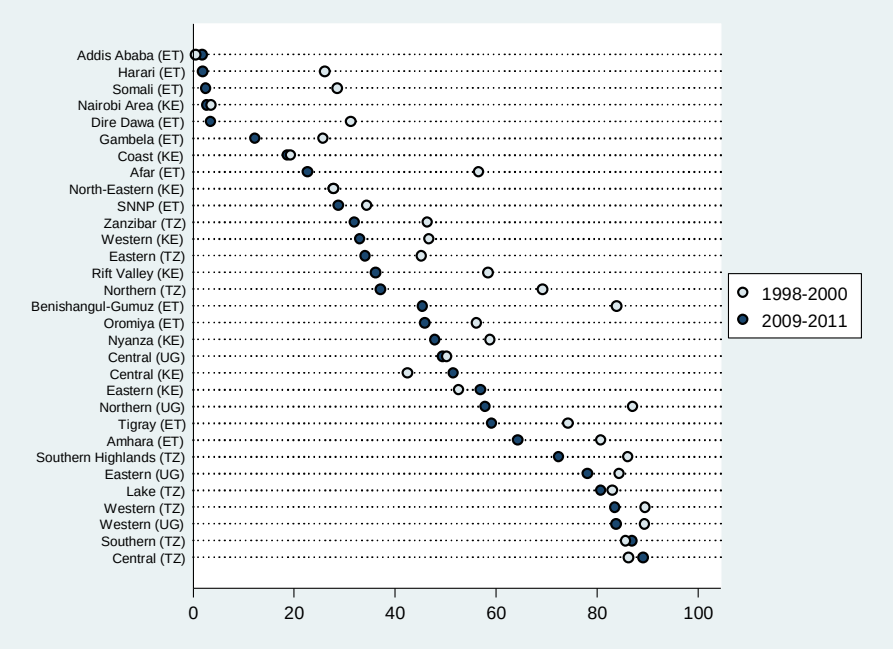


Since there is no data for the first wave in Tanzania, we restrict the trend analysis to the subsequent waves. The data for women shows considerable variation between the two periods, with no clear patterns emerging. Several regions observed declines in the share of women that did no work, while several other regions recorded increases. Overall, the data for men seems to point to a decrease in no work. The unweighted average for women only showed a minor decline in that period – from 39 percent to 38 percent – while for men the value dropped from 18 percent in 2003-2006 to 11 percent in 2009-2011. The coefficient of variation and the Theil index suggest a decline in spatial inequality, especially for women.

Occupation

The share of employment in agriculture has declined for both women and men – despite increases in some regions. This can be seen as a sign of structural change. Naturally, employment in agriculture is very low in the four urban regions – all below 3 percent (Figure 19). However, the indicator reaches over 80 percent in several regions, especially in Tanzania – Central (TZ), Southern (TZ), Western (UG), Western (TZ) and Lake (TZ). The pace of structural change seems to have accelerated in recent years, as the unweighted averages shows fast declines since the mid-2000s. The average for women declined from 51 percent in 2003-2006 to 43 percent in 2009-2011, while for men it fell from 60 to 53 percent over the same period. However, there are large variations across regions, while inequality measures point to growing regional disparities – in particular for women.

Figure 19: Women employed in agriculture (%)



Finally, there is a strong negative correlation between the proportion of women employed in agriculture and the proportion of women that did no work. Moreover, there seems to be a fairly strong negative correlation between the proportion of men employed in agriculture and the proportion of men with secondary or higher education.

6. Conclusion

In this paper, we compared the levels and trends of several socio-economic indicators across 31 regions in Eastern Africa. The analysis suggests that most regions have recorded improvements, especially with regard to health. However, there remains considerable scope for further progress in all dimensions.

More importantly, we assessed whether regional disparities have increased in a period characterised by stronger economic growth – as the theory predicts. Spatial inequalities are of considerable and increasing importance because they can fuel socio-political instability, especially if they result from ethnic, religious or political discrimination. The analysis suggest that inequality between regions has declined in some dimensions, especially in education (Table 5).

While this could be partly due to the fast improvements in Ethiopian regions, the conclusions are broadly unchanged when spatial inequality measures are computed for each individual country. Another partial explanation might be that, unlike income, most variables considered in this paper have strict bounds. For instance, mortality rates and malnutrition measures have a strict lower bound (zero), while literacy and education achievement have a strict upper bound (100 percent). This may facilitate convergence (and thus lower inequality), but cannot by itself provide a sufficient explanation of these trends. Policy interventions are still required to ensure that the lagging regions do gradually catch up with the leading regions.

Table 5: Inequality trends

	Coefficient of Variation			Theil Index		
	1998-2000	2003-2006	2009-2011	1998-2000	2003-2006	2009-2011
Total fertility	0.26	0.27	0.26	0.03	0.04	0.04
Infant mortality	0.29	0.25	0.23	0.05	0.03	0.02
Under-five mortality	0.33	0.26	0.29	0.06	0.03	0.04
Stunting	0.25	0.23	0.22	0.03	0.03	0.02
Wasting	0.63	0.75	0.62	0.17	0.24	0.17
Underweight	0.40	0.47	0.43	0.07	0.10	0.09
Education (Women)	0.87	0.84	0.69	0.34	0.32	0.21
Education (Men)	0.68	0.67	0.52	0.22	0.21	0.12
Literacy (Women)	..	0.47	0.39	..	0.12	0.08
Literacy (Men)	..	0.26	0.16	..	0.04	0.01
Electricity	1.27	1.26	0.97	0.55	0.57	0.37
No work (Women)	..	0.58	0.49	..	0.18	0.12
No work (Men)	..	0.67	0.64	..	0.19	0.20
Agriculture (Women)	0.48	0.58	0.64	0.14	0.23	0.24
Agriculture (Men)	0.43	0.43	0.46	0.12	0.12	0.13

Despite some evidence of regional convergence in terms of socio-economic indicators, spatial disparities remain very high. For instance, a child born in Benishangul-Gumuz (ET) is over three times more likely to die before the age of five than a child born in Central (KE). The percentage of children wasted in Somali (ET) is 10 times larger than in Western (KE). The proportion of children that are underweight ranges from 6 percent in Addis Ababa (ET) to 40 percent in Afar (ET) – a 36 percentage point difference. The literacy rate for women was 96 percent in Nairobi Area (KE), but only 20 percent in Somali (ET).The proportion of men with secondary or higher education ranged from 11 percent in Central (TZ) to 78 percent in Nairobi Area (KE). The proportion of households with electricity in their homes ranged from 2 percent in Northern (UG) to 35 percent in Zanzibar (TZ) – excluding the four predominantly-urban regions. These large disparities call for concerted actions at the sub-national, national and even supra-national level to ensure that economic growth in Eastern Africa is inclusive and sustained. Stronger investments in (regional) public infrastructure, improved service delivery and greater worker mobility may help further reduce spatial inequalities.

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Annex

Table 6: Top and bottom improvements in absolute terms (percentage points, 1998-2011)

	Top-5 improvements			Bottom-5 improvements		
Total fertility	Northern	(UG)	-1.4	Somali	(ET)	2.0
	Amhara	(ET)	-1.3	Afar	(ET)	0.6
	North-Eastern	(KE)	-1.1	Nyanza	(KE)	0.4
	Tigray	(ET)	-0.7	Central	(TZ)	0.4
	SNNP	(ET)	-0.7	Benishangul-Gumuz	(ET)	0.2
Infant mortality	Afar	(ET)	-65	Nairobi Area	(KE)	19
	Harari	(ET)	-54	Central	(KE)	15
	Southern	(TZ)	-48	Benishangul-Gumuz	(ET)	3
	Gambela	(ET)	-47	Western	(KE)	1
	Dire Dawa	(ET)	-46	Coast	(KE)	1
Under-5 mortality	Gambela	(ET)	-110	Central	(KE)	18
	Afar	(ET)	-102	Western	(KE)	-1
	Harari	(ET)	-97	Nairobi Area	(KE)	-2
	Tigray	(ET)	-84	Rift Valley	(KE)	-9
	North-Eastern	(KE)	-83	Coast	(KE)	-9
Stunting	Somali	(ET)	-18.8	North-Eastern	(KE)	7.3
	SNNP	(ET)	-16.7	Eastern	(KE)	5.1
	Gambela	(ET)	-14.4	Central	(KE)	4.9
	Eastern	(UG)	-13.2	Nairobi Area	(KE)	2.8
	Southern	(TZ)	-12.7	Rift Valley	(KE)	2.6
Wasting	Gambela	(ET)	-8.2	Coast	(KE)	6.4
	SNNP	(ET)	-7.2	Somali	(ET)	5.5
	North-Eastern	(KE)	-6.3	Afar	(ET)	3.3
	Benishangul-Gumuz	(ET)	-4.9	Zanzibar	(TZ)	3.0
	Nairobi Area	(KE)	-3.3	Eastern	(KE)	2.6
Underweight	SNNP	(ET)	-18.9	Dire Dawa	(ET)	1.5
	Amhara	(ET)	-12.1	Zanzibar	(TZ)	0.8
	Nyanza	(KE)	-11.6	Northern	(TZ)	0.1
	Gambela	(ET)	-11.3	Central	(TZ)	-0.1
	Oromiya	(ET)	-10.9	Harari	(ET)	-0.7
Education (W)	Zanzibar	(TZ)	17.3	Addis Ababa	(ET)	-8.8
	Nairobi Area	(KE)	13.7	Dire Dawa	(ET)	-6.2
	Central	(UG)	13.1	Western	(KE)	-2.5
	Eastern	(TZ)	11.8	Harari	(ET)	-0.1
	Western	(UG)	11.7	Afar	(ET)	0.4
Education (M)	Zanzibar	(TZ)	27.0	Addis Ababa	(ET)	-15.2
	North-Eastern	(KE)	14.4	Western	(KE)	-11.1
	Lake	(TZ)	13.7	Dire Dawa	(ET)	-10.1
	Southern Highlands	(TZ)	13.6	Tigray	(ET)	-3.0
	Western	(TZ)	13.3	SNNP	(ET)	-1.8
Electricity	Nairobi Area	(KE)	28.5	Central	(TZ)	-4.2
	Afar	(ET)	25.1	Western	(KE)	-2.3
	Harari	(ET)	23.4	Northern	(UG)	-0.2
	Central	(UG)	14.3	Eastern	(UG)	0.6
	Zanzibar	(TZ)	13.5	Addis Ababa	(ET)	1.5
Agriculture (W)	Benishangul-Gumuz	(ET)	-38.5	Central	(KE)	9.1
	Afar	(ET)	-34.0	Eastern	(KE)	4.3
	Northern	(TZ)	-32.1	Central	(TZ)	2.9
	Northern	(UG)	-29.3	Southern	(TZ)	1.3
	Dire Dawa	(ET)	-27.7	Addis Ababa	(ET)	1.3
Agriculture (M)	Gambela	(ET)	-23.3	Eastern	(UG)	19.5
	North-Eastern	(KE)	-20.9	Central	(UG)	14.5
	Harari	(ET)	-13.8	Northern	(TZ)	11.8
	Eastern	(TZ)	-12.8	Nyanza	(KE)	11.1
	Lake	(TZ)	-12.3	Western	(UG)	7.0

Note: Results for literacy and 'no work' are not reported due to gaps in the data.

Table 7: Spearman pairwise correlations (third wave)

	Total fertility	Infant mortality	Under-5 mortality	Stunting	Wasting	Underweight	Education (W)	Education (M)	Literacy (W)	Literacy (M)	Electricity	No work (W)	No work (M)	Agriculture (W)	Agriculture (M)
Total fertility	1.00														
Infant mortality	0.20	1.00													
Under-five mortality	0.44	**0.82**	1.00												
Stunting	0.17	0.22	0.17	1.00											
Wasting	-0.14	0.10	0.04	0.07	1.00										
Underweight	0.02	0.29	0.23	**0.57**	**0.81**	1.00									
Education (Women)	**-0.47**	-0.42	**-0.52**	**-0.60**	-0.33	**-0.65**	1.00								
Education (Men)	-0.43	-0.36	-0.44	**-0.72**	-0.14	**-0.59**	**0.89**	1.00							
Literacy (Women)	-0.32	-0.44	**-0.54**	-0.33	**-0.60**	**-0.75**	**0.85**	**0.65**	1.00						
Literacy (Men)	-0.42	-0.40	**-0.57**	-0.41	-0.45	**-0.67**	**0.85**	**0.78**	**0.90**	1.00					
Electricity	**-0.73**	-0.16	-0.30	-0.36	0.41	0.07	0.45	**0.49**	0.12	0.27	1.00				
No work (Women)	-0.22	0.08	0.12	-0.19	**0.66**	**0.46**	-0.10	0.10	-0.36	-0.20	0.42	1.00			
No work (Men)	0.03	-0.21	-0.11	-0.29	0.09	-0.12	0.15	0.28	0.12	0.19	0.24	0.32	1.00		
Agriculture (Women)	**0.46**	0.01	0.05	**0.49**	**-0.50**	-0.16	-0.21	-0.42	0.10	-0.13	**-0.72**	**-0.83**	-0.42	1.00	
Agriculture (Men)	**0.59**	0.34	0.42	**0.54**	-0.24	0.20	**-0.57**	**-0.72**	-0.37	**-0.55**	**-0.71**	**-0.49**	**-0.56**	**0.77**	1.00

Note: Shaded and bold value means that the correlation coefficient is statistically significant at the 1 percent level.

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