African Review of Economics and Finance | ISSN 2042-1478 | Volume 12 | Issue 1 | June 2020

Progress on poverty in Africa: How have growth and inequality mattered?

Augustin Kwasi Fosu $^{\scriptscriptstyle\#}$ and Dede Woade Gafa *

[#] Institute of Statistical, Social, and Economic Research, University of Ghana, Legon, Ghana; Faculty of Economic and Management Sciences, University of Pretoria, Pretoria, South Africa; Centre for the Study of African Economies (CSAE), University of Oxford, UK. Email: afosu@isser.edu.gh

> * Department of Economics, University of Ghana, Legon, Ghana. Email: dwagafa@st.ug.edu.gh

Abstract

The increasing focus on global inequality should not shift attention away from poverty. Together with growth, it is, perhaps, their interrelationships that require continuing focus. Using World Bank data, this paper, first, examines Africa's record on poverty incidence, spread and severity since the early-mid 1990s at the US\$1.25 and US\$2.00 per day poverty standards (2005 PPP dollars). Second, based on Fosu (2017a), it evaluates country-specific progress on growth, poverty and inequality, and compares the 'poverty transformation efficiency' among African countries. Third, as in Fosu (2018), the study analyses the relative roles of income growth and inequality changes in explaining the African countries' poverty record, through a decomposition of poverty changes using 'optimal' income and inequality elasticity estimates from the 'identity' model. We find that poverty levels have declined substantially since Africa's growth resurgence starting in the 1990s, and that this progress was driven mainly by income growth, consistent with the global evidence. Nonetheless, inequality often played a complementary role in most of the countries and, in a small number of cases, it was the primary driver of changes in poverty. Thus, the present study sheds light on country-specific differences in the relative roles of growth and inequality in poverty reduction on the continent, based on both qualitative and quantitative evidence. Methodologically, the paper also suggests that SYS-GMM should not be considered necessarily superior to the 'old' methods of fixed effects and random effects for predictive purposes.

Keywords: Poverty; Inequality; Growth; Africa.

1. Introduction

Inequality has increasingly become the focus of development economics, but poverty reduction is at the forefront of the development discourse in Africa. Although many developing countries, including African economies, have achieved commendable progress on most poverty and development indicators, especially over the last two decades, considerable differences remain across regions and countries. Indeed, compared to other sub-regions, the progress in sub-Saharan Africa (SSA) on poverty has been slow and poverty levels remain relatively high (Thorbecke, 2013; World Bank, 2018). So, rather than crude binaries, it is more useful to analyse the relationship between inequality and poverty.

The existing literature suggests that countries' initial characteristics, growth and redistributive policies are the underlining factors behind poverty reduction. Focusing on SSA, Fosu (2015) has observed that the progress on poverty since the early-mid-1990s may be attributable primarily to income growth, presumably linked to the GDP growth resurgence, though improvements in income distribution have been quite complementary. Building on this literature, the present study provides further evidence on the relative roles of income growth and changes in inequality in Africa's recent record on poverty reduction.

Specifically, the study first presents qualitative evidence on the growthinequality-poverty nexus in African countries, using an updated version of the data employed by Fosu (2015) and the 'poverty transformation efficiency vector' (PTEV), which was first developed in Fosu (2017a). The PTEV provides a better understanding of countries' performance in transforming per capita GDP growth into income growth and income growth into poverty reduction, conditional on changes in income distribution. Second, we quantify the extent of the transformation of income growth and changes in inequality into poverty reduction. Following Fosu (2018), the paper employs the 'optimal' estimates of the 'identity' model based on various estimation techniques – the fixed effects (FE), the random effects (RE) and the two-step GMM (SGMM) – to decompose the changes in poverty into contributions by income and inequality changes.

The contribution of this study is three-fold. First, it provides more recent evidence on the progress of SSA on poverty incidence, spread and severity since the early-mid 1990s using US\$1.25 and US\$2.00 poverty lines. Second, the paper employs an extended version of the PTEV proposed by Fosu (2017a) to show the efficiency in the transformation of per capita GDP growth into income growth, and of income growth into poverty reduction for all the three Foster-

Greer-Thorbecke (FGT) measures, and also to provide greater insight into the role of inequality in that transformation. Third, the contribution of the paper is methodological. As indicated above, it provides further evidence, following Fosu (2018), on how to optimally choose among the various panel-estimation methodologies.

The rest of the paper is structured as follows. In Section 2, it briefly reviews the literature underlying the relationship among growth, inequality, and poverty, with a focus on how growth and inequality may influence poverty. Section 3 discusses Africa's progress on poverty, growth and inequality. Section 4 estimates the 'identity' model and decomposes African countries' progress on poverty into changes in income and in inequality. In Section 5, we conclude with some policy implications.

2. Brief literature review: Inequality and growth-poverty linkages

Income growth is widely recognized as a primary route for poverty reduction (Deininger and Squire, 1998; Dollar and Kraay, 2002; Dollar *et al.*, 2016). Critics (e.g., Gore, 2007) argue that only particular types of growth reduce levels of poverty. Indeed, other factors play a role in influencing poverty, such as the level of development and other initial characteristics; in particular, income distribution is generally believed to matter greatly for poverty reduction (Bruno *et al.*, 1998; Ravallion, 2012; Dabla-Norris *et al.*, 2015).

As emphasized in the theoretical literature, inequality influences poverty reduction directly as well as indirectly, through two main channels, namely, the 'growth channel' (Ravallion, 1997; Alesina and Rodrik, 1994) and the 'growth elasticity' channel (Ravallion, 1997; Adams Jr, 2004; Easterly, 2000). In the case of the indirect effect, considering firstly the 'growth channel', it is usually argued that inequality severely hampers growth by limiting human capital formation and political stability, and therefore has negative implications for poverty alleviation (Deininger and Squire, 1998; Birdsall *et al.*, 1997)¹. Secondly, many studies, both cross-country and country-specific, stipulate that a high level of inequality lowers the growth elasticity of poverty, that is, the extent of transformation of income growth into poverty reduction (Bourguignon, 2003; Kalwij and Verschoor, 2007; Ferreira and Ravallion, 2008). In other words, with high income disparities, the extent to which individuals at the

¹ The literature on the effect of inequality on growth, however, remains inconclusive given that a wide number of studies also find a positive relationship between inequality and growth (Kaldor, 1957; Forbes, 2000; Knowles, 2005).

African Review of Economics and Finance Vol 12 (1) 2020

bottom of the income distribution benefit from growth is considerably limited. For instance, using the 'identity' model, Bourguignon (2003) investigates the relationship between inequality, growth and poverty and shows that in a highly unequal country, poverty is less sensitive to income growth. In other words, the poverty-reducing effect of growth is attenuated by high inequality levels. This observation is supported empirically based on African data (Fosu, 2008, 2010a, 2010b). Similarly, Fosu (2009, 2010c, 2015, 2017a) found that the higher the initial inequality, the lower are both the growth and inequality elasticities of poverty, but these effects differ considerably across regions and countries.

With respect to the direct effect, redistribution of resources from the rich to the poor segment of society is likely to reduce poverty, even with a negligible growth (Bourguignon, 2003). Fosu (2010c, 2015, 2017a) for example, however, find that a fall in inequality may or may not promote poverty reduction, depending on a country's level of income. While a reduction in inequality would generally decrease poverty, in very poor countries, redistribution may actually exacerbate poverty.

3. Progress on poverty

3.1. Progress on poverty: Regional trends

The analysis of poverty requires a careful examination of progress on poverty reduction in the Global South. Based on World Bank poverty data, PovcalNet, Appendix Figures 1 to 6 present a useful starting point. The figures show the trends in poverty for the developing world as a whole (DW) and across regions – East Asia and Pacific (EAP), Middle East and North Africa (MENA), Latin America and Caribbean (LAC), South Asia (SA) and SSA – over the period 1981–2011. Presented are the three FGT poverty measures, namely, the headcount ratio, poverty gap and squared poverty gap at the US\$1.25 and US\$2.00 poverty standards.

Overall, the figures reveal a considerable decline in poverty for DW. The decline is observed for all the three measures of poverty. Furthermore, the regional disaggregation reveals that while EAP and SA have seen considerable and consistent declines in each of the three FGT measures throughout, SSA in particular actually registered poverty increases until the early-1990s, corresponding to the period of the region's dismal economic performance. Since the early-mid-1990s, however, when growth has resurged, poverty has also fallen appreciably. Nonetheless, the declines in DW's poverty rates have been even faster, thus leading to widening gaps between the SSA region and the

rest of the developing world. This observation holds for both poverty standards, US\$1.25 and US\$2.00 per day, although SSA's rates of poverty reduction have been slower for the US\$2.00 threshold.

3.2. Progress on poverty and inequality among African countries, and implications of growth

Beyond this average story, the progress on poverty across African countries is quite heterogeneous. Tables 1a and 1b report countries' performance on per capita GDP, average income (at the household level), inequality and poverty among African countries from the early-mid-1990s to the latest available year (2000s). The data related to the three FGT poverty measures are reported in the two tables for the US\$1.25 and US\$2.00 standards, respectively. For each country, the tables present the annual mean growth of per capita GDP, as well as annualised growth rates of income, poverty (headcount ratio, poverty gap and squared poverty gap) and inequality measured by the Gini index. All data, except that for per capita GDP growth which emanate from the World Bank Global Development Indicators Online, are derived from the World Bank PovcalNet. These data are based on household surveys that are not conducted in the same years across countries. Thus, the growth rates are annualized over the relevant period, using the logarithmic differences between the available data for each country and then dividing by the number of intervening years, in order to achieve some level of comparability across countries².

Country	Period	Per Capita GDP Growth	Income Growth	Headcount Poverty (P ₀) Growth	Poverty Gap (P ₁) Growth	Squared Pov. Gap (P ₂) Growth	Inequality (Gini) Growth
Botswana	1994-2009	2.54	3.71	-5.51	-6.7	-6.73	-0.05
Burkina Faso	1994-2009	3.03	2.14	-3.14	-5.78	-7.64	-1.62
Burundi	1992-2006	-2.93	0.76	-0.25	-0.71	-1.26	-0.01
Cameroon	1996-2007	1.25	2.51	-4.92	-7.13	-8.99	-0.82
CAR	1992-2008	0.95	4.68	-1.80	-3.90	-5.37	-0.55
Côte d'Ivoire	1993-2008	-0.15	-0.67	1.87	2.93	3.93	0.62

 TABLE 1A: ANNUALIZED GROWTH (%) OF POVERTY MEASURES (POVERTY LINE: US\$1.25 A

 DAY IN 2005 PPP), PER CAPITA GDP, INCOME AND INEQUALITY (GINI INDEX)

 $^{^2}$ Given the usual data problems (Jerven, 2014, 2015) and ongoing debates on measurement (e.g., Obeng-Odoom, 2015, 2017), the existing data cannot be taken on face value and appropriate caution is called for. Nonetheless, the PovcalNet data, which is based on actual household surveys, may be subject to less inaccuracies than those for GDP and trade.

A	frican I	Review	of	^c Economics	and Finance	Vol 12	? (1)	20.	20)
	/		./				1	/			

Egypt	1991-2008	3.02	0.69	-5.50	-2.72	0.71	-0.22
Eswatini	1995-2010	1.01	5.83	-4.62	-7.62	-10.01	-1.09
Ethiopia	1995-2011	4.42	1.56	-3.49	-5.09	-6.23	-1.12
Gambia, The	1998-2003	1.08	13.32	-13.37	-21.24	-27.57	-1.21
Ghana	1992-2006	2.07	3.57	-4.14	-4.42	-4.27	0.82
Guinea	1991-2012	0.49	6.35	-3.95	-7.8	-10.56	-1.57
Guinea- Bissau	1993-2002	-2.31	1.11	-3.22	-6.23	-8.43	-3.31
Kenya	1992-2005	0.00	-2.60	0.90	0.72	0.54	-1.39
Lesotho	1993-2010	2.65	1.24	-1.03	-1.75	-2.14	-0.4
Madagascar	1993-2010	-0.32	-3.18	1.58	2.72	3.29	-0.75
Malawi	1998-2010	1.19	1.82	-1.12	-2.34	-3.17	-0.67
Mali	1994-2010	2.66	4.14	-3.31	-7.32	-10.40	-2.66
Mauritania	1993-2008	0.65	1.16	-4.02	-5.03	-5.71	-1.42
Morocco	1991-2007	2.17	0.19	0.29	2.74	5.42	0.25
Mozambique	1996-2009	4.71	3.37	-2.28	-3.75	-4.59	0.21
Niger	1992-2011	-0.01	2.17	-3.05	-5.51	-7.44	-0.77
Nigeria	1992-2010	3.2	0.26	0.01	-0.71	-1.40	-0.26
Senegal	1991-2011	0.79	2.06	-3.29	-5.64	-7.55	-1.47
South Africa	1993-2011	1.46	3.51	-5.36	-9.96	-14.34	0.52
Tanzania	1992-2012	2.58	2.59	-2.53	-4.08	-5.47	0.56
Tunisia	1990-2010	3.19	2.01	-10.14	-9.43	-8.27	-0.57
Uganda	1992-2013	3.45	3.23	-3.14	-4.77	-6.20	0.22
Zambia	1993-2010	2.26	-0.45	0.76	0.95	0.89	0.52
Mean		1.56	2.31	-3.03	-4.47	-5.48	-0.63
Median		1.46	2.06	-3.14	-4.77	-5.71	-0.57
		(South Africa)	(Senegal)	(Uganda)	(Uganda)	(Mauri- tania)	(Tunisia)
Max		4.71	13.32	1.87	2.93	5.42	0.82
		(Mozam- bique)	(Gambia, The)	(Côte d'Ivoire)	(Côte d'Ivoire)	(Morocco)	(Ghana)
Min		-2.93	-3.18	-13.37	-21.24	-27.57	-3.31
		(Burundi)	(Madagas- car)	(Gambia, The)	(Gambia, The)	(Gambia, The)	(Guinea- Bissau)

Notes: The annualized growth rates are the logarithmic differences between the latest-year and the beginning-year values, divided by the number of intervening years, x 100 percent. The data on per capita GDP are from the World Bank Development Indicators (WDI), World Bank (2015b), while the data on mean income, headcount poverty rate, poverty gap, squared poverty gap and Gini index are obtained from PovcalNet, World Bank (2015a). For all the poverty measures, the poverty line is US\$ 1.25 per day in 2005 PPP.

TABLE 1B: ANNUALIZED GROWTH (%) OF POVERTY MEASURES (POVERTY LINE: US\$2.00 ADAY IN 2005 PPP), PER CAPITA GDP, INCOME AND INEQUALITY (GINI INDEX)

Country	Period	Per Capita GDP Growth	Income Growth	Headcount Poverty (P ₀) Growth	Poverty Gap (P ₁) Growth	Squared Pov. Gap (P ₂) Growth	Inequality (Gini) Growth
Botswana	1994-2009	2.54	3.71	-3.86	-5.12	-5.92	-0.05
Burundi	1992-2006	-2.93	0.76	-0.13	-0.41	-0.68	-0.01
Cameroon	1996-2007	1.25	2.51	-2.75	-4.57	-5.86	-0.82
CAR	1992-2008	0.95	4.68	-0.84	-2.51	-3.69	-0.55
Côte d'Ivoire	1993-2008	-0.15	-0.67	1.03	1.82	2.46	0.62
Egypt	1991-2008	3.02	0.69	-3.40	-4.28	-3.80	-0.22
Gambia, The	1998-2003	1.08	13.32	-7.61	-14.17	-18.90	-1.21
Ghana	1992-2006	2.07	3.57	-2.93	-3.83	-4.21	0.82
Guinea- Bissau	1993-2002	-2.31	1.11	-0.95	-3.34	-5.15	-3.31
Guinea	1991-2012	0.49	6.35	-1.52	-4.61	-6.85	-1.57
Kenya	1992-2005	0.00	-2.60	0.94	0.88	0.72	-1.39
Lesotho	1993-2010	2.65	1.24	-0.49	-1.19	-1.61	-0.40
Madagascar	1997-2010	-0.02	-2.69	0.50	1.82	2.64	0.28
Mali	1994-2010	2.66	4.14	-1.13	-4.09	-6.31	-2.66
Mauritania	1993-2008	0.65	1.16	-2.47	-3.68	-4.45	-1.42
Morocco	1991-2007	2.17	0.19	-0.70	-0.42	0.40	0.25
Niger	1992-2011	-0.01	2.17	-0.98	-2.89	-4.32	-0.77
Nigeria	1992-2010	3.20	0.26	0.13	-0.23	-0.62	-0.26
Senegal	1991-2011	0.79	2.06	-1.54	-3.47	-4.89	-1.47
South Africa	1993-2011	1.46	3.51	-2.59	-4.54	-6.34	0.52
Tanzania	1992-2012	2.58	2.59	-1.14	-2.47	-3.42	0.56
Tunisia	1990-2010	3.19	2.01	-7.21	-8.58	-9.09	-0.57
Uganda	1996-2013	3.04	3.39	-1.90	-3.01	-3.74	1.12
Zambia	1993-2006	1.21	0.06	0.17	0.28	0.24	0.29
Mean		1.23	2.23	-1.73	-3.03	-3.89	-0.51
Median		1.23	2.03	-1.14	-3.18	-4.01	-0.33
Max		3.20	13.32	1.03	1.82	2.64	1.12
		(Nigeria)	(Gambia, The)	(Côte d'Ivoire)	(Madagas- car)	(Madagas- car)	(Uganda)
Min		-2.93	-2.69	-7.61	-14.17	-18.90	-3.31
		(Burundi)	(Madagas- car)	(Gambia, The)	(Gambia, The)	(Gambia, The)	(Guinea- Bissau)

Notes: Sierra Leone, Burkina Faso, Malawi, Mozambique, Eswatini and Ethiopia are omitted for the US\$ 2.00 poverty line because of the lack of poverty data starting from the early-mid 1990s. For details on data sources and computation, see the notes of Table 1a.

In addition, Tables 2a and 2b report the quintile ranks based on the data presented in Tables 1a and 1b, respectively. The highest quintile (fifth quintile) represents the worst performance while the lowest (first quintile) is assigned to the best performers.

Focusing on the poverty line of US\$1.25 a day, data in Table 1a show that The Gambia exhibits the greatest progress on reducing the incidence, spread and severity of poverty. This performance seems to be as a result of considerable income growth and moderate reduction in inequality. In Côte d'Ivoire, meanwhile, poverty increased considerably making the country the worst performer on the headcount ratio and poverty gap, while Morocco has the poorest performance on squared poverty gap. Other top performers on poverty incidence are detailed in Table 2a. Briefly: Botswana, Cameroon, Egypt, The Gambia, South Africa, Tunisia (first quintile), Ethiopia, Ghana, Guinea, Mali, Mauritania, Eswatini³ (second quintile), Burkina Faso, Guinea Bissau, Niger, Senegal and Uganda (median quintile), while the other bottom performers on the same measure are: Burundi, Central African Republic (CAR), Lesotho, Malawi, Mozambique, Tanzania (fourth quintile), Kenya, Madagascar, Morocco, Nigeria and Zambia (fifth quintile).

In most cases, countries' performance on poverty incidence is maintained for the poverty gap and squared poverty gap as well. Indeed, the top performers on poverty incidence also achieved substantial progress on poverty gap and squared poverty gap, and the same applies to the bottom performers. For instance, The Gambia, Botswana, Cameroon, Guinea, Mali, South Africa, Eswatini and Tunisia all rank in the top quintiles (first and second quintiles) on all poverty measures; while Burundi, Côte d'Ivoire, Kenya, Lesotho, Madagascar, Malawi, Morocco, Mozambique, Nigeria and Zambia rank among the bottom quintiles (fourth and fifth quintiles). There are, however, exceptions such as Egypt which had a considerable fall in poverty incidence, but performed poorly on the depth and severity of poverty. Furthermore, the relative performance of African countries on poverty indicators is similar for the US\$1.25 and US\$2.00 poverty levels.

On average, Africa has experienced a reduction in inequality since the earlymid-1990s. Indeed, of the twenty-nine African countries presented in Table 1a, twenty-one experienced an improvement in income distribution over the period. Guinea-Bissau topped other African countries with a reduction in inequality of about 3 percent annually, while Ghana had the poorest performance. As reported

³ Previously called Swaziland.

in Table 2a, the countries are ranked as follows: (a) 1st quintile: Burkina Faso, Guinea, Guinea-Bissau, Mali, Mauritania, Senegal; (b) 2nd quintile: Cameroon, Ethiopia, The Gambia, Kenya, Niger, Eswatini; (c) Median quintile: CAR, Lesotho, Madagascar, Malawi, Tunisia; (d) 4th quintile: Botswana, Burundi, Egypt, Mozambique, Nigeria, Uganda; (e) 5th quintile: Côte d'Ivoire, Ghana, Morocco, South Africa, Tanzania and Zambia.

Country	Period	Per Capita GDP Growth	Income Growth	Headcount Poverty (P ₀) Growth	Poverty Gap (P ₁) Growth	Squared Pov. Gap (P ₂) Growth	Inequality (Gini) Growth
Botswana	1994-2009	2	1	1	2	2	4
Burkina Faso	1994-2009	1	3	3	2	2	1
Burundi	1992-2006	5	4	4	5	4	4
Cameroon	1996-2007	3	2	1	2	1	2
CAR	1992-2008	4	1	4	4	3	3
Côte d'Ivoire	1993-2008	5	5	5	5	5	5
Egypt	1991-2008	2	4	1	4	5	4
Eswatini	1995-2010	4	1	2	1	1	2
Ethiopia	1995-2011	1	4	2	3	3	2
Gambia, The	1998-2003	4	1	1	1	1	2
Ghana	1992-2006	3	2	2	3	4	5
Guinea	1991-2012	4	1	2	1	1	1
Guinea- Bissau	1993-2002	5	4	3	2	2	1
Kenya	1992-2005	5	5	5	5	5	2
Lesotho	1993-2010	2	4	4	4	4	3
Madagascar	1993-2010	5	5	5	5	5	3
Malawi	1998-2010	3	3	4	4	4	3
Mali	1994-2010	2	1	2	1	1	1
Mauritania	1993-2008	4	4	2	3	3	1
Morocco	1991-2007	3	5	5	5	5	5
Mozambique	1996-2009	1	2	4	4	4	4
Niger	1992-2011	5	3	3	2	2	2
Nigeria	1992-2010	1	5	5	4	4	4
Senegal	1991-2011	4	3	3	2	2	1
South Africa	1993-2011	3	2	1	1	1	5
Tanzania	1992-2012	2	2	4	3	3	5

 TABLE 2A: GROWTH OF POVERTY MEASURES (POVERTY LINE: US\$1.25 A DAY IN 2005 PPP),

 PER CAPITA GDP, INCOME AND INEQUALITY BY QUINTILE

African Review of Economics and Finance Vol 12 (1) 2020

Tunisia	1990-2010	1	3	1	1	2	3
Uganda	1992-2013	1	2	3	3	3	4
Zambia	1993-2010	2	5	5	5	5	5

Notes: The quintile values are obtained using the data provided in Table 1a. For each variable, the lowest quintile (first quintile) represents the best performance while the highest (fifth quintile) indicates the worst performance.

TABLE 2B: GROWTH OF POVERTY MEASURES (POVERTY LINE: US\$2.00 A DAY IN 2005 PPP),PER CAPITA GDP, INCOME AND INEQUALITY BY QUINTILE

Country	Period	Per Capita GDP Growth	Income Growth	Headcount Poverty (P ₀) Growth	Poverty Gap (P ₁) Growth	Squared Pov. Gap (P ₂) Growth	Inequality (Gini) Growth
Botswana	1994-2009	2	1	1	1	2	4
Burundi	1992-2006	5	4	4	4	4	4
Cameroon	1996-2007	3	2	2	1	2	2
CAR	1992-2008	4	1	4	4	4	3
Côte d'Ivoire	1993-2008	5	5	5	5	5	5
Egypt	1991-2008	1	4	1	2	3	3
Gambia, The	1998-2003	3	1	1	1	1	2
Ghana	1992-2006	2	2	1	2	3	5
Guinea	1991-2012	4	1	3	1	1	1
Guinea- Bissau	1993-2002	5	4	4	3	2	1
Kenya	1992-2005	4	5	5	5	5	2
Lesotho	1993-2010	2	3	4	4	4	3
Madagascar	1997-2010	5	5	5	5	5	4
Mali	1994-2010	1	1	3	2	1	1
Mauritania	1993-2008	4	4	2	2	2	1
Morocco	1991-2007	2	5	4	4	5	4
Niger	1992-2011	5	3	3	3	3	2
Nigeria	1992-2010	1	4	5	5	4	3
Senegal	1991-2011	4	3	2	3	2	1
South Africa	1993-2011	3	2	2	2	1	5
Tanzania	1992-2012	2	2	3	4	4	5
Tunisia	1990-2010	1	3	1	1	1	2
Uganda	1996-2013	1	2	2	3	3	5
Zambia	1993-2006	3	5	5	5	5	4

Notes: The quintile values are obtained using the data provided in Table 1b. For each variable, the lowest quintile (first quintile) represents the best performance while the highest (fifth quintile) indicates the worst performance.

3.3. Transformation efficiency vector

Following Fosu (2017a, 2017b), Tables 3a and 3b present in vector form the quintile ranks reported in Tables 2a and 2b, respectively. The vector consists of each country's respective ranks on the (logarithmic) changes in the following variables: per capita GDP, income, the headcount ratio, poverty gap, squared poverty gap, and inequality. Thus, Zambia's vector of (2, 5, 5, 5, 5; 5) means that the country ranks in the second quintile on per capita GDP growth, and belongs to the fifth quintile with respect to income growth, the growth of headcount ratio, poverty gap, squared poverty gap and inequality, respectively. The first two coordinates of the vector show the efficiency in translating per capita GDP into income growth. The second to fourth coordinates exhibit the transformation of income growth into poverty reduction, while the last coordinate following the semi-colon gives an idea of the importance of inequality in transforming growth into poverty reduction. Hence, the vector not only provides valuable information on countries' efficiency in transforming per capita GDP growth into income growth and poverty reduction, but also sheds some light on the role of income distribution in the progress on poverty.

As shown in Tables 3a and 3b, many African countries have been able to translate per capita GDP growth into income growth, with positive implications for poverty reduction over the period (for example, Botswana, Cameroon, Egypt, South Africa, Tunisia, Ghana, Mali and Burkina Faso). Nevertheless, countries such as Nigeria and Mozambique, which have also grown tremendously in terms of per capita GDP, failed to generate a significant increase in income growth, presumably due to the dominance of capital intensive sectors in these economies. In contrast, The Gambia and Eswatini have respective vectors of (4, 1, 1, 1, 1; 2) and (4, 1, 2, 1, 1; 2). These countries, therefore, had relatively weak per capita GDP growth, and yet experienced substantial growth of income, accompanied by considerable declines in inequality, thus leading to fast poverty reduction.

Country	Efficiency Vector	Country	Efficiency Vector
Botswana	(2,1,1,2,2;4)	Madagascar	(5,5,5,5,5;3)
Burkina Faso	(1,3,3,2,2;1)	Malawi	(3,3,4,4,4;3)
Burundi	(5,4,4,5,4;4)	Mali	(2,1,2,1,1;1)
Cameroon	(3,2,1,2,1;2)	Mauritania	(4,4,2,3,3;1)
CAR	(4,1,4,4,3;3)	Morocco	(3,5,5,5,5;5)
Côte d'Ivoire	(5,5,5,5,5;5)	Mozambique	(1,2,4,4,4;4)
Egypt	(2,4,1,4,5;4)	Niger	(5,3,3,2,2;2)
Eswatini	(4,1,2,1,1;2)	Nigeria	(1,5,5,4,4;4)
Ethiopia	(1,4,2,3,3;2)	Senegal	(4,3,3,2,2;1)
Gambia, The	(4,1,1,1,1;2)	South Africa	(3,2,1,1,1;5)
Ghana	(3,2,2,3,4;5)	Tanzania	(2,2,4,3,3;5)
Guinea	(4,1,2,1,1;1)	Tunisia	(1,3,1,1,2;3)
Guinea-Bissau	(5,4,3,2,2;1)	Uganda	(1,2,3,3,3;4)
Kenya	(5,5,5,5,5;2)	Zambia	(2,5,5,5,5;5)
Lesotho	(2,4,4,4,4;3)		

Table 3a: Poverty Transformation Efficiency Vector (poverty line: US\$1.25 a day in 2005 PPP)

Notes: The vectors are based on the quintile values presented in Table 2a.

TABLE 3B: POVERTY	TRANSFORMATION	Efficiency	VECTOR	(POVERTY	LINE:	US\$2.00	A DAY
		IN 2005 PPI	2)				

Country	Efficiency Vector	Country	Efficiency Vector
Botswana	(2,1,1,1,2;4)	Madagascar	(5,5,5,5,5;4)
Burundi	(5,4,4,4,4;4)	Mali	(1,1,3,2,1;1)
Cameroon	(3,2,2,1,2;2)	Mauritania	(4,4,2,2,2;1)
CAR	(4,1,4,4,4;3)	Morocco	(2,5,4,4,5;4)
Côte d'Ivoire	(5,5,5,5,5;5)	Niger	(5,3,3,3,3;2)
Egypt	(1,4,1,2,3;3)	Nigeria	(1,4,5,5,4;3)
Gambia, The	(3,1,1,1,1;2)	Senegal	(4,3,2,3,2;1)
Ghana	(2,2,1,2,3;5)	South Africa	(3,2,2,2,1;5)
Guinea	(4,1,3,1,1;1)	Tanzania	(2,2,3,4,4;5)
Guinea-Bissau	(5,4,4,3,2;1)	Tunisia	(1,3,1,1,1;2)
Kenya	(4,5,5,5,5;2)	Uganda	(1,2,2,3,3;5)
Lesotho	(2,3,4,4,4;3)	Zambia	(3,5,5,5,5;4)

Notes: The vectors are based on the quintile values presented in Table 2b.

The fall in inequality seems to have been the main driver of poverty decline in Mauritania and Guinea-Bissau, with vectors of (4, 4, 2, 3, 3; 1) and (5, 4, 3, 2, 2; 1), respectively. Although growth has been relatively slow in these countries, the impressive reductions in inequality may have led to relatively fast declines in poverty. Inequality also played an important, but negative, role in countries such as Uganda, Tanzania and Ghana, with respective vectors: (1, 2, 3, 3, 3; 4), (2, 2, 4, 3, 3; 5) and (3, 2, 2, 3, 4; 5). Therefore, despite their strong income growth, these countries belong to the median quintile on poverty changes mainly as a result of their poor performance on inequality. The countries would have probably performed better on poverty reduction in the absence of worsening inequality.

With respect to the bottom performers on poverty reduction, Tables 3a and 3b show for Côte d'Ivoire PTEVs of (5, 5, 5, 5, 5; 5) at both US\$1.25 and US\$2.00 poverty standards, implying that the country had poor progress on poverty, explained by a combination of its dismal income growth, likely reflecting the country's poor performance on per capita GDP, as well as its worsening income distribution. The country obtained a vector of (5, 5, 5, 5, 5; 5) at both US\$1.25 and US\$2.00 poverty standards. A similar situation is presented for Morocco and Zambia, although in terms of per capita GDP growth the countries are ranked in the median and second quintiles, respectively. Finally, Kenya and Madagascar both performed poorly on poverty even though the countries rank in the second and middle quintiles on inequality changes, respectively, thanks to their dismal performance on growth.

4. Model, estimation procedure and results

We now provide a quantitative analysis of the importance of growth and inequality for poverty reduction in Africa, as in Fosu (2018), by estimating the 'identity' poverty equation and using the estimates to decompose poverty changes into the contributions by income growth vis-à-vis changes in income distribution. We employ unbalanced panel data obtained from the World Bank's PovcalNet database for a sample of 40 African countries over the period 1985-2013, separately for the three FGT poverty measures, and for both the US\$1.25 and US\$2.00 poverty standards. Similar to Fosu (2018), the estimation was conducted using the fixed effects (FE), random effects (RE) and two-step system GMM (SYS-GMM), with the 'best' estimates used for computing the income and inequality elasticities that are employed for the decomposition of poverty changes over the period.

The estimated identity model is of the form⁴:

$$\hat{p} = \hat{b}_1 + \hat{b}_2 y + \hat{b}_3 y G^I + \hat{b}_4 y (\frac{Z}{Y}) + \hat{b}_5 g + \hat{b}_6 g G^I + \hat{b}_7 g (\frac{Z}{Y}) + \hat{b}_8 G^I + \hat{b}_9 \frac{Z}{Y}$$
(1)

Where \hat{p} is the estimated logarithmic change (growth) in poverty, y is income growth, G^{I} is the logarithm of the initial Gini index, $\frac{z}{y}$ is the logarithmic ratio of the poverty line to mean income, g is the logarithmic change in inequality, measured by the Gini coefficient; and \hat{b}_{j} , j = 1, 2, ..., 9) are the estimated coefficients.

Consistent with theory, \hat{b}_2 is anticipated to be significantly negative, depicting the negative relationship between income growth and poverty, while \hat{b}_3 is expected to be significantly positive, meaning that an initially high inequality dampens the effect of income growth on poverty reduction; \hat{b}_4 is also expected to be significantly positive, suggesting that the higher the mean income, the larger the effect of income growth on poverty reduction. Furthermore, \hat{b}_5 is anticipated to be significantly positive, indicating the deteriorating effect of rising inequality on poverty reduction, and \hat{b}_6 is anticipated to be significantly negative, depicting the attenuating effect of increasing inequality on poverty. The coefficient \hat{b}_7 is also likely to be significantly negative, suggesting that an improvement of income distribution in low-income countries may have a limited poverty-reducing effect and even in some cases increase poverty. Finally, \hat{b}_8 and \hat{b}_9 are expected to be significantly positive, implying a greater poverty reduction at lower levels of initial inequality and at higher levels of mean income (lower $\frac{z}{y}$), respectively.

From Equation (1), the income and inequality elasticities can be estimated as:

$$\hat{E}_{y} = \hat{b}_{2} + \hat{b}_{3}G^{I} + \hat{b}_{4}(Z/Y)$$
(2)

$$\hat{E}_g = \hat{b}_5 + \hat{b}_6 G^I + \hat{b}_7 (Z/Y) \tag{3}$$

As observed in Equations 2 and 3, both elasticities depend on the country's initial inequality and the ratio of the poverty line to the mean income. Hence, it is expected that the higher the initial inequality (Gini) and/or the lower the mean income (relative to the poverty line), the weaker the poverty-reducing effect of income growth and improvement in income distribution. Furthermore, given the expected signs of \hat{b}_2 , \hat{b}_3 , \hat{b}_4 , \hat{b}_5 , \hat{b}_6 and \hat{b}_7 discussed above, \hat{E}_y and \hat{E}_g should generally be negative and positive, respectively. Nevertheless, in an empirical investigation, a perverse sign could be obtained for both elasticities, especially when initial inequality and/or the ratio of the poverty line to the mean income are very high (see Fosu (2017a) for more details).

⁴ See Fosu (2018) for more details.

Using the elasticities, \hat{E}_{y} and \hat{E}_{g} , the changes in poverty can be predicted as follows:

$$\hat{p} = y\hat{E}_y + g\hat{E}_g + r \tag{4}$$

Where y and g are the growth rates of income and inequality, respectively, and r is a residual, which is smaller as the prediction is more accurate. Hence, using the two selection criteria proposed by Fosu (2018), namely, the root mean squared (RMSE) and mean absolute error (MAE), the estimation procedure with the 'best' predictive power is identified as the one with the minimum RMSE and MAE. The results for both criteria are provided in Tables 4 and 5 for the US\$1.25 and US\$2.00 poverty lines, respectively.

Focusing on the US\$1.25 poverty standard, FE turns out as the best method in predicting in-sample changes in poverty incidence and spread, given the above selection criterion. With respect to the squared poverty gap, however, the RMSE criterion suggests that RE is the most preferred predictively, while MAE identifies FE as the most preferred, suggesting that both techniques are equally qualified in predicting the squared poverty gap. Furthermore, for the US\$2.00 poverty line, RE is identified as the best choice for prediction purposes for the headcount ratio, while the FE is best for the poverty gap and squared poverty gap. Interestingly, for both poverty standards and all the three FGT poverty measures, SYS-GMM is never best (predictively), in spite of its generally acclaimed superiority to FE and RE in accounting for possible endogeneity (Fosu, 2018).

	Headcount Ratio (P ₀)		Poverty	Gap (P ₁)	Squared Poverty Gap (P ₂)		
	RMSE	MAE	RMSE	MAE	RMSE	MAE	
Fixed Effects	1.68	1.38	3.98	3.07	7.22	5.28	
Random Effects	2.31	1.73	4.19	3.41	7.00	5.56	
Two-step System GMM	5.08	4.25	10.84	9.21	17.21	14.56	

TABLE 4: ROOT MEAN SQUARE ERROR (RMSE) AND MEAN ABSOLUTE ERROR (MAE) (POVERTY LINE: US\$1.25 A DAY IN 2005 PPP)

Notes: RMSE and MAE are computed based on Equation 4 of the text, using the observed and predicted values of the poverty growth rate for all sample countries.

	Headcount Ratio (P ₀)		Poverty	Gap (P ₁)	Squared Poverty Gap (P ₂)		
	RMSE	MAE	RMSE	MAE	RMSE	MAE	
Fixed Effects	2.86	2.06	1.18	0.94	1.57	1.22	
Random Effects	1.89	1.35	1.43	1.14	1.66	1.31	
Two-step System GMM	2.01	1.46	3.11	2.39	5.07	4.06	

TABLE 5: ROOT MEAN SQUARE ERROR (RMSE) AND MEAN ABSOLUTE ERROR (MAE) (POVERTY LINE: US\$2.00 a day in 2005 PPP)

Notes: See Table 4.

4.1. Income and inequality elasticities

Appendix Tables A1 to A5 present the estimates of the income and inequality elasticities with respect to poverty obtained from Equations 2 and 3. The estimates are reported for the headcount ratio, poverty gap and squared poverty gap at the US\$1.25 and US\$2.00 poverty standards. Overall, most elasticity estimates have the expected signs under FE and RE procedures, and appreciably more than under SYS-GMM. Moreover, compared with the estimates at the US\$1.25 poverty standard, most of the estimated income and inequality elasticities at the US\$2.00 poverty line have the theoretically expected signs and tend to be smaller in absolute terms. This finding suggests that at higher standards of poverty, greater efforts on growth and inequality reduction are required to alleviate poverty (Fosu, 2018). Additionally, both the income elasticity (absolute value) and inequality elasticity tend to be higher for the squared poverty gap compared with the poverty gap, and for the poverty gap compared with the headcount ratio, suggesting that the spread and severity of poverty tend to be more sensitive to income growth and changes in income distribution on the continent than does the incidence of poverty.

Figures 1 and 2 show the cross-country distributions of the income elasticity (absolute value) and inequality elasticity as respective functions of the initial inequality. 'Africa' in the figures corresponds to the average Africa line, which is evaluated at the sample means as respective functions of the initial inequality, GI. Hence, countries that lie above the Africa line (Egypt, Morocco, Tunisia, Botswana, South Africa, Côte d'Ivoire, Mauritania, Cameroon and Kenya) have higher levels of income relative to the Africa average. In contrast, the majority

of the countries have incomes below the Africa mean, with CAR exhibiting the least income.

FIGURE 1: INCOME ELASTICITY (ABSOLUTE VALUED) VS INITIAL INEQUALITY, BASED ON THE OPTIMALLY SELECTED FE RESULTS (US\$1.25 A DAY IN 2005 PPP, HEADCOUNT RATIO)



Figure 2: Inequality Elasticity vs Initial Inequality, based on the optimally selected FE results (US\$1.25 a day in 2005 PPP, headcount ratio)



Figures 1 and 2 reveal an inverse relationship between income and inequality elasticities versus initial inequality, suggesting that poverty is less responsive to income growth and redistributive policies in countries with high levels of inequality. Hence, dealing with inequality would be crucial for greater progress on poverty, especially in highly unequal countries. Furthermore, the findings suggest that the lower a country's level of income, the smaller the effects of growth and changes in inequality on poverty reduction are. For instance, even though Mozambique and Uganda have similar levels of initial inequality and about the same performance with respect to income growth and inequality reduction – 3.37% and 0.21% for Mozambique and 3.23% and 0.22% for Uganda (see Table 1a), – Uganda was able to achieve faster poverty reduction than Tanzania, presumably as a result of Uganda's higher income. Indeed, as shown in Figures 1 and 2, both income and inequality elasticities with respect to poverty are lower in Mozambique compared to Uganda. Thus, policies to tackle poverty would tend to be less effective in poorer countries (Ravallion, 2012; Fosu, 2017a, 2017b).

4.2. Contribution of growth and inequality changes to poverty reduction in *African countries*

To evaluate the relative role of income growth and inequality changes in the poverty performance of African countries from the early-mid-1990s to the present, the period of Africa's growth resurgence, changes in poverty are decomposed. The results are reported in Tables 6 to 8 for the three measures of poverty for the US\$1.25 line.

Countries experiencing poverty reduction							
				Α	В	A+B	
Country	Period	Sub-Region	Headcount Poverty (P ₀) Growth	Ey*dlnY	Eg*dlnG	Predicted Headcount Poverty (P ₀) Growth	
Botswana	1994-2009	SA	-5.51	-7.02	-0.33	-7.34	
Burkina Faso	1994-2009	WA	-3.14	-1.84	-1.02	-2.86	
Burundi	1992-2006	CA	-0.25	-1.00	0.01	-0.99	
Cameroon	1996-2007	CA	-4.92	-4.03	-2.62	-6.65	
CAR	1992-2008	CA	-1.80	-0.89	0.60	-0.28	
Egypt	1991-2008	NA	-5.50	-1.90	-1.38	-3.28	
Eswatini	1995-2010	SA	-4.62	-4.25	-1.54	-5.79	
Ethiopia	1995-2011	EA	-3.49	-2.25	-1.69	-3.94	
Gambia, The	1998-2003	WA	-13.37	-15.05	-2.22	-17.26	
Ghana	1992-2006	WA	-4.14	-6.78	2.28	-4.51	
Guinea	1991-2012	WA	-3.95	-5.97	-0.58	-6.55	
Guinea-Bissau	1993-2002	WA	-3.22	-1.31	-5.59	-6.9	
Lesotho	1993-2010	SA	-1.03	-0.94	-0.36	-1.3	

Table 6: Decomposition of Poverty Growth into the Contributions of Inequality and Income Growth based on the optimally selected FE results (US\$1.25 a day in 2005 PPP, headcount ratio), Early-mid-1990s – Present

	D (·	1 .1	1 . 1., ., 19
Fosu and Gafa:	Progress on poverty	' in Africa: How	, have growth and	<i>inequality</i> mattered?

Malawi	1998-2010	SA	-1.12	-0.93	0.75	-0.18
Mali	1994-2010	WA	-3.31	-2.85	0.66	-2.19
Mauritania	1993-2008	NA	-4.02	-1.94	-4.81	-6.75
Mozambique	1996-2009	SA	-2.28	-3.10	-0.03	-3.12
Niger	1992-2011	WA	-3.05	-3.49	-1.21	-4.69
Senegal	1991-2011	WA	-3.29	-1.79	-1.78	-3.58
South Africa	1993-2011	SA	-5.36	-6.95	3.76	-3.18
Tanzania	1992-2012	EA	-2.53	-4.14	0.55	-3.59
Tunisia	1990-2010	NA	-10.14	-5.05	-4.23	-9.27
Uganda	1992-2013	EA	-3.14	-3.94	0.28	-3.66
Mean			-4.05	-3.8	-0.89	-4.69

Countries experiencing poverty increases							
				Α	В	A+B	
Country	Period	Sub-Region	Headcount Poverty (P ₀) Growth	Ey*dlnY	Eg*dlnG	Predicted Headcount Poverty (P ₀) Growth	
Côte d'Ivoire	1993-2008	WA	1.87	1.22	2.75	3.97	
Kenya	1992-2005	EA	0.90	2.73	-3.49	-0.76	
Madagascar	1993-2010	EA	1.58	2.04	0.90	2.94	
Morocco	1991-2007	NA	0.29	-0.49	1.68	1.19	
Nigeria	1992-2010	WA	0.01	-0.35	-0.23	-0.58	
Zambia	1993-2010	NA	0.76	0.31	0.04	0.35	
Mean	1995-2010	SA	0.9	0.91	0.27	1.18	

Notes: A: Predicted poverty growth by income growth, B: predicted poverty growth by changes in inequality; A+B: predicted poverty growth due to both income growth and changes in inequality.

African Review of Economics and Finance Vol 12 (1) 2020

Table 7: Decomposition of Poverty Growth into the Contributions of Inequality and Income Growth based on the optimally selected FE results (US1.25 a day in 2005 PPP, poverty Gap), Early-mid-1990s – present

Countries experiencing poverty reduction							
				Α	В	A+B	
Country	Period	Sub-Region	Pov. Gap (P ₁) Growth	Ey*dlnY	Eg*dlnG	Predicted Pov. Gap (P ₁) Growth	
Botswana	1994-2009	SA	-6.70	-9.36	-0.68	-10.03	
Burkina Faso	1994-2009	WA	-5.78	-2.44	-1.59	-4.03	
Burundi	1992-2006	CA	-0.71	-1.71	0.00	-1.71	
Cameroon	1996-2007	CA	-7.13	-5.86	-5.76	-11.62	
CAR	1992-2008	CA	-3.90	0.09	1.92	2.01	
Egypt	1991-2008	NA	-2.72	-2.99	-3.28	-6.28	
Eswatini	1995-2010	SA	-7.62	-4.37	-2.19	-6.56	
Ethiopia	1995-2011	EA	-5.09	-3.47	-4.21	-7.68	
Gambia, The	1998-2003	WA	-21.24	-20.37	-4.38	-24.76	
Ghana	1992-2006	WA	-4.42	-10.78	5.70	-5.09	
Guinea	1991-2012	WA	-7.80	-8.51	-1.08	-9.59	
Guinea-Bissau	1993-2002	WA	-6.23	-1.83	-11.55	-13.37	
Lesotho	1993-2010	SA	-1.75	-1.09	-0.49	-1.57	
Malawi	1998-2010	SA	-2.34	-1.20	1.88	0.67	
Mali	1994-2010	WA	-7.32	-3.72	2.47	-1.25	
Mauritania	1993-2008	NA	-5.03	-2.84	-10.62	-13.46	
Mozambique	1996-2009	SA	-3.75	-4.61	-0.04	-4.65	
Niger	1992-2011	WA	-5.51	-5.61	-3.28	-8.88	
Nigeria	1992-2010	WA	-0.71	-0.56	-0.66	-1.21	
Senegal	1991-2011	WA	-5.64	-2.22	-2.93	-5.16	
South Africa	1993-2011	SA	-9.96	-8.91	7.69	-1.23	
Tanzania	1992-2012	EA	-4.08	-6.83	1.80	-5.03	
Tunisia	1990-2010	NA	-9.43	-7.34	-9.30	-16.63	
Uganda	1992-2013	EA	-4.77	-5.77	0.62	-5.15	
Mean			-5.82	-5.10	-1.67	-6.76	

countries experiencing powers, increases							
				Α	В	A+B	
Country	Period	Sub-Region	Pov. Gap (P ₁) Growth	Ey*dlnY	Eg*dlnG	Predicted Pov. Gap (P ₁) Growth	
Côte d'Ivoire	1993-2008	WA	2.93	1.75	5.98	7.73	
Kenya	1992-2005	EA	0.72	3.28	-6.40	-3.13	
Madagascar	1993-2010	EA	2.72	2.96	2.00	4.96	
Morocco	1991-2007	NA	2.74	-0.73	3.79	3.06	
Zambia	1993-2010	SA	0.95	0.38	-0.20	0.18	
Mean			2.01	1.53	1.03	2.56	

Countries experiencing poverty increases

Notes: See Table 6.

 Table 8: Decomposition of Poverty Growth into the Contributions of Inequality

 and Income Growth based on the optimally selected FE results (US\$1.25 a day in 2005 PPP, squared poverty gap), Early-mid-1990s – present

Countries expe	Countries experiencing poverty reduction							
				Α	В	A+B		
Country	Period	Sub-Region	Squared Pov. Gap (P ₁) Growth	Ey*dlnY	Eg*dlnG	Predicted Pov. Gap (P ₁) Growth		
Botswana	1994-2009	SA	-6.73	-11.06	-1.06	-12.12		
Burkina Faso	1994-2009	WA	-7.64	-2.72	-1.81	-4.54		
Burundi	1992-2006	CA	-1.26	-2.30	-0.01	-2.31		
Cameroon	1996-2007	CA	-8.99	-7.27	-9.10	-16.37		
CAR	1992-2008	CA	-5.37	1.73	3.56	5.29		
Eswatini	1995-2010	SA	-10.01	-3.67	-2.61	-6.28		
Ethiopia	1995-2011	EA	-6.23	-4.46	-6.83	-11.29		
Gambia, The	1998-2003	WA	-27.57	-23.57	-6.50	-30.07		
Ghana	1992-2006	WA	-4.27	-14.14	9.41	-4.73		
Guinea	1991-2012	WA	-10.56	-10.10	-1.30	-11.40		
Guinea-Bissau	1993-2002	WA	-8.43	-2.18	-17.47	-19.65		
Lesotho	1993-2010	SA	-2.14	-1.06	-0.51	-1.58		
Malawi	1998-2010	SA	-3.17	-1.20	3.31	2.11		
Mali	1994-2010	WA	-10.40	-3.97	5.15	1.18		
Mauritania	1993-2008	NA	-5.71	-3.55	-16.86	-20.41		
Mozambique	1996-2009	SA	-4.59	-5.62	-0.10	-5.72		
Niger	1992-2011	WA	-7.44	-7.34	-5.48	-12.82		
Nigeria	1992-2010	WA	-1.40	-0.72	-1.08	-1.81		
Senegal	1991-2011	WA	-7.55	-2.35	-3.83	-6.18		

South Africa	1993-2011	SA	-14.34	-10.32	11.93	1.62
Tanzania	1992-2012	EA	-5.47	-9.10	3.13	-5.98
Tunisia	1990-2010	NA	-8.27	-9.25	-14.86	-24.11
Uganda	1992-2013	EA	-6.20	-7.13	0.96	-6.17
Mean			-7.55	-6.15	-2.26	-8.41

African Review of Economics and Finance Vol 12 (1) 2020

Countries experiencing poverty increases							
				Α	В	A+B	
Country	Period	Sub-Region	Squared Pov. Gap (P ₂) Growth	Ey*dlnY	Eg*dlnG	Predicted Squared Pov. Gap (P ₂) Growth	
Côte d'Ivoire	1993-2008	WA	3.93	2.17	9.46	11.63	
Egypt	1991-2008	NA	0.71	-3.96	-5.39	-9.35	
Kenya	1992-2005	EA	0.54	3.43	-9.27	-5.84	
Madagascar	1993-2010	EA	3.29	3.44	3.39	6.83	
Morocco	1991-2007	NA	5.42	-0.93	6.11	5.18	
Zambia	1993-2010	SA	0.89	0.39	-0.60	-0.20	
Mean			2.46	0.76	0.62	1.37	

Notes: See Table 6.

As the results in these tables clearly show, growth has been critical for poverty reduction in Africa. The decomposition indicates, on average, a much greater relative contribution of income growth to poverty changes compared to inequality, although the contributions of growth and inequality have been largely complementary. For instance, the decomposition of changes in the headcount ratio at the US\$1.25 poverty line (Table 6) shows that out of the twenty-three African countries that experienced poverty reduction, twenty-one have reduced poverty owing primarily to their positive performance on income growth. However, in the two remaining countries, Mauritania and Guinea-Bissau, the fall in poverty was driven mainly by decreases in inequality. Overall, these results are consistent across poverty measures (see Tables 7 and 8).

As suggested earlier by the qualitative analysis, among the top performers on poverty progress, Botswana, Ethiopia, The Gambia, Cameroon, Tunisia and Eswatini have achieved considerable poverty reduction on all the three FGT measures, as a result of the joint contribution of increases in income and decreases in inequality. Meanwhile, in countries like Ghana and South Africa, greater progress could have been achieved if inequality had not increased. Similarly, in the case of poverty increases, the results based on the quantitative analysis complement those of the qualitative investigation. In Côte d'Ivoire, Madagascar and Zambia, for example, the increases in poverty can be attributed to the complementary effects of declines in income and increases in inequality over the period. In Kenya, however, the rise in poverty is solely driven by the reduction in income,⁵ while in Morocco, a rise in inequality has been the main determinant of rising poverty.

The dominant role of growth in the progress of African countries on poverty from the early-mid-1990s to the 2000s is also confirmed for the US\$2.00 poverty line. Considering the headcount ratio (Table 9), growth provides by far the main explanation for the poverty progress. Indeed, not only is growth on average eight times stronger than inequality changes in contributing to poverty reduction, but it actually dominates in each of the 19 countries. Furthermore, growth accounts for the lion's share of five of the sample African countries who experienced increases in poverty. These findings also hold for the poverty gap and squared poverty gap. Yet, the particular growth generally prevalent in Africa has contributed to socio-ecological costs, as systematic and ethnographic research in the oil industry in Africa shows (Adu, 2009; Obeng-Odoom, 2014, 2019). Indeed, the role of inequality cannot be overlooked, since in most of the countries it played complementary roles with income growth in determining the rate of poverty reduction; in some cases, it actually served to moderate poverty increases resulting from falling incomes.

Countries experiencing poverty reduction							
				Α	В	A+B	
Country	Period	Sub-Region	Headcount Poverty (P ₀) Growth	Ey*dlnY	Eg*dlnG	Predicted Headcount Poverty (P ₀) Growth	
Botswana	1994-2009	SA	-3.86	-5.12	-0.09	-5.21	
Burundi	1992-2006	CA	-0.13	-0.57	0.01	-0.57	
Cameroon	1996-2007	CA	-2.75	-2.88	-0.61	-3.49	
CAR	1992-2008	CA	-0.84	-2.10	-0.05	-2.16	

 Table 9: Decomposition of Poverty Growth into the Contributions of Inequality

 and Income Growth based on the optimally selected RE results (US\$2.00 a day in

 2005 PPP, headcount ratio), Early-mid-1990s – present

⁵Note that in Tables 1A and 1B, Kenya's annualized income growth was -2.6 percent, while its inequality fell by an annualized rate of 1.4 percent.

Egypt	1991-2008	NA	-3.40	-1.17	-0.24	-1.40
Gambia, The	1998-2003	WA	-7.61	-12.12	-0.68	-12.80
Ghana	1992-2006	WA	-2.93	-4.39	0.32	-4.07
Guinea	1991-2012	WA	-1.52	-5.91	-0.74	-6.64
Guinea-Bissau	1993-2002	WA	-0.95	-0.86	-0.46	-1.33
Lesotho	1993-2010	SA	-0.49	-0.91	-0.19	-1.10
Mali	1994-2010	WA	-1.13	-2.73	-0.21	-2.94
Mauritania	1993-2008	NA	-2.47	-1.37	-1.09	-2.46
Morocco	1991-2007	NA	-0.70	-0.31	0.35	0.04
Niger	1992-2011	WA	-0.98	-2.32	-0.10	-2.42
Senegal	1991-2011	WA	-1.54	-1.65	-0.74	-2.38
South Africa	1993-2011	SA	-2.59	-5.16	1.03	-4.13
Tanzania	1992-2012	EA	-1.14	-2.69	-0.04	-2.73
Tunisia	1990-2010	NA	-7.21	-3.34	-0.96	-4.30
Uganda	1996-2013	EA	-1.90	-3.12	0.32	-2.80
Mean			-2.32	-3.09	-0.22	-3.31

African Review of Economics and Finance Vol 12 (1) 2020

Countries experiencing poverty increases

				Α	В	A+B
Country	Period	Sub-Region	Headcount Poverty (P ₀) Growth	Ey*dlnY	Eg*dlnG	Predicted Headcount Poverty (P ₀) Growth
Côte d'Ivoire	1993-2008	WA	1.03	0.85	0.65	1.51
Kenya	1992-2005	EA	0.94	2.39	-1.20	1.20
Madagascar	1997-2010	EA	0.50	1.61	-0.07	1.55
Nigeria	1992-2010	WA	0.13	-0.25	-0.01	-0.26
Zambia	1993-2006	SA	0.17	-0.04	0.06	0.02
Mean			0.55	0.91	-0.11	0.80

Notes: See Table 6.

_

TABLE 10: DECOMPOSITION OF POVERTY GROWTH INTO THE CONTRIBUTIONS OFINEQUALITY AND INCOME GROWTH BASED ON THE OPTIMALLY SELECTED FE RESULTS(US\$2.00 a day in 2005 PPP, poverty GAP), Early-mid-1990s – present

	81	<i>v</i>				
				Α	В	A+B
Country	Period	Sub-Region	Poverty Gap (P ₁) Growth	Ey*dlnY	Eg*dlnG	Predicted Pov. Gap (P ₁) Growth
Botswana	1994-2009	SA	-5.12	-5.72	-0.19	-5.91
Burundi	1992-2006	CA	-0.41	-0.89	0.01	-0.89
Cameroon	1996-2007	CA	-4.57	-3.61	-1.53	-5.14
CAR	1992-2008	CA	-2.51	-1.54	-0.15	-1.70
Egypt	1991-2008	NA	-4.28	-1.65	-0.62	-2.27
Gambia, The	1998-2003	WA	-14.17	-14.12	-1.68	-15.80
Ghana	1992-2006	WA	-3.83	-6.25	1.06	-5.19
Guinea	1991-2012	WA	-4.61	-6.16	-0.90	-7.06
Guinea-Bissau	1993-2002	WA	-3.34	-1.24	-4.10	-5.34
Lesotho	1993-2010	SA	-1.19	-0.94	-0.44	-1.38
Mali	1994-2010	WA	-4.09	-3.14	-1.01	-4.15
Mauritania	1993-2008	NA	-3.68	-1.73	-2.74	-4.47
Morocco	1991-2007	NA	-0.42	-0.41	0.84	0.44
Niger	1992-2011	WA	-2.89	-3.36	-0.57	-3.92
Nigeria	1992-2010	WA	-0.23	-0.35	-0.13	-0.49
Senegal	1991-2011	WA	-3.47	-1.75	-1.77	-3.52
South Africa	1993-2011	SA	-4.54	-5.47	2.22	-3.25
Tanzania	1992-2012	EA	-2.47	-4.06	0.20	-3.86
Tunisia	1990-2010	NA	-8.58	-4.16	-2.21	-6.37
Uganda	1996-2013	EA	-3.01	-4.00	1.04	-2.96
Mean			-3.87	-3.53	-0.63	-4.16

Countries experiencing poverty reduction

Countries experiencing poverty increases

				Α	В	A+B
Country	Period	Sub-Region	Poverty Gap (P ₁) Growth	Ey*dlnY	Eg*dlnG	Predicted Pov. Gap (P ₁) Growth
Côte d'Ivoire	1993-2008	WA	1.82	1.05	1.55	2.61
Kenya	1992-2005	EA	0.88	2.44	-2.69	-0.24
Madagascar	1997-2010	EA	1.82	2.07	-0.06	2.01
Zambia	1993-2006	SA	0.28	-0.05	0.17	0.13
Mean			1.20	1.38	-0.26	1.12

African Review of Economics and Finance Vol 12 (1) 2020

TABLE 11: DECOMPOSITION OF POVERTY GROWTH INTO THE CONTRIBUTIONS OF INEQUALITY AND INCOME GROWTH BASED ON THE OPTIMALLY SELECTED FE RESULTS (US\$2.00 A DAY IN 2005 PPP, SQUARED POVERTY GAP), EARLY-MID-1990S – PRESENT

Countries experiencing poverty reduction							
				Α	В	A+B	
Country	Period	Sub-Region	Squared Pov. Gap (P ₂) Growth	Ey*dlnY	Eg*dlnG	Predicted Sqared Pov. Gap (P ₂) Growth	
Botswana	1994-2009	SA	-5.92	-6.68	-0.30	-6.98	
Burundi	1992-2006	CA	-0.68	-1.26	0.01	-1.25	
Cameroon	1996-2007	CA	-5.86	-4.59	-2.48	-7.07	
CAR	1992-2008	CA	-3.69	-1.08	0.10	-0.97	
Egypt	1991-2008	NA	-3.80	-2.23	-1.15	-3.38	
Gambia, The	1998-2003	WA	-18.90	-17.04	-2.45	-19.49	
Ghana	1992-2006	WA	-4.21	-8.53	2.01	-6.53	
Guinea	1991-2012	WA	-6.85	-7.68	-1.18	-8.86	
Guinea-Bissau	1993-2002	WA	-5.15	-1.53	-6.15	-7.68	
Lesotho	1993-2010	SA	-1.61	-1.01	-0.55	-1.56	
Mali	1994-2010	WA	-6.31	-3.72	-0.85	-4.57	
Mauritania	1993-2008	NA	-4.45	-2.21	-4.50	-6.71	
Niger	1992-2011	WA	-4.32	-4.59	-1.14	-5.73	
Nigeria	1992-2010	WA	-0.62	-0.47	-0.26	-0.73	
Senegal	1991-2011	WA	-4.89	-2.00	-2.35	-4.34	
South Africa	1993-2011	SA	-6.34	-6.18	3.45	-2.73	
Tanzania	1992-2012	EA	-3.42	-5.69	0.52	-5.17	
Tunisia	1990-2010	NA	-9.09	-5.27	-3.69	-8.95	
Uganda	1996-2013	EA	-3.74	-5.16	1.62	-3.54	
Mean			-5.25	-4.57	-1.02	-5.59	

Countries experiencing poverty reduction

countries experiencing poverty increases							
				Α	В	A+B	
Country	Period	Sub-Region	Squared Pov. Gap (P ₁) Growth	Ey*dlnY	Eg*dlnG	Predicted Squared Pov. Gap (P ₁) Growth	
Côte d'Ivoire	1993-2008	WA	2.46	1.33	2.52	3.85	
Kenya	1992-2005	EA	0.72	2.68	-3.77	-1.09	
Madagascar	1997-2010	EA	2.64	2.63	-0.16	2.48	
Morocco	1991-2007	NA	0.40	-0.53	1.45	0.92	
Zambia	1993-2006	SA	0.24	-0.05	0.18	0.13	
Mean			1.29	1.21	0.04	1.25	

Countries experiencing poverty increases

Notes: See Table 6.

5. Conclusion

The recent interest in inequality is welcome. However, according to the present paper, this flurry of interest in inequality should amply include investigating the growth-poverty-inequality nexus. Clearly, as this paper shows, Africa's progress on poverty reduction has been appreciable since the early-mid-1990s, consistent with the continent's growth resurgence. This more recent positive progress, however, is in contrast with the continent's performance during the 1980s, when economic growth was sluggish and poverty rose. Despite its recent achievement, Africa, that is, SSA, still lags behind other regions with respect to the reduction of the incidence, spread and severity of poverty. However, there are considerable differences across African countries, with several countries like Botswana, The Gambia and Tunisia registering very fast poverty reduction, while others like Côte d'Ivoire, Kenya, Madagascar, and Zambia actually experienced poverty increases.

Similar to Fosu (2015, 2017b), the present paper finds that the decline in poverty in Africa, as is the case globally (Dollar and Kraay, 2002; Dollar *et al.*, 2016; Fosu, 2017a), has been growth-driven. However, this average story hides major country-specific experiences. While income growth was the main contributor to poverty reduction in most African countries, there are cases where the contribution of inequality dominated. Consequently, although economic growth should remain a policy priority on the continent, greater poverty reduction in Africa also lies in the ability of the state to implement an optimal combination of growth and redistributive policies. This policy orientation is even

more crucial given that income growth and improvement in income distribution have often played complementary roles in the fight against poverty.

The present study further reveals that the level of income (relative to the poverty line) as well as the initial level of inequality substantially explain the differences in the income and inequality elasticities with respect to poverty among African countries. Specifically, the extent of the transformation of income growth and changes in income distribution into poverty reduction is weaker in lower-income countries, and in countries with higher levels of inequality. Hence, achieving the twin goal of boosting income levels while improving distribution could further raise the rate of poverty transformation, which should facilitate the process of poverty alleviation over time. Indeed, the process can be bolstered by virtuous-cycle promoting policies such as endowing the poor with the requisite capital, while providing social protection (Thorbecke, 2013) within certain 'limits to growth' (Meadows *et al.*, 1972).

The analysis based on the poverty transformation efficiency vector (PTEV), adapted from Fosu (2017a, 2017b), suggests that per capita GDP growth does not necessarily translate into an increase in the income of poor households. And while in many African countries the poor seem to have benefited from economic growth, in other countries such as Nigeria and Mozambique, this trickle-down effect has been limited. Effective policies are, therefore, required to tackle both institutional and structural challenges (Bigsten and Shimeles, 2004; Fosu and O'Connell, 2006; Asongu and le Roux, 2019). Appropriate reforms and adequate investment in basic infrastructures to improve the business environment and remove existing bottlenecks to productivity growth and investment, and promote structural transformation would be crucial if Africa is to reduce the gap and catch up with other regions in the coming years.

Finally, and perhaps anticlimactically, in line with the findings of Fosu (2018), the paper finds that FE and RE, but especially FE, seem to be predictively superior to SYS-GMM. This finding is, of course, based on a relatively small sample, while the present problem of analysis may be a special case. The point is that one need not, as is common practice, jump to SYS-GMM as the most preferred panel estimating methodology, that is, at the expense of the 'old' methods, particularly in the case of prediction.

Biographical notes

Augustin Kwasi Fosu is Professor, Institute of Statistical, Social and Economic Research (ISSER), University of Ghana, Legon, Ghana; Extraordinary Professor, Faculty of Economic and Management Sciences (FEMS), University of Pretoria, Pretoria, South Africa; and Research Associate, Centre for the Study of African Economies (CSAE), University of Oxford, Oxford, UK.

Dede Woade Gafa obtained her bachelor's degree in economics from University of Lomé in Togo, and her Master of Philosophy (MPhil) degree in economics from the University of Ghana, Legon, Ghana. She is currently a PhD candidate in the UNU-WIDER/University of Ghana collaborative PhD programme in Development Economics.

Acknowledgements

The paper is derived from the first author's keynote presentation at the August 2018 AREF conference, Wits University. The authors appreciate helpful comments from two anonymous referees and the editor, Franklin Obeng-Odoom, as well as grant support from the National Research Fund (NRF), South Africa.

References

- Adams Jr, R. H. (2004). Economic growth, inequality and poverty: Estimating the growth elasticity of poverty. *World Development*, vol. 32, no. 12, pp. 1989–2014.
- Adu, G. (2009). On the theory of optimal depletion of an exhaustible resource: the case of oil in Ghana. *African Review of Economics and Finance*, vol. 1, no. 1, pp. 40-50.
- Alesina, A. and Rodrik, D. (1994). Distributive politics and economic growth. *The Quarterly Journal of Economics*, 109(2):465–490.
- Asongu, S. A. and le Roux, S. (2019). Understanding Sub-Saharan Africa's extreme poverty tragedy. *International Journal of Public Administration*, vol. 42, no. 6, pp. 457-467.
- Bigsten, A. and Shimeles, A. (2004). Prospects for 'pro-poor' growth in Africa. WIDER Research Paper 2004/042. Helsinki: UNU-WIDER.
- Birdsall, N. and Londono, J. L. (1997). Asset inequality matters: An assessment of the World Bank's approach to poverty reduction. *American Economic Review*, vol. 87, no. 2, pp. 32–37.

- Bourguignon, F. (2003). The growth elasticity of poverty reduction: Explaining heterogeneity across countries and time periods, in Eicher, T. S., and Turnovsky, S. J. (eds). *Inequality and growth: Theory and policy implications* (Vol. 1). MIT Press.
- Dabla-Norris, E., Kochhar, K., Ricka, F., Suphaphiphat, N., and Tsounta, E. (2015). Causes and consequences of income inequality: A global perspective. IMF Discussion Note, DN/15/13.
- Deininger, K. and Squire, L. (1998). New ways of looking at old issues: Inequality and growth. *Journal of Development Economics*, vol. 57, no. 2, pp. 259–287.
- Dollar, D., Kleineberg, T., and Kraay, A. (2016). Growth still is good for the poor. *European Economic Review*, vol. 81, 68–85.
- Dollar, D. and Kraay, A. (2002). Growth is good for the poor. *Journal of Economic Growth*, vol.3, pp. 195–225.
- Easterly, W. (2000). The effect of IMF and World Bank programs on poverty. Washington, DC: World Bank, mimeo.
- Ferreira, F. H. and Ravallion, M. (2008). Global poverty and inequality: A review of the evidence. World Bank Policy Research Working Paper Series, World Bank: Washington D.C.
- Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American Economic Review*, pp. 869–887.
- Fosu, A. K. (2008). Inequality and the growth-poverty nexus: Specification empirics using African data. *Applied Economics Letters*, vol. 15, no. 7–9, pp. 563–566.
- Fosu, A. K. (2009). Inequality and the impact of growth on poverty: Comparative evidence for Sub-Saharan Africa. *Journal of Development Studies*, vol. 45, no. 5, pp. 726–745.
- Fosu, A. K. (2010a). Does inequality constrain poverty reduction programs? Evidence from Africa. *Journal of Policy Modeling*, vol. 32, no. 6, pp. 818–827.
- Fosu A. K. (2010b). The effect of income distribution on the ability of growth to reduce poverty: Evidence from rural and urban African economies. *American Journal of Economics and Sociology*, vol. 69, no. 3, pp. 1034–53.
- Fosu, A. K. (2010c). Inequality, income, and poverty: Comparative global evidence. *Social Science Quarterly*, vol. 91, no. 5, pp. 1432–1446.

- Fosu, A. K. (2015). Growth, inequality and poverty in Sub-Saharan Africa: Recent progress in a global context. *Oxford Development Studies*, vol. 43, no. 1, pp. 44–59.
- Fosu, A. K. (2017a). Growth, inequality, and poverty reduction in developing countries: Recent global evidence. *Research in Economics*, vol. 71, no. 2, pp. 306–336.
- Fosu, A. K. (2017b). Growth, inequality, and poverty reduction: Africa in a global setting, in M. Nissanke and M. Ndulo (eds.), *Poverty reduction in the course of African development*, Oxford University Press, 2017, pp. 57-76.
- Fosu, A. K. (2018). The recent growth resurgence in Africa and poverty reduction: The context and evidence. *Journal of African Economies*, vol. 27, no. 1, pp. 92–107.
- Fosu, A. K., and O'Connell, S. A. (2006). Explaining African economic growth: The role of antigrowth syndromes, in Bourguignon F, Pleskovic B (eds), Annual Bank Conference on Development Economics, World Bank: Washington, DC; pp. 31–66.
- Gore, C. (2007). Which growth theory is good for the poor? *The European Journal of Development Research*, vol. 19, no. 1, pp. 30–48.
- Jerven, M. (2014). On the accuracy of trade and GDP statistics in Africa: Errors of commission and omission. *Journal of African Trade*, vol. 1, no. 1, pp. 45-52.
- Jerven, M. (2015). Africa: Why Economists Get it Wrong. London: Zed Books.
- Kaldor, N. (1957). A model of economic growth. *The Economic Journal*, vol. 67, no. 268, pp. 591–624.
- Knowles, S. (2005). Inequality and economic growth: The empirical relationship reconsidered in the light of comparable data. *The Journal of Development Studies*, vol. 41, no. 1, pp. 135–159.
- Meadows D.H., Meadows D.L, Randers J, and Behrens III W.W. (1972). *The limits to growth*. New American Library Inc, New York.
- Obeng-Odoom, F. (2014). *Oiling the urban economy: Land, labour, capital, and the state in Sekondi-Takoradi, Ghana*. Routledge, London
- Obeng-Odoom, F. (2015). Africa on the rise, but to where? *Forum for Social Economics*, vol. 44, no. 3, pp. 234-250.
- Obeng-Odoom, F. (2017). The myth of economic growth in Africa. *Review of African Political Economy*, vol. 44, no. 153, pp. 466-475.

- Obeng-Odoom, F. (2019). 'Petroleum accidents in the global south'. *Research in Political Economy*, vol.33, pp. 111-142.
- Ravallion, M. (1997). Can high inequality developing countries escape absolute poverty? *Economics Letters*, vol. 56, pp. 51-57.
- Ravallion, M. (2001). Growth, inequality and poverty: Looking beyond averages. *World Development*, vol. 29, no. 11, pp. 1803-1815.
- Ravallion, M. (2012). Why don't we see poverty convergence? *American Economic Review*, vol. 102, no. 1, pp. 504-23.
- Thorbecke, E. (2013). The interrelationship linking growth, inequality and poverty in Sub-Saharan Africa. *Journal of African Economies*, vol. 22, Supplement 1, pp. 15-48.
- World Bank (2015a). POVCALNET 2015. Available at http://iresearch. worldbank.org/PovcalNet/index.htm.
- World Bank (2015b). World Development Indicators Online 2015. Available at http://data.worldbank.org/data-catalog/world-development-indicators.

APPENDICES

FIGURE A1: PROGRESS ON POVERTY REDUCTION ACROSS REGIONS, 1981-2011 (POVERTY LINE US\$1.25 A DAY IN 2005 PPP, SIMILAR TO US\$1.90 A DAY IN 2011 PPP)



Notes: EAP=East Asia and Pacific; LAC=Latin America and the Caribbean; SA=South Asia; EECA=Eastern Europe and Central Asia; MENA=Middle East and North Africa; SSA=Sub-Saharan Africa.

FIGURE A2: PROGRESS ON POVERTY REDUCTION ACROSS REGIONS, 1981-2011 (POVERTY LINE: US\$1.25 A DAY IN 2005 PPP, SIMILAR TO US\$1.90 A DAY IN 2011 PPP)



Notes: See Figure A1.

Data source: PovcalNet, World Bank, 2015a

Figure A3: Progress on Poverty Reduction Across Regions, 1981-2011 (poverty line: US\$1.25 A day in 2005 PPP, similar to US\$1.90 A day in 2011 PPP)



Notes: See Figure A1. Data source: PovcalNet, World Bank, 2015a

Figure A4: Progress on Poverty Reduction across Regions, 1981-2011 (poverty line: US\$2.00 a day in 2005 PPP)



Notes: See Figure A1. Data source: PovcalNet, World Bank, 2015a





Notes: See Figure A1. Data source: PovcalNet, World Bank, 2015a

Figure A6: Progress on Poverty Reduction across Regions, 1981-2011 (poverty line: US\$2.00 a day in 2005 PPP)



Notes: See Figure A1. Data source: PovcalNet, World Bank, 2015a

Country	Income Elasticity (Ey)			Inequality Elasticity (Eg)		
	Fixed Effects	Random Effects	Two-Step System GMM	Fixed Effects	Random Effects	Two-Step System GMM
Botswana	-1.89	-2.11	-1.82	6.10	5.67	7.38
Burkina Faso	-0.86	-1.16	-1.26	0.63	0.61	-0.27
Burundi	-1.32	-1.68	-4.66	-0.50	-0.62	-0.10
Cameroon	-1.61	-1.89	-2.91	3.19	2.90	3.99
CAR	-0.19	-0.49	0.76	-1.10	-0.91	-3.61
Côte d'Ivoire	-1.83	-2.09	-2.98	4.43	4.05	5.70
Egypt	-2.76	-3.05	-6.4	6.14	5.47	9.70
Eswatini	-0.73	-1.00	0.13	1.41	1.39	0.08
Ethiopia	-1.44	-1.76	-3.51	1.51	1.31	2.03
Gambia, The	-1.13	-1.41	-1.59	1.83	1.70	1.51
Ghana	-1.90	-2.22	-4.84	2.78	2.42	4.40
Guinea	-0.94	-1.25	-1.89	0.37	0.33	-0.31
Guinea-Bissau	-1.18	-1.47	-1.98	1.69	1.55	1.51
Kenya	-1.05	-1.31	-0.56	2.51	2.38	1.91
Lesotho	-0.76	-1.04	-0.45	0.91	0.91	-0.30
Madagascar	-0.64	-0.97	-1.7	-1.21	-1.13	-2.53
Malawi	-0.51	-0.84	-0.96	-1.12	-1.01	-2.78
Mali	-0.69	-1.00	-1.11	-0.25	-0.21	-1.54
Mauritania	-1.67	-1.95	-3.08	3.39	3.08	4.34
Morocco	-2.53	-2.78	-4.74	6.6	5.98	9.50
Mozambique	-0.92	-1.25	-2.23	-0.12	-0.15	-0.80
Niger	-1.61	-1.94	-4.4	1.56	1.31	2.54
Nigeria	-1.36	-1.69	-3.66	0.89	0.73	1.28
Senegal	-0.87	-1.16	-0.81	1.21	1.16	0.28
South Africa	-1.98	-2.18	-1.28	7.26	6.77	8.67
Tanzania	-1.60	-1.95	-4.84	0.98	0.75	1.98
Tunisia	-2.51	-2.75	-4.01	7.36	6.73	10.16
Uganda	-1.22	-1.53	-2.55	1.28	1.14	1.25
Zambia	-0.69	-0.99	-0.82	0.07	0.10	-1.25

TABLE A1: INCOME AND INEQUALITY ELASTICITIES (POVERTY LINE: US\$1.25 A DAY IN 2005 PPP), HEADCOUNT RATIO

Country	Income Elasticity (Ey)			Inequality Elasticity (Eg)			
	Fixed Effects	Random Effects	Two-Step System GMM	Fixed Effects	Random Effects	Two-Step System GMM	
Botswana	-2.52	-2.87	-2.03	12.64	11.61	12.22	
Burkina Faso	-1.14	-1.68	-1.72	0.98	0.97	-0.67	
Burundi	-2.26	-2.84	-9.33	0.05	-0.26	1.80	
Cameroon	-2.34	-2.79	-4.89	7.01	6.32	7.38	
CAR	0.02	-0.58	2.38	-3.49	-2.91	-7.44	
Côte d'Ivoire	-2.62	-3.04	-4.83	9.63	8.72	10.21	
Egypt	-4.34	-4.70	-12.01	14.63	12.93	18.97	
Eswatini	-0.75	-1.27	1.45	2.01	2.07	-1.00	
Ethiopia	-2.22	-2.73	-6.47	3.76	3.27	4.55	
Gambia, The	-1.53	-2.03	-2.24	3.62	3.35	2.45	
Ghana	-3.02	-3.48	-9.16	6.96	6.06	9.27	
Guinea	-1.34	-1.89	-3.14	0.69	0.63	-0.34	
Guinea-Bissau	-1.65	-2.16	-3.12	3.49	3.19	2.72	
Kenya	-1.26	-1.74	0.11	4.60	4.37	2.45	
Lesotho	-0.88	-1.41	0.09	1.23	1.28	-1.24	
Madagascar	-0.93	-1.53	-2.98	-2.68	-2.44	-4.09	
Malawi	-0.66	-1.26	-1.37	-2.80	-2.47	-4.97	
Mali	-0.90	-1.47	-1.54	-0.93	-0.77	-2.85	
Mauritania	-2.44	-2.89	-5.22	7.49	6.75	8.05	
Morocco	-3.78	-4.12	-8.31	14.90	13.36	17.57	
Mozambique	-1.37	-1.94	-3.97	-0.19	-0.22	-0.92	
Niger	-2.59	-3.09	-8.41	4.23	3.61	5.95	
Nigeria	-2.15	-2.68	-6.91	2.53	2.13	3.41	
Senegal	-1.08	-1.61	-0.64	1.99	1.94	-0.06	
South Africa	-2.54	-2.86	-0.65	14.83	13.68	13.98	
Tanzania	-2.64	-3.17	-9.47	3.21	2.62	5.33	
Tunisia	-3.65	-3.97	-6.58	16.18	14.62	18.18	
Uganda	-1.79	-2.31	-4.43	2.88	2.57	2.65	
Zambia	-0.85	-1.41	-0.86	-0.38	-0.23	-2.56	

 TABLE A2: INCOME AND INEQUALITY ELASTICITIES (POVERTY LINE: US\$1.25 A DAY IN 2005 PPP), POVERTY GAP

Country	Income Elasticity (Ey)			Inequality Elasticity (Eg)			
	Fixed Effects	Random Effects	Two-Step System GMM	Fixed Effects	Random Effects	Two-Step System GMM	
Botswana	-2.98	-3.52	-2.06	19.7	18.06	18.59	
Burkina Faso	-1.27	-2.09	-2.06	1.12	1.1	-1.46	
Burundi	-3.04	-3.86	-13.83	0.53	-0.14	3.18	
Cameroon	-2.9	-3.58	-6.71	11.08	9.92	11.37	
CAR	0.37	-0.57	4.07	-6.47	-5.46	-12.41	
Côte d'Ivoire	-3.25	-3.86	-6.51	15.24	13.73	15.77	
Egypt	-5.74	-6.21	-17.37	24.03	21.11	30.13	
Eswatini	-0.63	-1.43	2.86	2.39	2.55	-2.31	
Ethiopia	-2.85	-3.59	-9.28	6.10	5.22	7.15	
Gambia, The	-1.77	-2.53	-2.76	5.37	4.94	3.44	
Ghana	-3.96	-4.62	-13.29	11.49	9.90	14.77	
Guinea	-1.59	-2.41	-4.27	0.83	0.70	-0.79	
Guinea-Bissau	-1.97	-2.73	-4.12	5.28	4.77	3.95	
Kenya	-1.32	-2.06	0.90	6.66	6.34	3.18	
Lesotho	-0.86	-1.68	0.73	1.30	1.43	-2.53	
Madagascar	-1.08	-1.98	-4.16	-4.55	-4.20	-6.64	
Malawi	-0.66	-1.57	-1.68	-4.94	-4.41	-8.17	
Mali	-0.96	-1.83	-1.86	-1.94	-1.68	-4.86	
Mauritania	-3.05	-3.71	-7.19	11.89	10.63	12.46	
Morocco	-4.86	-5.33	-11.65	24.03	21.45	27.57	
Mozambique	-1.67	-2.51	-5.59	-0.48	-0.57	-1.61	
Niger	-3.39	-4.12	-12.25	7.07	5.93	9.54	
Nigeria	-2.78	-3.55	-10.01	4.19	3.43	5.42	
Senegal	-1.14	-1.95	-0.36	2.60	2.55	-0.63	
South Africa	-2.94	-3.44	0.15	23.02	21.23	21.18	
Tanzania	-3.52	-4.26	-13.92	5.58	4.47	8.68	
Tunisia	-4.6	-5.05	-8.94	25.87	23.29	28.33	
Uganda	-2.21	-2.98	-6.17	4.46	3.91	3.99	
Zambia	-0.87	-1.73	-0.79	-1.14	-0.89	-4.48	

TABLE A3: INCOME AND INEQUALITY ELASTICITIES (POVERTY LINE: US\$1.25 A DAY IN 2005 PPP), SQUARED POVERTY GAP

Country	Income Elasticity (Ey)			Inequality Elasticity (Eg)		
	Fixed Effects	Random Effects	Two-Step System GMM	Fixed Effects	Random Effects	Two-Step System GMM
Botswana	-1.55	-1.38	-1.32	2.10	1.63	1.67
Burundi	-0.83	-0.76	-1.10	-0.25	-0.45	-0.06
Cameroon	-1.26	-1.15	-1.29	1.05	0.74	0.96
CAR	-0.76	-0.45	-0.16	1.14	0.10	-0.02
Côte d'Ivoire	-1.39	-1.28	-1.41	1.33	1.05	1.25
Egypt	-1.61	-1.69	-2.26	0.69	1.05	1.61
Gambia, The	-1.10	-0.91	-0.90	1.13	0.56	0.65
Ghana	-1.24	-1.23	-1.65	0.36	0.39	0.83
Guinea	-0.95	-0.78	-0.83	0.68	0.14	0.30
Guinea-Bissau	-1.09	-0.93	-0.97	0.97	0.47	0.61
Kenya	-1.16	-0.92	-0.75	1.61	0.86	0.83
Lesotho	-0.99	-0.74	-0.58	1.26	0.47	0.45
Madagascar	-0.79	-0.60	-0.65	0.36	-0.24	-0.08
Mali	-0.88	-0.66	-0.61	0.77	0.08	0.16
Mauritania	-1.28	-1.18	-1.34	1.05	0.77	1.00
Morocco	-1.64	-1.63	-1.96	1.31	1.38	1.74
Niger	-1.11	-1.07	-1.45	0.20	0.13	0.54
Nigeria	-1.03	-0.95	-1.24	0.26	0.05	0.40
Senegal	-1.02	-0.80	-0.68	1.22	0.50	0.51
South Africa	-1.66	-1.47	-1.31	2.54	1.99	1.95
Tanzania	-1.06	-1.04	-1.49	-0.08	-0.07	0.40
Tunisia	-1.71	-1.66	-1.88	1.73	1.67	1.94
Uganda	-1.06	-0.92	-1.05	0.70	0.29	0.51
Zambia	-0.91	-0.68	-0.58	0.94	0.20	0.24

Table A4: Income and Inequality Elasticities (poverty line: US2.00 a day in 2005 PPP), Headcount Ratio

Country	Income Elasticity (Ey)			Inequality Elasticity (Eg)		
	Fixed Effects	Random Effects	Two-Step System GMM	Fixed Effects	Random Effects	Two-Step System GMM
Botswana	-1.54	-1.61	-1.39	3.59	3.35	3.77
Burundi	-1.18	-1.36	-2.85	-0.50	-0.32	-0.50
Cameroon	-1.44	-1.56	-2.19	1.86	1.81	2.09
CAR	-0.33	-0.44	0.50	0.28	0.24	-1.68
Côte d'Ivoire	-1.58	-1.69	-2.24	2.50	2.40	2.94
Egypt	-2.39	-2.53	-4.75	2.77	2.76	4.92
Gambia, The	-1.06	-1.18	-1.22	1.39	1.34	0.85
Ghana	-1.75	-1.91	-3.60	1.29	1.36	2.28
Guinea	-0.97	-1.10	-1.44	0.57	0.60	-0.05
Guinea-Bissau	-1.12	-1.24	-1.51	1.24	1.22	0.86
Kenya	-0.94	-1.03	-0.47	1.93	1.80	1.06
Lesotho	-0.76	-0.87	-0.39	1.11	1.05	-0.04
Madagascar	-0.77	-0.92	-1.30	-0.22	-0.13	-1.15
Mali	-0.76	-0.89	-0.87	0.38	0.40	-0.66
Mauritania	-1.49	-1.61	-2.31	1.93	1.88	2.26
Morocco	-2.13	-2.24	-3.53	3.32	3.20	4.82
Niger	-1.55	-1.71	-3.28	0.73	0.83	1.36
Nigeria	-1.35	-1.51	-2.74	0.52	0.61	0.74
Senegal	-0.85	-0.96	-0.65	1.20	1.14	0.25
South Africa	-1.56	-1.61	-0.99	4.29	3.98	4.41
Tanzania	-1.57	-1.75	-3.61	0.35	0.50	1.09
Tunisia	-2.07	-2.16	-2.99	3.85	3.66	5.15
Uganda	-1.18	-1.32	-1.93	0.93	0.95	0.73
Zambia	-0.74	-0.86	-0.66	0.60	0.60	-0.51

TABLE A5: INCOME AND INEQUALITY ELASTICITIES (POVERTY LINE: US\$2.00 A DAY IN 2005PPP), POVERTY GAP

Country	Income Elasticity (Ey)			Inequality Elasticity (Eg)		
	Fixed Effects	Random Effects	Two-Step System GMM	Fixed Effects	Random Effects	Two-Step System GMM
Botswana	-1.80	-1.87	-1.65	5.61	5.25	6.05
Burundi	-1.66	-1.86	-4.29	-0.64	-0.38	-0.79
Cameroon	-1.83	-1.95	-3.05	3.02	2.92	3.40
CAR	-0.23	-0.41	0.95	-0.19	-0.07	-3.29
Côte d'Ivoire	-1.99	-2.08	-3.06	4.06	3.86	4.81
Egypt	-3.23	-3.32	-6.91	5.11	4.89	8.50
Gambia, The	-1.28	-1.41	-1.60	2.02	1.98	1.19
Ghana	-2.39	-2.52	-5.28	2.45	2.44	3.95
Guinea	-1.21	-1.38	-2.02	0.75	0.84	-0.27
Guinea-Bissau	-1.38	-1.52	-2.06	1.86	1.84	1.25
Kenya	-1.03	-1.15	-0.39	2.71	2.59	1.40
Lesotho	-0.82	-0.97	-0.34	1.38	1.37	-0.42
Madagascar	-0.98	-1.18	-1.87	-0.56	-0.36	-2.11
Mali	-0.90	-1.07	-1.15	0.32	0.43	-1.37
Mauritania	-1.90	-2.02	-3.23	3.17	3.06	3.70
Morocco	-2.77	-2.83	-4.98	5.69	5.39	8.14
Niger	-2.12	-2.28	-4.84	1.47	1.54	2.37
Nigeria	-1.82	-1.98	-4.02	0.99	1.09	1.25
Senegal	-0.97	-1.11	-0.74	1.59	1.57	0.09
South Africa	-1.76	-1.80	-0.97	6.65	6.18	7.05
Tanzania	-2.20	-2.36	-5.38	0.93	1.06	1.97
Tunisia	-2.62	-2.67	-4.10	6.42	6.03	8.60
Uganda	-1.52	-1.67	-2.73	1.45	1.48	1.10
Zambia	-0.85	-1.01	-0.80	0.62	0.70	-1.16

 TABLE A6: INCOME AND INEQUALITY ELASTICITIES (POVERTY LINE: US\$2.00 a day in 2005 PPP), Squared Poverty Gap