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AFRICAN POVERTY IS FALLING...MUCH FASTER THAN YOU THINK!

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### **ABSTRACT**

The conventional wisdom that Africa is not reducing poverty is wrong. Using the methodology of Pinkovskiy and Sala-i-Martin (2009), we estimate income distributions, poverty rates, and inequality and welfare indices for African countries for the period 1970-2006. We show that: (1) African poverty is falling and is falling rapidly; (2) if present trends continue, the poverty Millennium Development Goal of halving the proportion of people with incomes less than one dollar a day will be achieved on time; (3) the growth spurt that began in 1995 decreased African income inequality instead of increasing it; (4) African poverty reduction is remarkably general: it cannot be explained by a large country, or even by a single set of countries possessing some beneficial geographical or historical characteristic. All classes of countries, including those with disadvantageous geography and history, experience reductions in poverty. In particular, poverty fell for both landlocked as well as coastal countries; for mineral-rich as well as mineral-poor countries; for countries with favorable or with unfavorable agriculture; for countries regardless of colonial origin; and for countries with below- or above-median slave exports per capita during the African slave trade.

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# 1 Introduction

After three decades of zero or negative growth, Africa began a growth spurt around 1995 that has been sustained at least to 2006. Some analysts claim that this growth trend has not been strong enough to reduce poverty. For example, in its 2008 Millennium Development Goals Report, the United Nations Development Program contends that *“the goal of cutting in half the proportion of people in the developing world living on less than \$1 a day by 2015 remains within reach. However, this achievement will be due largely to extraordinary economic success in most of Asia. In contrast, previous estimates suggest that little progress was made in reducing extreme poverty in sub-Saharan Africa.”* The World Bank concurs: *“In 1990, 28.3 percent of the people in low and middle-income countries lived on less than \$1 a day. By 1999 the share had fallen to 21.6 percent, driven mainly by strong growth in China and India (...) In Sub-Saharan, where the GDP per capita fell by 5 percent, the extreme poverty rate rose from 47.4 percent in 1990 to 49 percent in 1999. The numbers are believed to be still rising”* (World Bank 2004) The U.N. Millennium Campaign Deputy Director for Africa says: *“Poverty continues to intensify due to the exclusion of groups of people on the basis of class, caste, gender, disability, age, race, religion and other status,”* (UN Millennium Campaign 2009) This conventional wisdom is further documented and critically reviewed in Easterly (2009).

It is also believed that most of the recent African growth is due to rising oil and natural resource prices, which entails a redistribution of income from mineral-poor countries to mineral-rich countries (Collier 2006). Moreover, gains from natural resource wealth are believed to accrue to very narrow elites and to be irrelevant for poverty reduction. These claims imply that African growth should be accompanied by rapidly rising inequality, which is testable with data.

In this paper, we use the methodology of Pinkovskiy and Sala-i-Martin (2009) to estimate income distributions for African countries, and compute their poverty rates, and inequality and welfare indices for the period 1970-2006. Our results show that the conventional wisdom that Africa is not reducing poverty is wrong. In fact, since 1995, African poverty has been falling steadily. Moreover, contrary to the commonly held idea that African growth is largely based on natural resources and helps only the rich and well-connected, we show that Africa's income distribution has become *less* rather than more unequal than it was in 1995, and therefore, that a great deal of this growth has accrued to the poor. Specifically, Africa's growth

trend in 1995 has been accompanied by a symmetric, sustained reduction in poverty that places it on track to achieve the Millennium Development Goal of halving poverty within a few years of 2015. If countries hit by exceptional adverse shocks like Congo-Zaire<sup>2</sup> converge to the average African poverty rate, then the first poverty MDG will actually be achieved two years in advance of 2015.

Not only has poverty fallen in Africa as a whole, but this decline has been remarkably general across types of countries that the literature suggests should have different growth performances. In particular, poverty fell for both landlocked as well as coastal countries; for mineral-rich as well as mineral-poor countries; for countries with favorable or with unfavorable agriculture; for countries regardless of colonial origin; and for countries with below- or above-median slave exports per capita during the African slave trade.<sup>3</sup> Hence, the substantial decline in poverty is not driven by any particular country or set of countries.

The rest of the paper is organized as follows. Section 2 provides a brief description of the data and the statistical procedure to estimate the income distributions of African countries and of all of Africa in every year in the sample period. Section 3 describes the evolution of the income distributions. Section 4 analyzes the evolution of poverty rates in Africa. Section 5 provides measures of inequality and welfare. Section 6 discusses the evolution of poverty for various African regions. Section 7 provides robustness checks, and section 8 concludes.

## 2 Data and statistical procedure

We use national accounts purchasing-power-parity (PPP)-adjusted GDP data from Penn World Tables, Mark 6.2. We use this series because it is the standard GDP series used in the study of economic growth (Barro and Sala-i-Martin 2004). In the robustness checks, we

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<sup>2</sup> The Democratic Republic of Congo was called Zaire for most of our sample period (until 1997). We will refer to the country as Congo-Zaire in this paper.

<sup>3</sup> Bloom and Sachs (1998) suggest that landlocked countries, or countries with unfavorable agriculture have poorer performance than geographically advantaged countries. La Porta et al. (1999) argue that the identity of the colonizer may matter for subsequent economic development. Nunn (2008) presents evidence that the impact of the African slave trade was highly persistent, and affected recent African performance.

experiment with other national accounts-based series with comprehensive coverage of all countries and years we consider, but with different corrections for PPP.

We obtain inequality data from the WIDER-DS dataset, pioneered by Deininger and Squire (1996) and maintained by the United Nations University. The dataset provides Gini coefficients and quintile shares for countries and years in which income or consumption surveys were conducted. In order to maintain comparability of the survey data, we select surveys from WIDER-DS following special criteria and we adjust surveys with consumption data so that they are comparable to surveys with income data, which is described in detail by Pinkovskiy and Sala-i-Martin (2009). Overall, we have 118 surveys for the 48 African countries considered.

Our procedure exactly follows Pinkovskiy and Sala-i-Martin (2009). The crux of the methodology is to assume that the distribution of income in each country and each year has the same functional form, with changes in GDP and inequality manifesting themselves through changes in the parameters of this form only. Then, we use the survey data to recover the functional form parameters, and from these parameters we can compute any statistic of the distribution of income for any country or for all of Africa that we want. Following Pinkovskiy and Sala-i-Martin (2009), our baseline functional form is lognormal but, as a robustness check, we also consider Gamma and Weibull distributions. These distributions are mathematically convenient because they have a single parameter that determines the mean of the distribution (the scale parameter), and a single parameter that determines the degree of inequality of the distribution (the distribution parameter). In particular, the Gini coefficient and the quintile shares of each distribution are functions of the distribution parameter alone. Hence, it is very easy to compute the distribution parameter on the basis of the survey data alone, and then to compute the scale parameter on the basis of the distribution parameter and GDP, so that the mean of the distribution of each country is given exactly by GDP. We proceed as follows:

1) For country-years with surveys, our baseline method for obtaining the distribution parameter is to choose the distribution parameter that minimizes the sum of squared deviations between the quintile shares in the data and the theoretical predicted quintile shares based on the distribution parameter. In our robustness section we experiment with two methods. The first is to invert the theoretical expression for the Gini coefficient. The second method is similar to the baseline method, except we replace the 5 quintile shares by the three middle quintile shares divided by the total share of the middle 60%, and minimize the squared deviations of

these three numbers from their theoretically predicted values. We ignore the top and bottom quintile shares because there may be considerable doubt as to the accuracy of the surveys in reporting the incomes of the very rich (who may be unwilling to participate, or who may lie outright to conceal their income) and the very poor (whose income may be in kind, and hence, converted into a monetary equivalent with error). Using only the three middle shares avoids these problems so long as all survey respondents are correctly placed into the quintile of the sample that they belong to, which is much more likely than that their income is reported correctly.

II) For countries and years without survey data, we impute a Gini coefficient, which we then invert to get the distribution parameter. If the country in question has two or more surveys in other years, we impute the Ginis for a year without data by interpolating and extrapolating the series of Gini coefficients we have from WIDER-DS. In the robustness section, we experiment with different interpolation and extrapolation procedures in the robustness checks. We then compute the average of the Gini series for all countries with two or more surveys (weighting such countries equally). For countries with no surveys, we impute this average Gini series. For countries with exactly one survey, we impute the average Gini series but shift it vertically to coincide with the single observation of the Gini for that country in the year in which this observation is made.

III) For each country in each year, we compute the scale parameter from GDP and the distribution parameter.

IV) Using the assumed functional forms and the calculated parameters, we compute poverty and inequality statistics for each country, for all of Africa, and for any groups of countries of special interest.

In our robustness checks, we experiment with varying the GDP source, the assumed functional form, the method of interpolation and extrapolation, and the method of recovering the distribution parameter. We list these variations below:

a) We consider GDP from the Penn World Tables, 6.2; GDP from Angus Maddison's website (dated 2007), which uses different PPP adjustments from the Penn World Tables; and GDP from the World Bank's World Development Indicators, with data from both before and

after the 2007 PPP revision by the World Bank. Hence, we experiment with a wide variety of purchasing power parity adjustments.

b) We consider three parametric functional forms for the income distribution: lognormal, gamma and Weibull. The lognormal functional form is very commonly used, whereas the gamma and Weibull tend to predict more inequality for the same quintile shares than the lognormal form.

c) We consider three methods of extrapolation and interpolation: i) horizontal extrapolation and piecewise cubic interpolation, ii) linear interpolation and extrapolation, iii) horizontal interpolation and horizontal extrapolation, although if the last two surveys happened in consecutive years, linear extrapolation is used. Linear extrapolation allows for greater variation of inequality in the period after our data ends, and allows strong responses of inequality to trends at the point at which our data ends.

d) We consider three methods of recovering distribution parameters from data: i) minimize least squares of quintiles, ii) minimize least squares of ratios of each of the middle three quintiles to their sum, iii) invert the Gini.

For our baseline estimates, we make the following choices:

- GDP data from PWT 6.2
- Cubic splines to interpolate between available survey data, and extrapolate by horizontal projection.
- Lognormal distributions in all countries, and recover scale parameters from least squares minimization on quintiles.

These choices are most consistent with the previous literature on measuring world income distribution and with the growth literature in general.

### **3 Dynamics of the African Distribution of Income**

Figures 1 through 4 present graphs of distributions of income for Africa as well as for various African countries. To have a visual anchor, each of the graphs contains three vertical

lines corresponding to daily incomes of \$1, \$2 and \$3. The one-dollar-a-day poverty line corresponds to 554 dollars per year, since the “poverty line” referred to in the United Nations’ Millenium Development Goals was originally defined by the World Bank as one dollar a day in 1985 prices, and \$365 in 1985 US dollars is \$554 in 2000 US dollars, the currency unit of the Penn World Tables. The \$2/day and \$3/day thresholds are exactly twice and three times the \$1/day line.

Figure 1 plots the 1970 distributions for the largest countries (Nigeria, Ethiopia, Congo-Zaire and South Africa) as well as for the entire continent. We see that the mode of the Ethiopian distribution is the lowest while the South African mode is the highest. However, the dispersion of the Nigerian distribution is so large that the number of Nigerians at the lowest levels of income is larger than that of any other large African country. The mode of African distribution is located slightly above the \$1/day line while the \$2/day and \$3/day lines are far above the mode.

While things were pretty much unchanged in 1990 (Figure 2), there are noticeable changes by 2006 (Figure 3): the distributions for Nigeria and Ethiopia shift to the right, while Congo-Zaire collapses. The modes of the Nigerian and Ethiopian distributions in 1990 were below the \$1/day line; by 2006 they are well above it, and the Nigerian mode is approaching two dollars a day. However, about two thirds of the Congo-Zaire distribution lies to the left of the one-dollar-a-day poverty line while virtually the entire distribution is to the left of the \$3/day threshold. For the continent as a whole, there is a slight movement of the distribution to the right. We notice that the mode of the distribution moves away from the \$1/day line and gets close to the \$2/day line.

To observe the dynamics, Figure 4 plots the African distributions for 1970, 1990, 2000 and 2006. If we look at the bottom of the distribution we notice a deterioration between 1970 and 1990: African poverty increased over these two decades. However, there seems to be some improvement after 1990. The 2000 and especially the 2006 distributions move to the right, indicating that poverty in Africa declined.



Figure 1

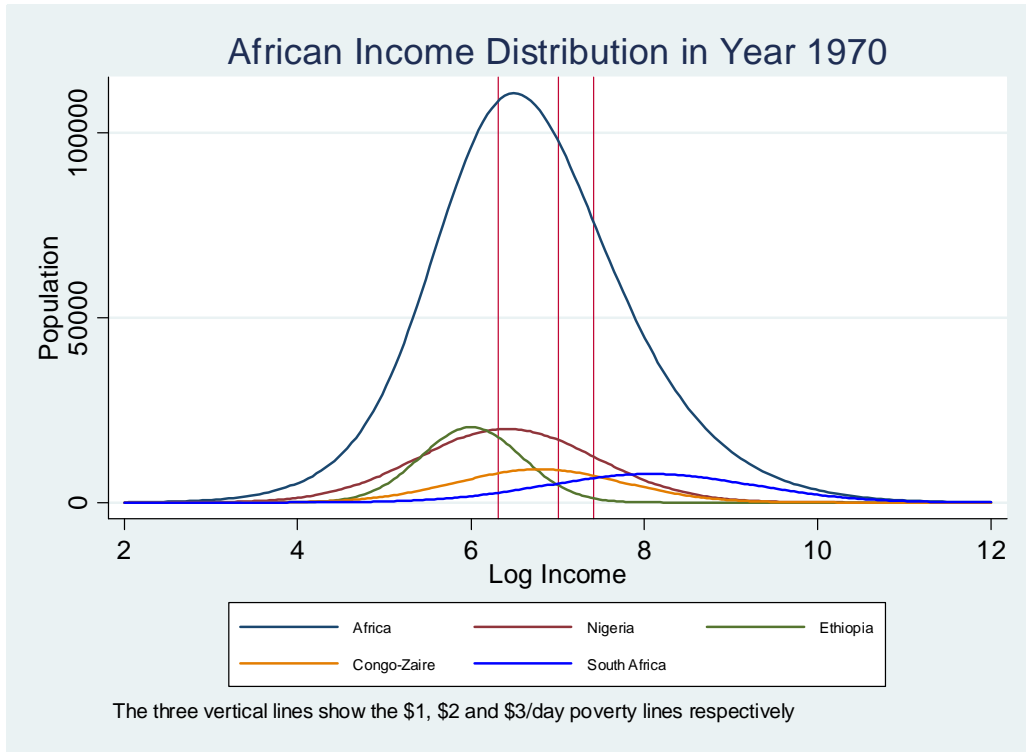


Figure 2

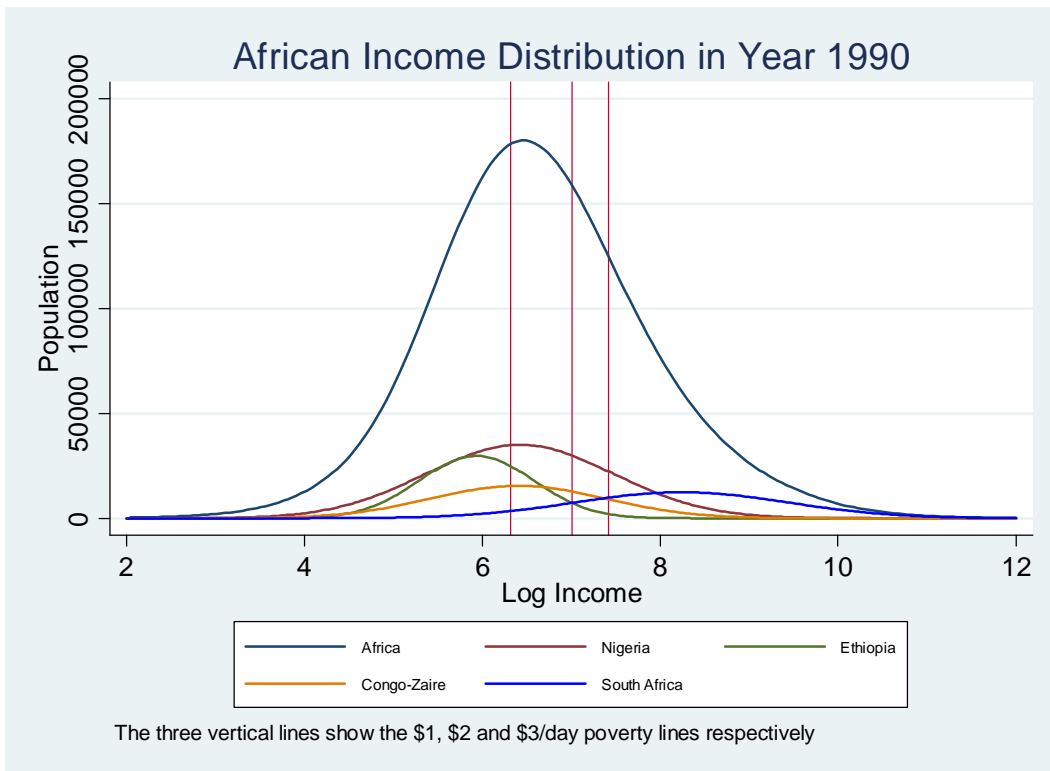


Figure 3

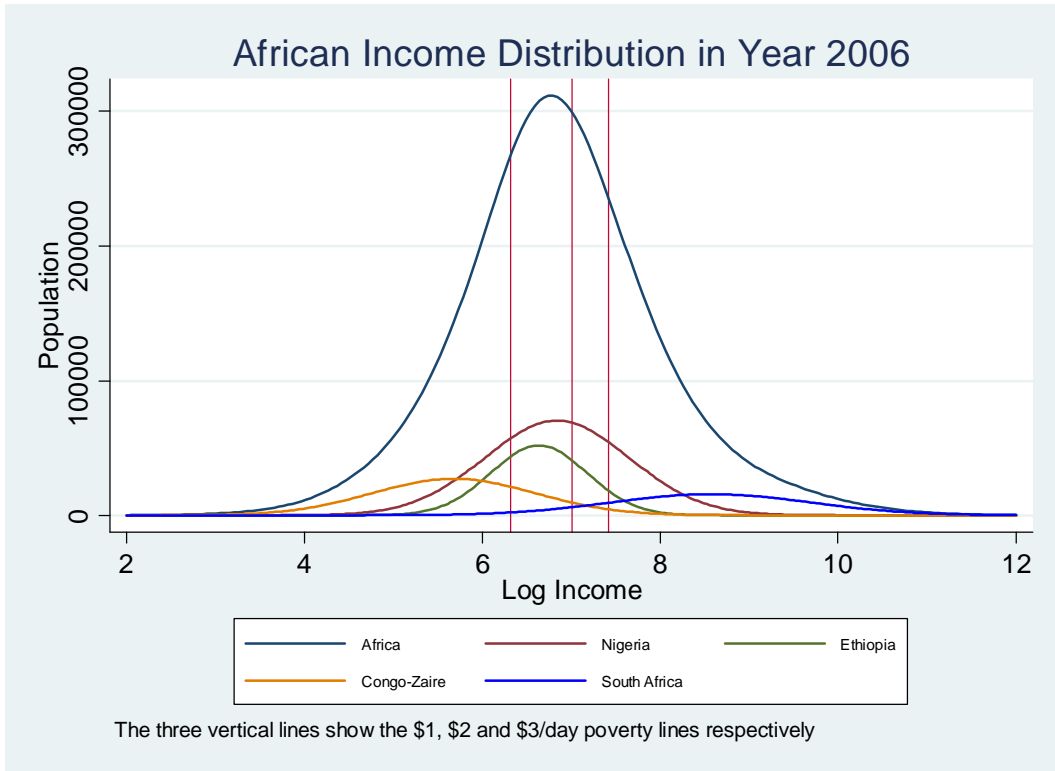
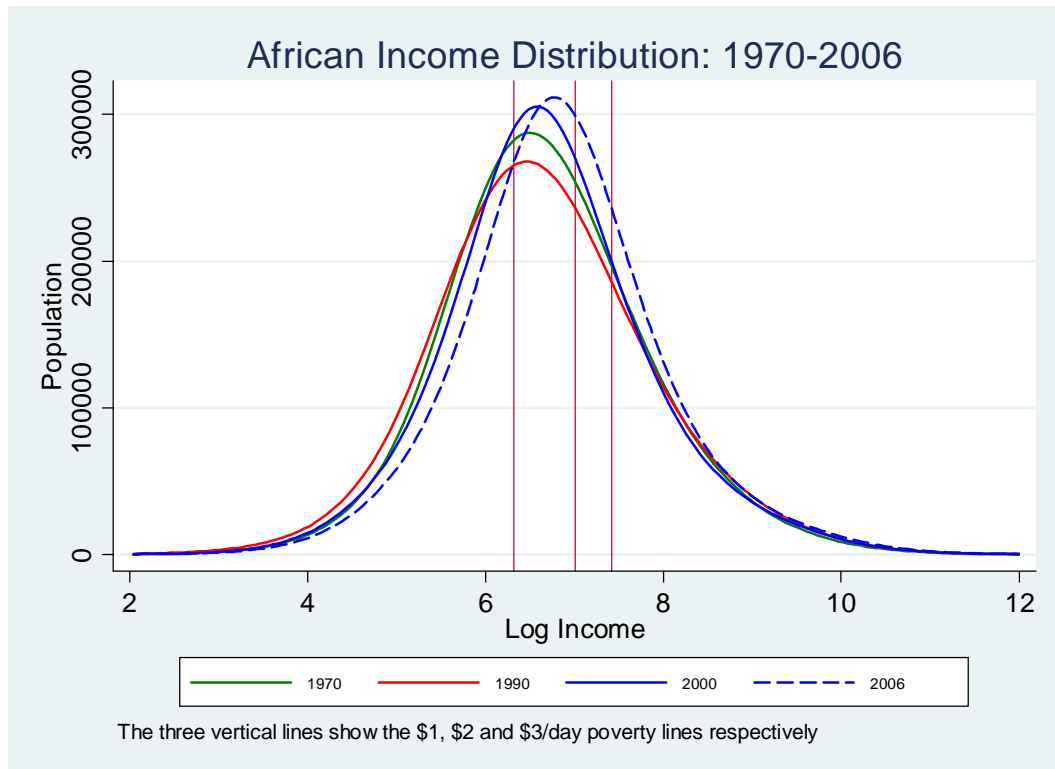


Figure 4



## 4 Poverty

To better assess the evolution of poverty, Figure 5 and Table I display the yearly African poverty rate between 1970 and 2006. The poverty rate in 1970 was 0.398. That is, close to 40% of the entire population lived with less than one dollar a day in Africa in 1970. After a small decline during the first half of the seventies, the rate jumped to around 0.42 in 1985 and stayed more or less at that level for a decade. In 1995 there is a dramatic change in trend: the poverty rate began a decline that led to a ten percentage point reduction by 2006.

What caused this dramatic change? The answer can be seen in Figure 6, where the poverty rate is plotted along with African GDP per capita. The evolution of poverty is an almost exact mirror image of the evolution of GDP per capita. That is, the driving force that explains the substantial reduction in poverty between 1995 and 2006 is economic growth. A similar conclusion is reached if we analyze the evolution of poverty and GDP per capita for the largest countries in the region. Figures 7-10 show that, for Ethiopia, South Africa, Nigeria and Congo-Zaire, poverty and GDP per capita are mirror images of each other.

Figure 5

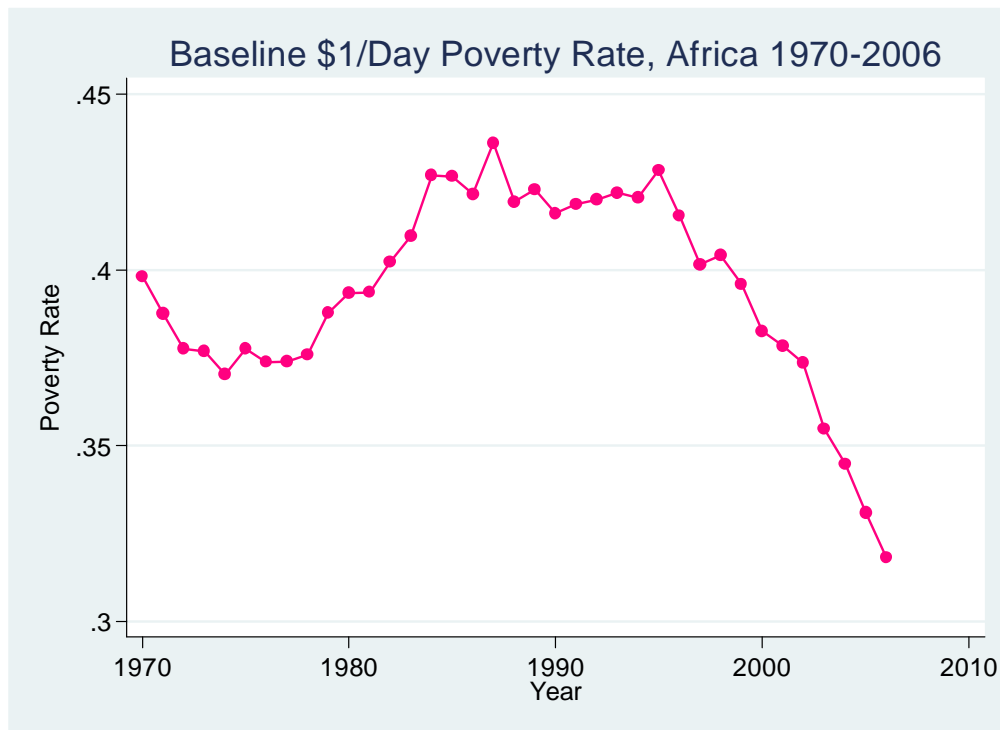


Figure 6

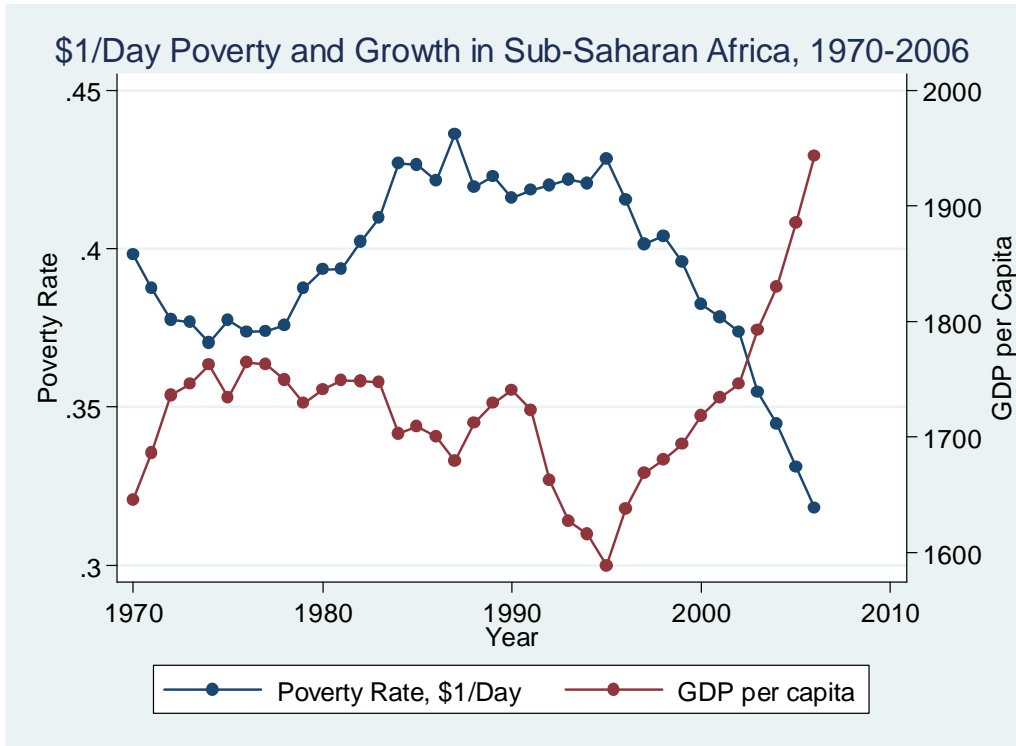


Figure 7

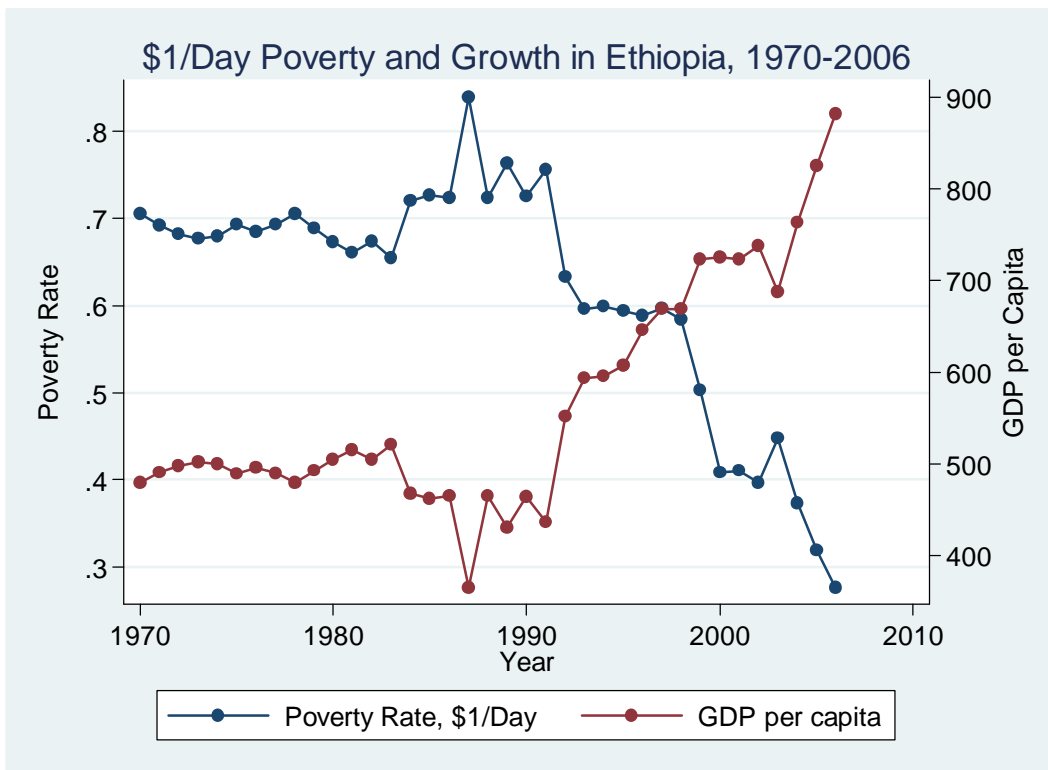


Figure 8

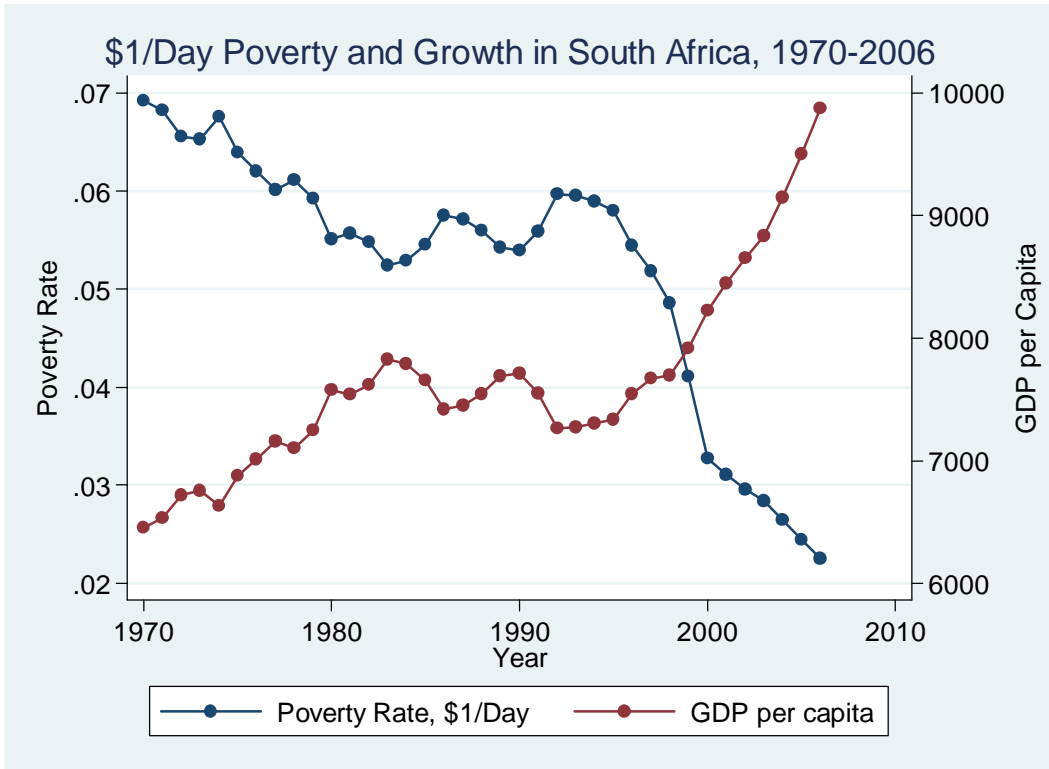


Figure 9

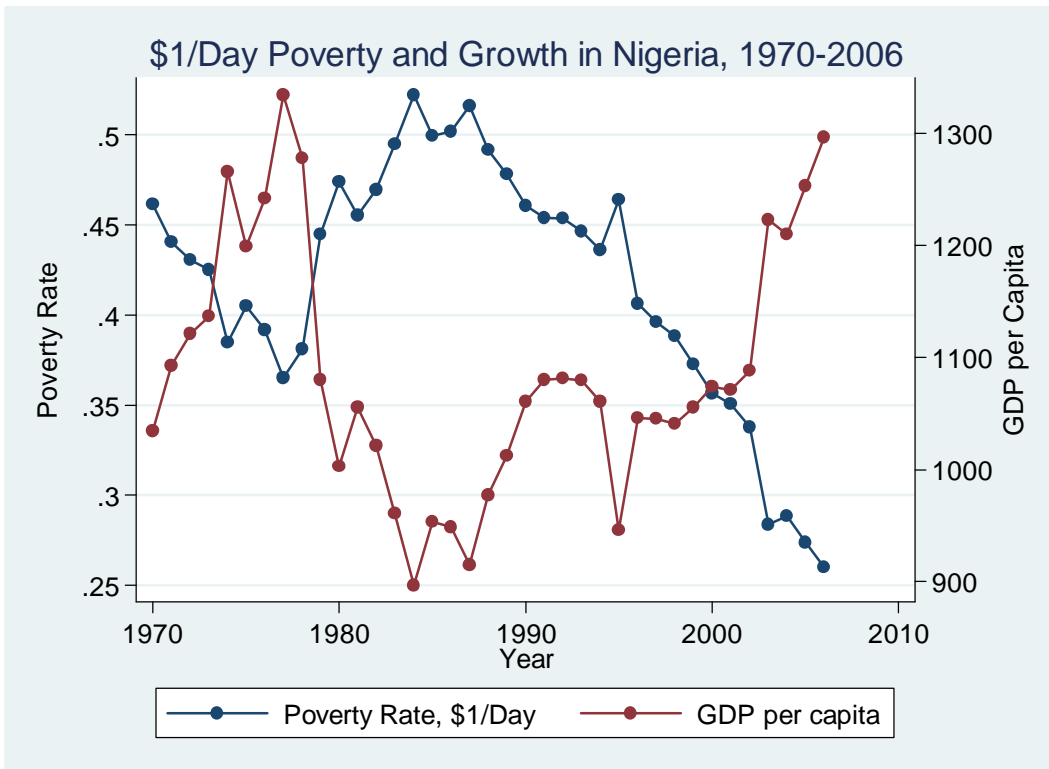
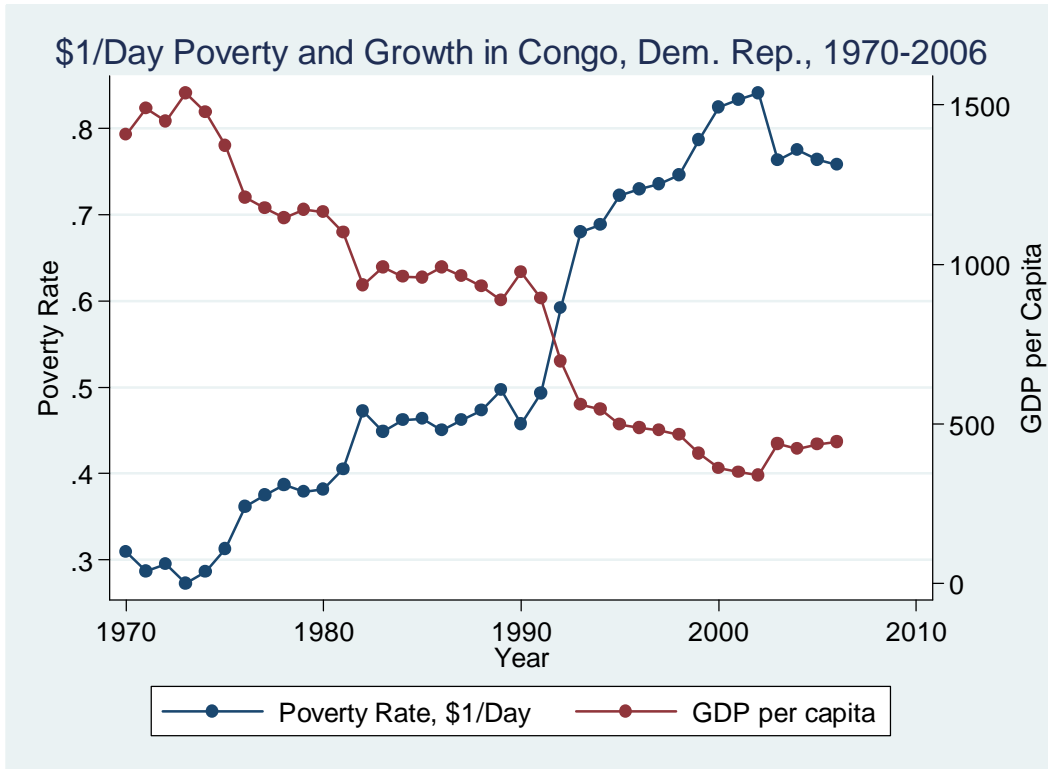


Figure 10



These results contradict the 2008 Millennium Development Goals Report (UN, 2008), which asserts that “little progress was made in reducing extreme poverty in sub-Saharan Africa.” Our estimates disagree: the African poverty rate in 2006 was 0.318, 30% lower than in 1995 (0.428) and 28% lower than in 1990 (0.421). That is, while progress in Africa has by no means been as extraordinary as that of East Asia, there has been a significant reduction in poverty and a substantial movement towards achieving the MDGs. The poverty rate in 1990 was 0.421. Hence, the MDG is for the poverty rate to be 0.210 by 2015. The rate in 2006 was 0.318, so even though substantial progress has been made, we still have ten basis points to go. But we also have 9 years left. We do not know what the future will look like, but if poverty continues to fall at the rates it fell between 1995 and 2006, we project that the \$1/day poverty rate will be 0.228 in 2015. In fact, we project that the MDG will be achieved by 2017: just two years late.<sup>4</sup>

<sup>4</sup> Of course our analysis excludes the impact of the 2008-2009 global recession. African GDP data for these years are not available yet so we are unable to assess the impact of the recession on African poverty.

One reason why the MDGs are projected to be achieved two years late is the poor performance of Congo-Zaire over the last decade. Naturally, this poor economic performance has to do with the war that took place in that country during that decade. If we exclude Congo-Zaire from our sample, the African poverty rate in 1990 was 0.417. Hence, the MDG is to cut that number to 0.209 by 2015. The poverty rate in 2006 was 0.279. Projecting the rate of progress between 1995 and 2006 into the future, we expect the African poverty rate to be 0.211 in 2012 and 0.200 in 2013. That is, the MDG will be achieved two to three years ahead of time!

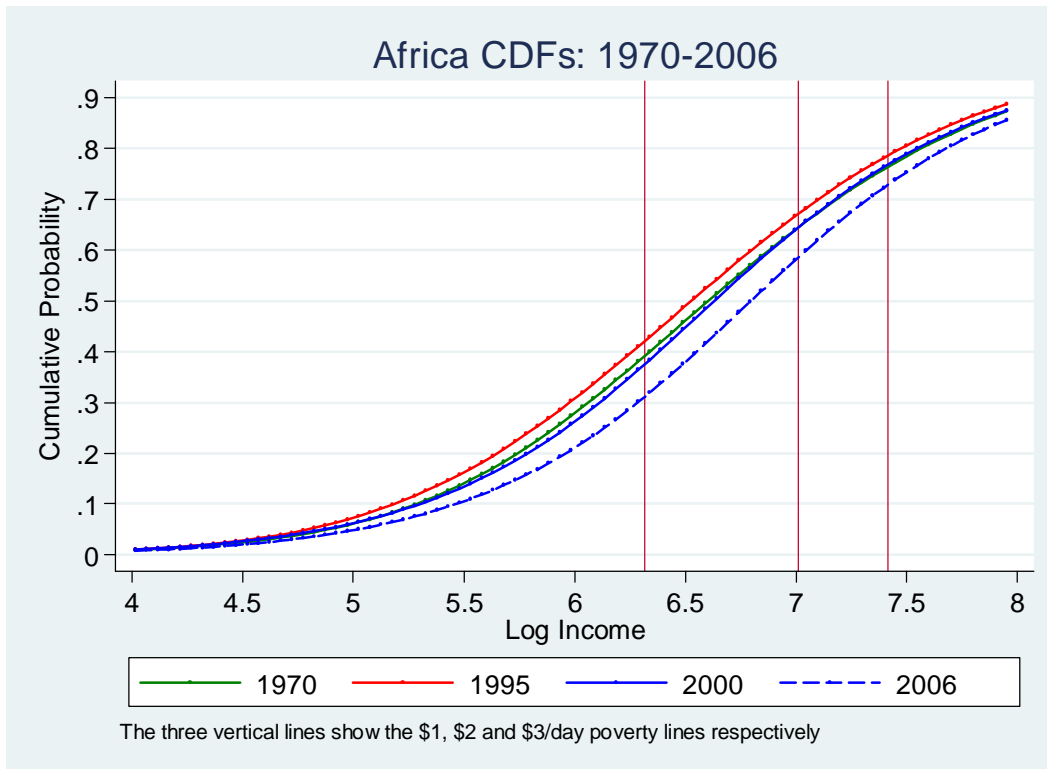
Of course we don't know whether poverty will continue to decline at the rates it fell between 1995 and 2006. But then again, we do not think that there is anything magic about 2015 either. And we do not think there is anything special about "halving the 1990 poverty rate." In other words, the MDGs are interesting goals but if the 1990 poverty rate is cut by one half in 2016 or 2020 rather than 2015, so what? The main point is that Africa has been moving in the right direction and, while progress has not been as substantial and spectacular as in Asia, poverty has been falling and it has been falling substantially. We should not let the literal interpretation of the MDGs turn good news (Africa is rapidly moving in the right direction) into bad news (Africa will not achieve the MDGs on time).<sup>5</sup>

Column 2 of Table I displays the evolution of the \$2/day poverty rate. The rate was 0.652 in 1970, it increased to 0.679 by 1995 and then it started a declining trend to 0.595 by 2006. Figure 11 displays the cumulative distribution function of the African distribution of income. The image of the CDF corresponds to the poverty rate if the poverty threshold happened to be the level of income in the horizontal axis. We see that for most conceivable poverty lines, the poverty rate between 1990 and 2006 has fallen. In particular, this is true for the \$1/day, \$2/day and \$3/day lines, which are also displayed in Figure 11 as vertical lines.

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<sup>5</sup> This argument is made in Easterly (2009)

Figure 11



## 5 Inequality and Welfare

This section analyzes the evolution of inequality and welfare. Many analysts claim that, because Africa's economy is largely based on natural resources, the growth rate of the last decade has benefited mainly the political and economic elites that own those resources. If this were true, we should observe an explosion in all measures of income inequality. And, of course, this can be checked with our data. Figure 12 displays the overall Gini coefficient for Africa: starting at a level of around 0.63, the inequality index increased to around 0.66 during the 1970s and the first half of the 1980s. Then it stayed at that level until the early 1990s and started a downward trend that took it to its initial level by 2006. In other words, during the period of positive and sustained African growth (1995 to 2006), not only did inequality not explode – as it would have if all the growth had accrued to a narrow elite – but inequality actually declined substantially.



As is well known (e.g., Cowell 2000), the Gini coefficient is not decomposable in the sense that the sum of “within-country inequality” and “between-country inequality” do not add up to “global inequality”. Two measures of inequality that are decomposable are the Mean Logarithmic Deviation (MLD) and the Theil Index. The two belong to the family of Generalized Entropy (GE) indexes: the MLD is the GE Index with coefficient zero and the Theil index is the GE index with coefficient one. Figures 13 and 14 show global African inequality according to both the MLD and Theil indexes. They both follow a pattern similar to that of the Gini: increasing between 1970 and 1985, remaining at that level for a few years and, in 1990, beginning a downward trend until 2006.

When we decompose the overall inequality index into its two components we see that, in 1970, most of the overall African inequality can be accounted for by within-country inequality. Within-country inequality, however, declines over the sample period (indicating that it is not true that all the extra income generated by the growth process that took place between 1990 and 2006 went to a few) while between-country inequality increases, by 2006, the within- and between-country inequality measures are about the same. That is, by 2006, half of the overall inequality is accounted for by the within-country component and the other half by the between-country component.

Our estimates of African inequality allow us to measure African welfare. For example, Amartya Sen (1976) proposed a measure of welfare equal to GDP per capita time one minus the Gini coefficient. Since we have estimated the Gini coefficient, we can calculate the Sen index for Africa. The results are displayed in Figure 15: African welfare declined substantially between 1970 and 1995, but the trend was reversed dramatically between 1995 and 2006. During this decade, the two components of the index moved in the same direction: mean income increased and overall inequality declined. Hence, African welfare improved.

Figure 12

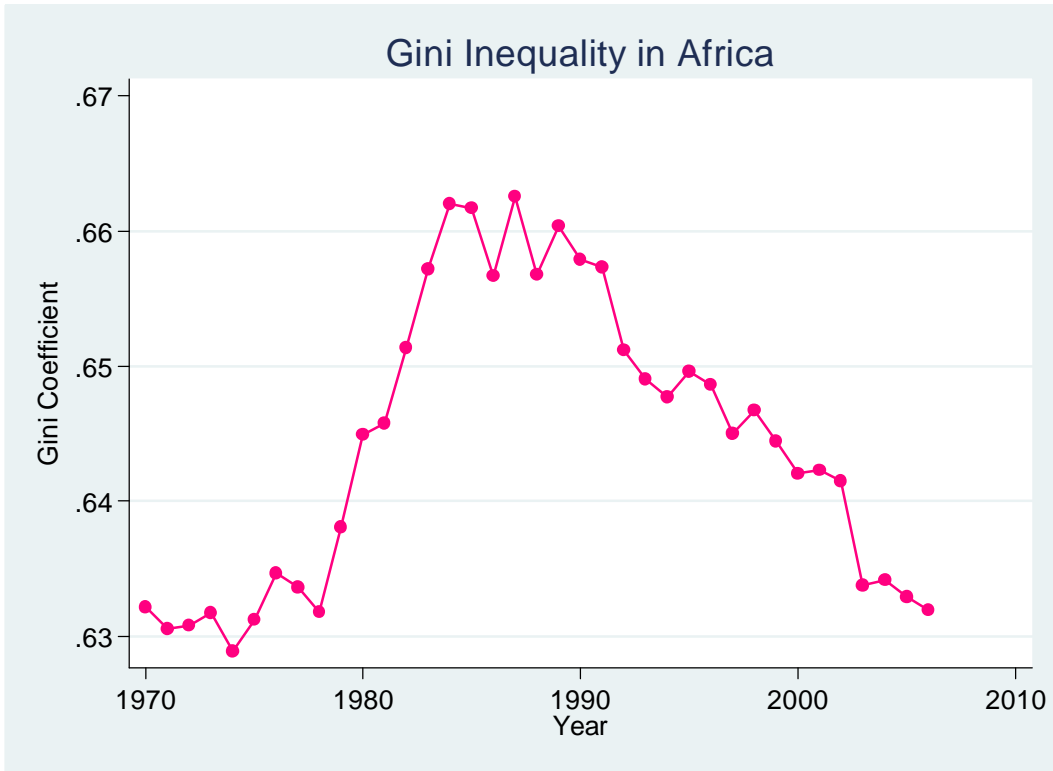


Figure 13

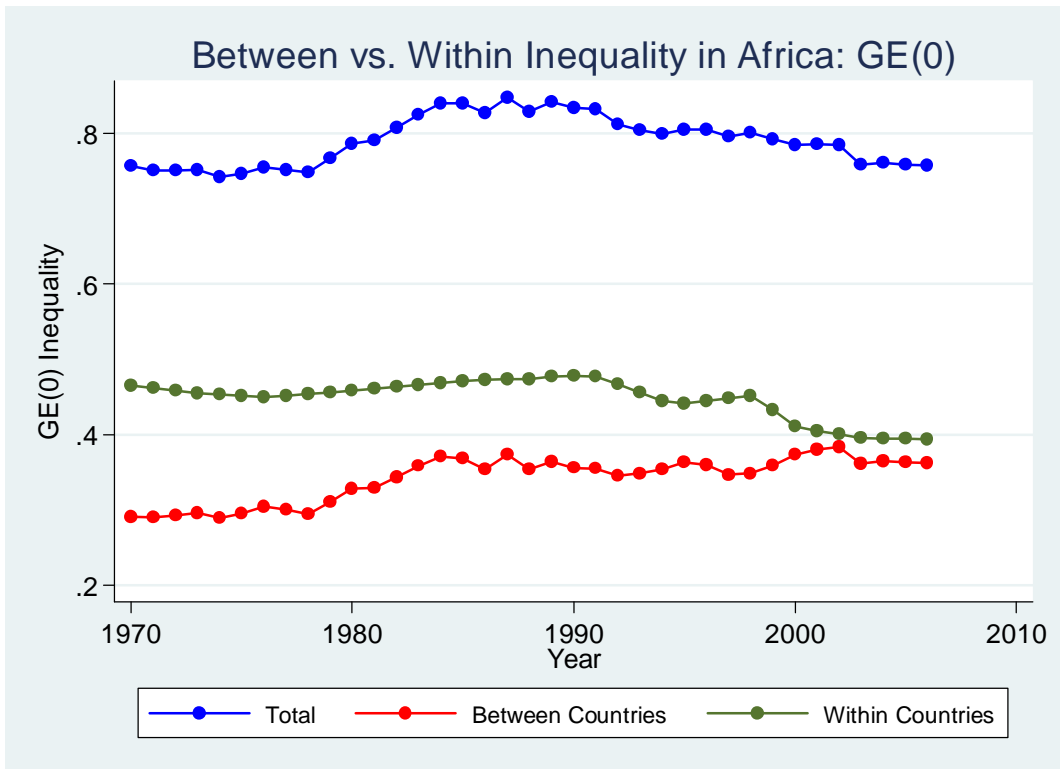


Figure 14

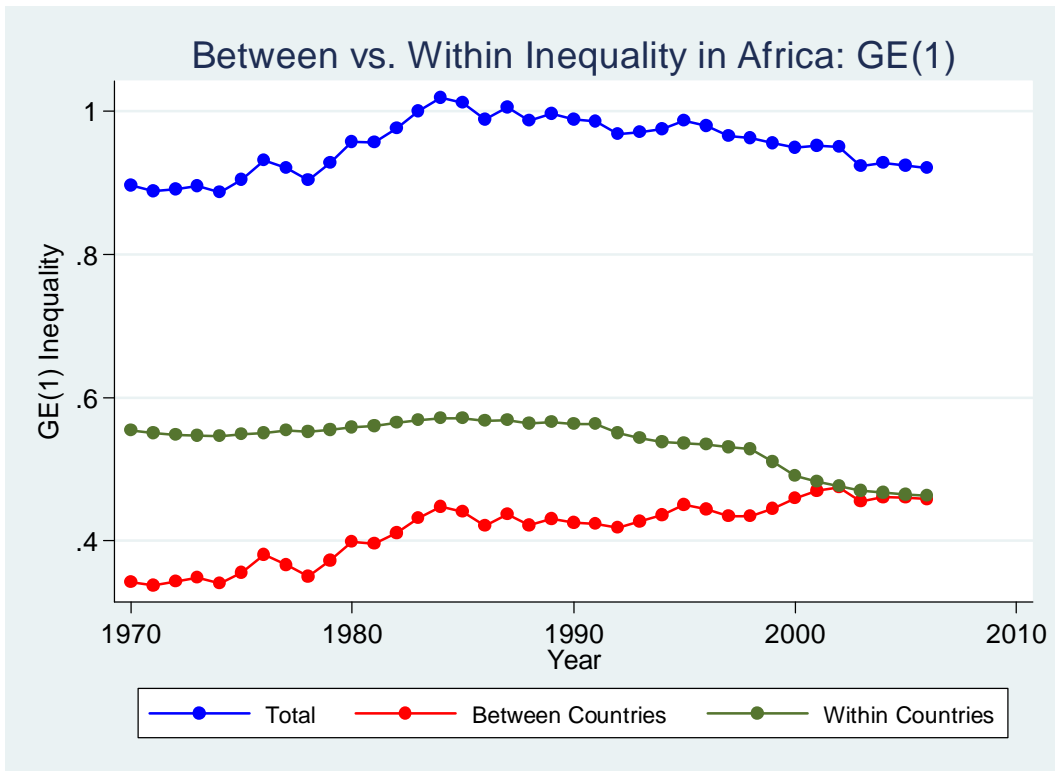
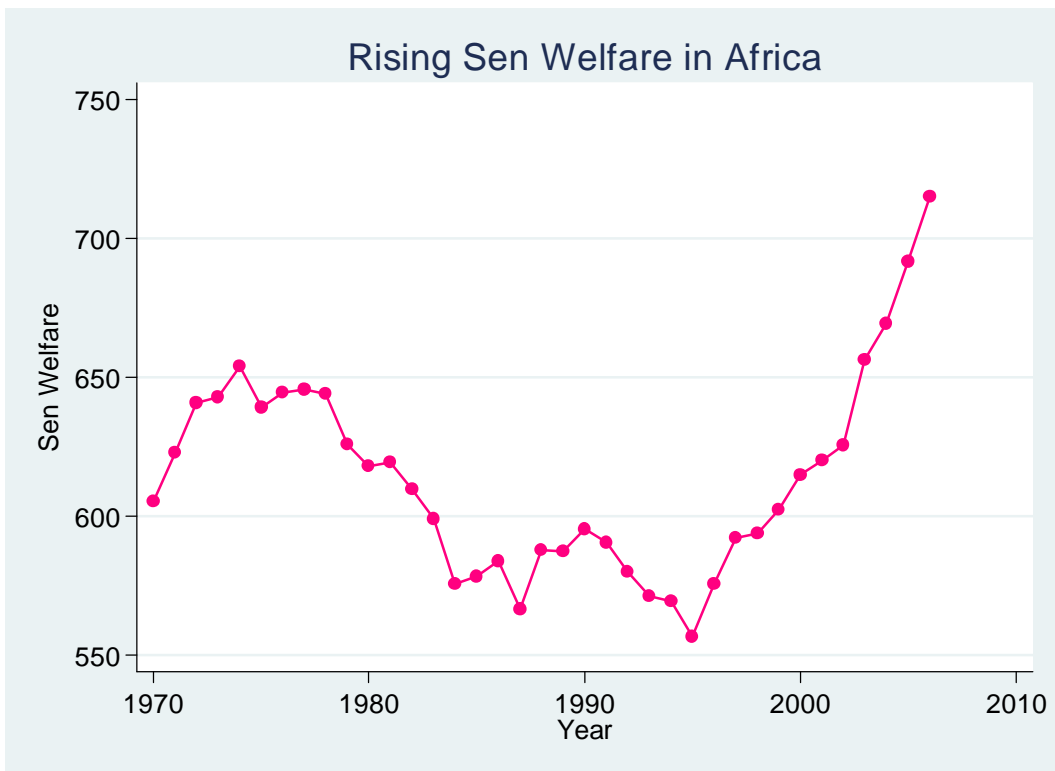


Figure 15



## 6 Regional Analysis

It is interesting to see whether African poverty reduction has been not only fast, but also general across characteristics of countries that the literature has identified as important for development. Bloom and Sachs (1998) point to adverse geography as a cause of slow development: in particular, countries that have unfavorable agriculture should be poorer than countries with more favorable conditions. Collier (2006) argues that coastal countries will perform better than landlocked countries in general. Also, mineral-rich countries should have been better-positioned than mineral-poor countries to take advantage of the increase in natural resource prices in the 2000s. For example, the 2008 UN Millennium Development Goals Report states that *“since 2002, one of the factors contributing to growth in many developing countries... has been the increased prices of commodities, including oil. For exporters, this has been a boon. But higher commodity prices, particularly oil prices, have dampened growth in countries importing these products. Many are among the poorest countries in the world.”* Collier (2006), suggests that being mineral-rich or mineral-poor will matter differently for coastal and landlocked countries.

Others have suggested that troubled history may have a persistent effect on growth performance. Nunn (2008), for example, argues that the African slave trade had *“particularly detrimental consequences, including social and ethnic fragmentation, political instability and a weakening of states, and the corruption of judicial institutions,”* which led the parts of Africa most affected by the slave trade to grow much slower than the parts that were not. La Porta et al. (1999) suggest that the identity of the colonizer mattered substantially for development. Since these factors are permanent (and cannot be changed with good policy), they imply that some parts of Africa may be at a persistent growth disadvantage relative to others.

In this section, we show the differential growth and poverty reduction performance of these types of African countries. Figure 16 breaks down Africa into landlocked and coastal countries. The list of countries in each category is provided in Appendix Table I. Panel A shows that between 1970 and 2006, both GDP per capita and the growth rate were larger for coastal than for landlocked countries. Panel B displays the evolution of the poverty rate for the two regions. As expected, the poverty rate for coastal countries is smaller. The interesting phenomenon, however, is that poverty in landlocked countries has also fallen. In fact, it has fallen faster than in coastal regions, especially over the last decade. Poverty in the mid-1990s was close to 55% for

the landlocked and about 35% the coastal countries. By 2006 the poverty rates in the two regions was 35% and 30% respectively. Hence, it does not appear that being landlocked is an insurmountable impediment to reducing poverty in Africa.

Figure 16

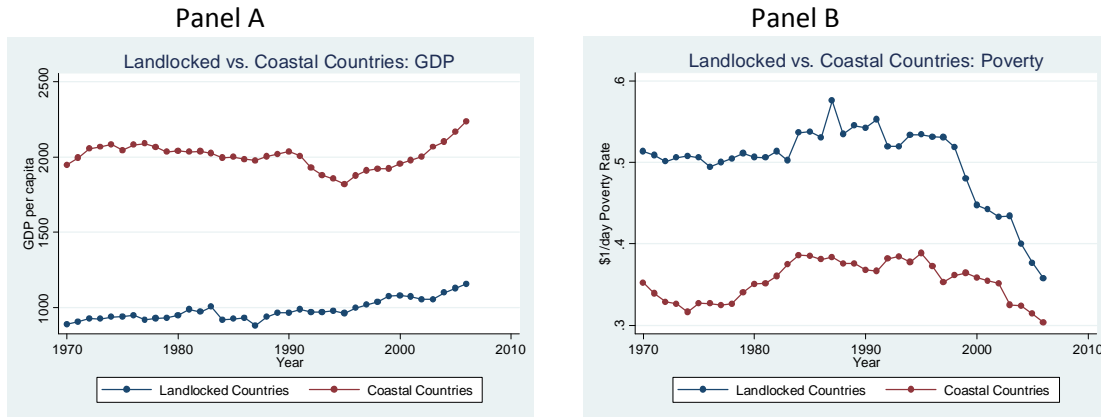
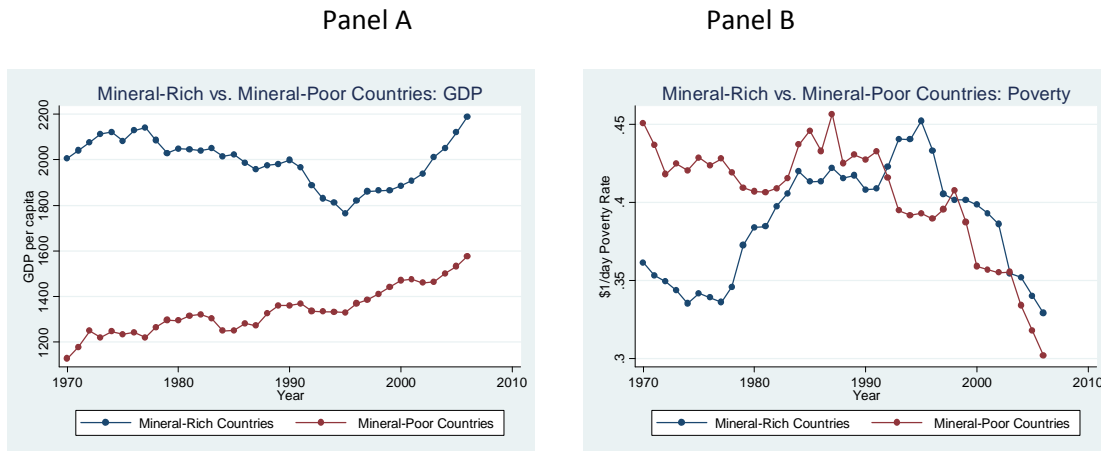


Figure 17 breaks down the sample of African countries into mineral-rich and mineral-poor. The definition of mineral-rich is taken from Nijkam (2008) and supplemented with data from the CIA World Factbook (2009).<sup>6</sup> The list of countries in each classification is provided in Appendix Table I. Panel A shows that mineral-rich countries have higher levels of GDP per capita and that their growth rate experienced an inflection at some point during the mid-nineties. GDP per capita for mineral-poor countries has been growing steadily throughout the sample period. Panel B shows that, while poverty rates in mineral-rich countries started out being much lower than in mineral-poor countries in the 1970s; by the mid-1980s the poverty rates in the two regions were about the same. Since then, the rates in mineral-rich and mineral-poor countries have fallen very similarly. By 2006, the poverty rate in mineral-poor was actually lower than in mineral-rich countries. Hence, the notion that African progress in poverty reduction is a statistical artifact due entirely or even mainly the favorable terms of trade shocks of the mineral-rich countries does not appear to be consistent with the data.

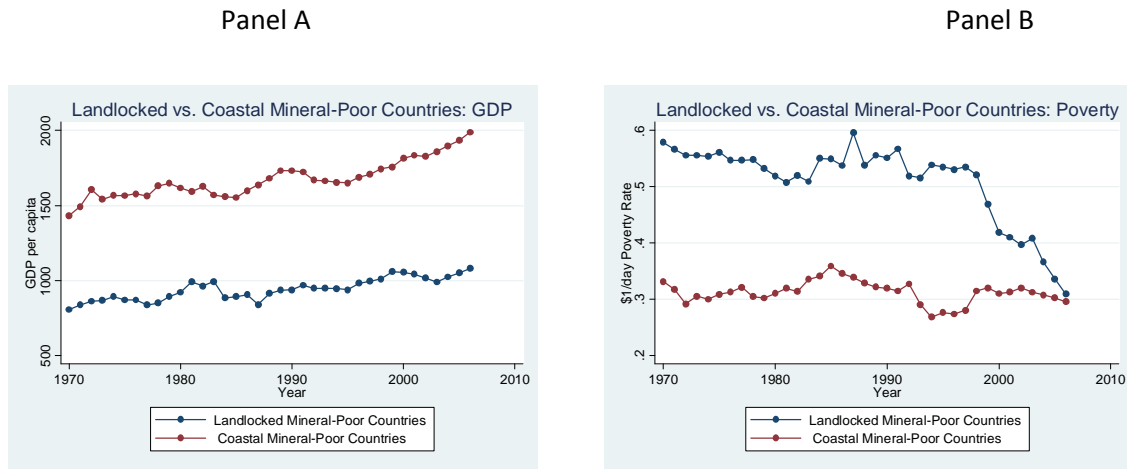
<sup>6</sup> For the mineral-rich/mineral-poor breakdown, as well as for the favorable/unfavorable agriculture breakdown, omitting the countries not classified by Nijkam (2008) from the analysis does not qualitatively change the results

Figure 17



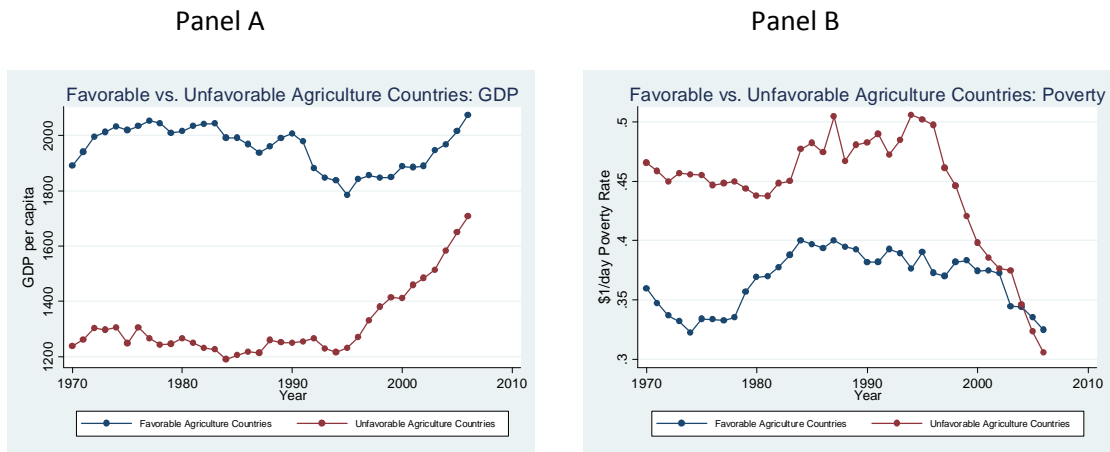
Following Collier (2006) we also look at the differential performance of mineral-poor countries depending on whether they are landlocked or coastal. The definitions are derived from Nijkam (2008) and the CIA World Factbook by combining the definitions for landlocked and mineral-poor countries that are presented in Appendix Table I. Figure 18 shows the GDP per capita and the poverty rates over time for these two sets of countries. Panel A confirms Collier (2006) by showing that the GDP per capita of landlocked mineral-poor countries is much lower than that of coastal mineral-poor countries. In fact, the GDP per capita of coastal mineral-poor countries is close to the average GDP per capita for sub-Saharan Africa as a whole. Panel B shows that the huge gap in GDP between landlocked and coastal mineral-poor countries has not been an insurmountable barrier to poverty reduction in the landlocked mineral-poor countries: since 1995, landlocked mineral-poor countries have cut their poverty rate by more than 20 percentage points, and by 2006, their poverty rate has fully converged to that of the coastal mineral-poor countries.

Figure 18



We now compare the performance of countries with favorable and unfavorable agricultural environments. The definition of favorable and unfavorable agriculture is taken from Nijkam (2008) and supplemented with data from the CIA World Factbook (2009). The list of countries in each category is provided in Appendix Table I. Panel A of Figure 19 shows that African countries with favorable agricultural environments are richer although countries with unfavorable agriculture seem to have converged over the last ten years. Panel B shows that the speed at which poverty has fallen in the unfavorable agriculture countries has been staggering: from more than 50% in the mid-nineties to just above 30% in 2006. The poverty rate of countries with favorable agricultural environments has fluctuated around 35% throughout the sample period, with a decline at the end of the sample period. Interestingly, the rate in 2006 was lower in the unfavorable than in the favorable countries, even though it was more than 10 basis points higher only ten years earlier.

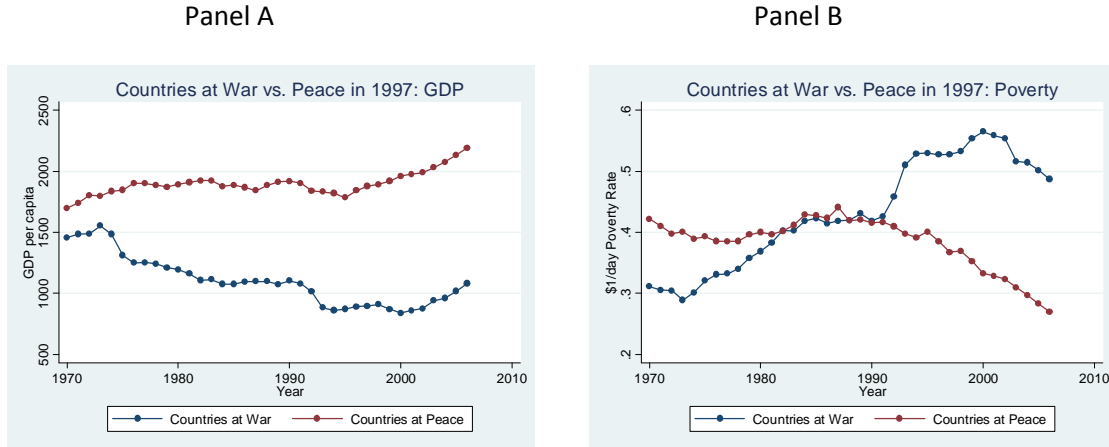
Figure 19



We now compare the performance of countries at war with countries at peace. Since many African countries have been at war at some point during the sample period, we use 1997 (the last year of the availability of Correlates of War data) as a breaking point. A country is labeled to be at war if it was at war in 1997 and it is labeled to be at peace if it is at peace in 1997 according to the Correlates of War dataset (Sarkees 2000). Appendix Table I provides a list of countries at war in 1997. Figure 20 shows the differential performance of both sets of countries. Countries at peace are richer and have experienced positive growth rates almost constantly during the sample period. Countries at war, on the other hand, experienced negative growth between 1970 and 2000 and a slight positive growth rate between 2000 and 2006. Panel B shows that the poverty rate of countries at peace was close to 40% in 1970 (larger than the rate of countries at war!). The rate remained almost constant for twenty years. But in 1990, the poverty rate of countries at peace started to decline. The rate was close to 25% by 2006. The poverty rate of countries at war, on the other hand, started at about 30% in 1970 and grew to about 55% by 2000. A small improvement during the last five years left the rate at just below 50% in 2006.

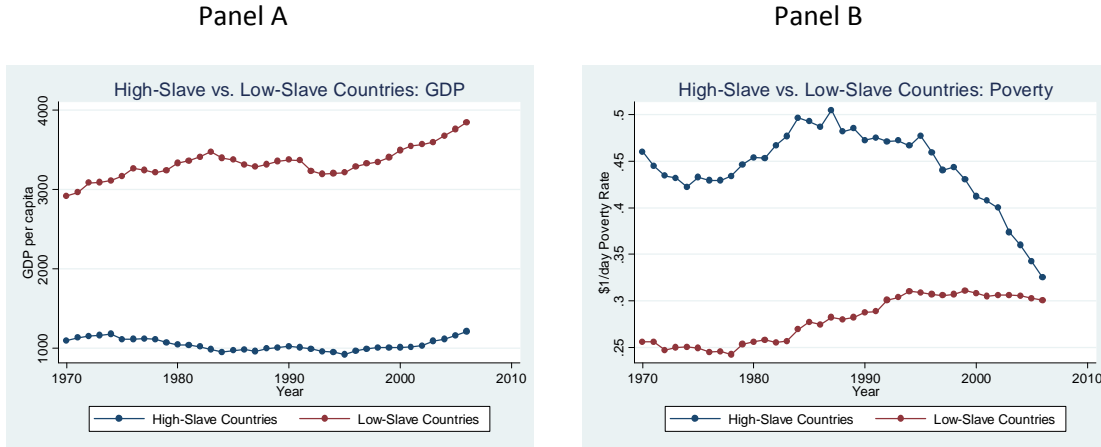


Figure 20



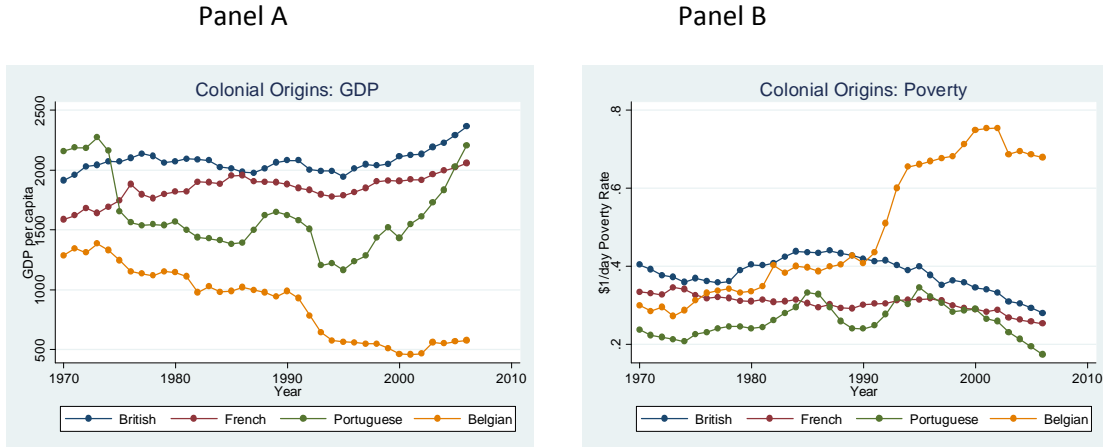
Nunn (2008) argues that a substantial part of Africa’s underdevelopment can be explained by the African slave trades. In essence, countries that did not suffer from the slave trades should tend to perform better than countries that did because the slave trades had damaging and permanent effects such as social and ethnic fragmentation, political instability and a weakening of states, and the corruption of judicial institutions. To assess this point Figure 21 decomposes Africa into countries that had slave exports per capita above (high-slave countries) and below (low-slave countries) the African median respectively. The definitions are taken from Nunn (2008) and the list of countries in each category is reported in Appendix Table I. Panel A shows that low-slave countries are richer in the sense of having larger GDP per capita than high-slave countries. Panel B shows that the evolution of poverty has been more favorable for high-slave countries. Starting from a level of over 50% in the mid 1980s, the poverty rate in high-slave countries declined dramatically over the following two and a half decades. The poverty rate was 35% in 2006. The poverty rate of low-slave countries, on the other hand, started at around 25% in the 1970s and it increased to over 30% by 1993. Poverty for low-slave countries levels off and slightly declines after 1995. It is surprising that poverty declines so little for the low-slave countries, but this can largely be explained because most of the growth that low-slave countries experienced since took place in countries that already had relatively low poverty in 1995, whereas the low-slave countries with substantial poverty grew relatively little in the aggregate since 1995.

Figure 21



Finally, we compare the experience of African countries by colonial origin. La Porta et al. (1999) argue that colonized countries inherited the legal framework of their colonizers and that some legal frameworks are more favorable to development than others. Panel A of Figure 22 displays the evolution of GDP. Former British colonies are richer than former French colonies. Portuguese colonies started out being the richest in 1970 but their GDP per capita declined rapidly in the 1970s due to the civil wars in Angola (1975-2002) and Mozambique (1977-1992). The positive growth rates over the last decade allowed the Portuguese colonies to become richer than the French colonies (although not richer than the British colonies) by 2006. Belgian former colonies (essentially Congo-Zaire and the two small countries of Rwanda and Burundi) witnessed a continued decline in GDP because of the poor performance of Congo-Zaire during the conflict surrounding the end of the Mobutu regime in 1997. The Congo war meant that poverty in the former Belgian colonies increased dramatically between 1990 and 2006 (Panel B). The evolution of poverty has been favorable for British, French and Portuguese colonies since the mid-1990s.

Figure 22



Our conclusion is that African poverty reduction has not only been large, but it also has been general, affecting many different types of countries. It is important to understand what our regional results do and do not imply. There is nothing in these results that should be interpreted as causal: the variation we are using is not exogenous. In particular, we cannot conclude that there is an “advantage to backwardness” because countries with disadvantaged history or geography reduce poverty faster (for instance, we may observe this because these countries are poorer in the first place, and have more poverty to reduce). However, we can conclude that neither geography nor history is destiny: it is possible for countries with poor geography and troubled history not only to reduce poverty rapidly, but to converge to the more advantaged countries, at least for the range of the data that we observe.

## 7 Robustness

In order to be confident in our results, we analyze changing the baseline specification in several directions. Figure 23 presents the \$1/day poverty rate for Africa under all the variations pertaining to extrapolation and functional form described in Section 2, as well as for World Bank and Maddison GDP. It is clear that the differences in estimates are very small, so that not only does poverty decline for each specification, but estimates from each specification follow the same qualitative pattern. Moreover, poverty declines across all specifications, so that the highest value for poverty across specifications in 2006 is less than the lowest value for poverty in

1970 (the starting year) or in 1995 (the year in which the declining trend begins). The only series that do not substantively match the baseline series are those for which the inequality parameters were produced by inverting the Gini, or by using the middle three quintiles only, as well as the series based on World Bank GDP after the PPP revision, which are shown in Figure 24. However, these three series also follow the same qualitative pattern as the baseline. Interestingly, the series based on the middle three quintiles, which should not depend on mismeasurements of income at the top or at the bottom of the distribution, shows a lower level of poverty for the entire sample period, which suggests that if the functional form assumption is correct, then mismeasurement of income takes place primarily for the poor, probably through undervaluing in-kind income.

Figures 25 and 26 present the series of the Gini coefficient for Africa. We again see that most of the series follow the baseline very closely. Only the series for different methods of computing lognormal parameters from quintiles and the series for Maddison GDP exhibiting large deviations from the baseline, but still with largely the same qualitative trends. The same is true for Figures 27 and 28, which show the series of Sen Welfare.

We also use these variations, alongside with the standard variations of excluding one large country, to perform a robustness check on our predictions for when the Millennium Development Goals will be achieved. Table II shows the results of the extrapolations. The MDGs are achieved in 2027 or earlier for all variations, with the MDGs achieved between 2013 and 2020 for most variations. While for some variations (e.g. using revised World Bank GDP), the MDGs are achieved twelve years behind schedule, for most of them, the MDGs are late by no more than 5 years, and for all of them, the poverty-reducing performance of Africa over the past 11 years (1995-2006) suggests that the Millennium Development Goals will be met in a reasonable amount of time. Table III shows the results of the extrapolations if Congo-Zaire is excluded from extrapolation, which assumes that as Congo-Zaire recovers from its war, it will reduce poverty sufficiently quickly to converge to the African mean poverty level. Then, the MDGs are met by 2015, except for the variations involving changing the source of GDP, and even then, the Millennium Development Goals are met by 2022. In results not reported, we check that the regional results described in Section 6 are valid qualitatively with the omission of any large country.

A final, but important, concern is that our results are being driven by survey selection. First, the number of surveys declines for the last years of the sample. If our extrapolation procedure understates inequality in Africa for these years, then poverty reduction will appear greater than it really is. This concern is partially addressed by our variations for extrapolation; neither the series with linear extrapolation nor the one with horizontal extrapolation vary much from the baseline series. Since the linear extrapolation series is sensitive to trends in inequality at the end of the sample period, this means that there were no incipient trends for inequality to rise in large African countries, which might have produced rising inequality in Africa overall that might have prevented growth from translating into poverty reduction. A further concern is that the surveys at the beginning of the period tend to be income surveys, whereas the surveys at the end of the period overwhelmingly are consumption surveys, and income is more unequally distributed than consumption is. Hence, the fall in inequality that we observe during the 1990s and the 2000s might simply be a result of inadequately correcting for the fact that consumption inequality is lower than income inequality.

To investigate these concerns explicitly, we plot the poverty and inequality series alongside with measures of survey availability: We construct the fraction of Africans either covered by an income survey, or with there being an income survey in their country both before and after the given year, for each year, and similarly for consumption surveys. These fractions are the income and consumption “cores” plotted in Figures 29 and 30, and they show the extent of coverage of income and consumption surveys. Looking at Figure 29, we see that the decline in poverty rates begins long after most surveys are consumption surveys, and that the trend in poverty decline is nearly identical (though slightly smaller) before the collapses in the fraction covered by surveys in 2000 and 2003 as afterwards. Moreover, from Figure 30 we see that while the collapse in survey coverage is accompanied by a leveling off of the Gini, this leveling off breaks a long-running downward trend in the Gini, and so, if anything, *exaggerates* inequality in the years 2002-2006. The decline in the Gini over the 1990s occurs long after the time that most of the surveys become consumption surveys, and occurs under a high survey coverage rate. To argue that we are understating inequality in the later parts of the sample period, one needs to assert that this declining trend broke abruptly in 2002-2006, and there is nothing in the data to support such an assertion.

Figure 23

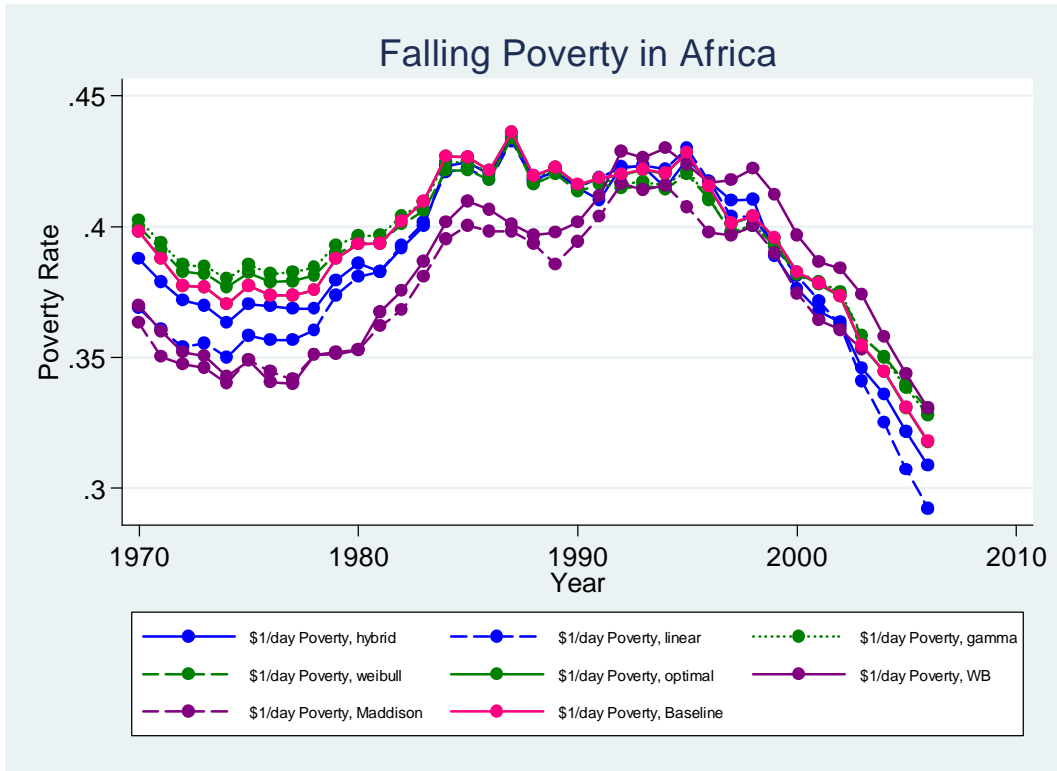


Figure 24

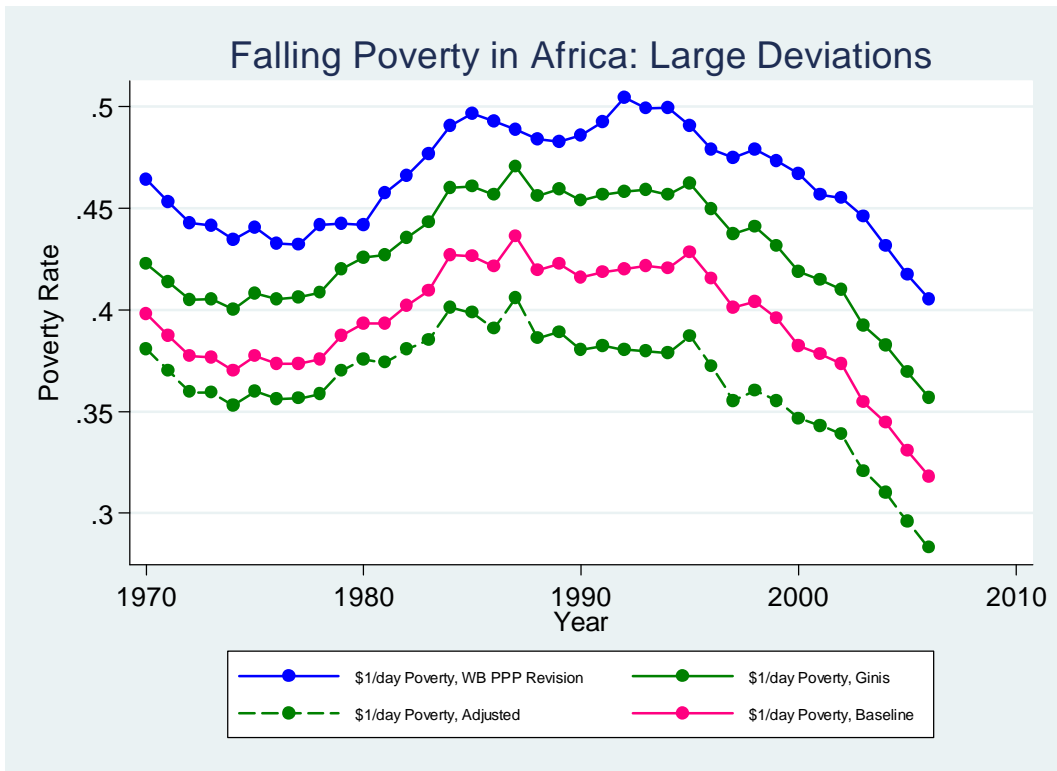


Figure 25

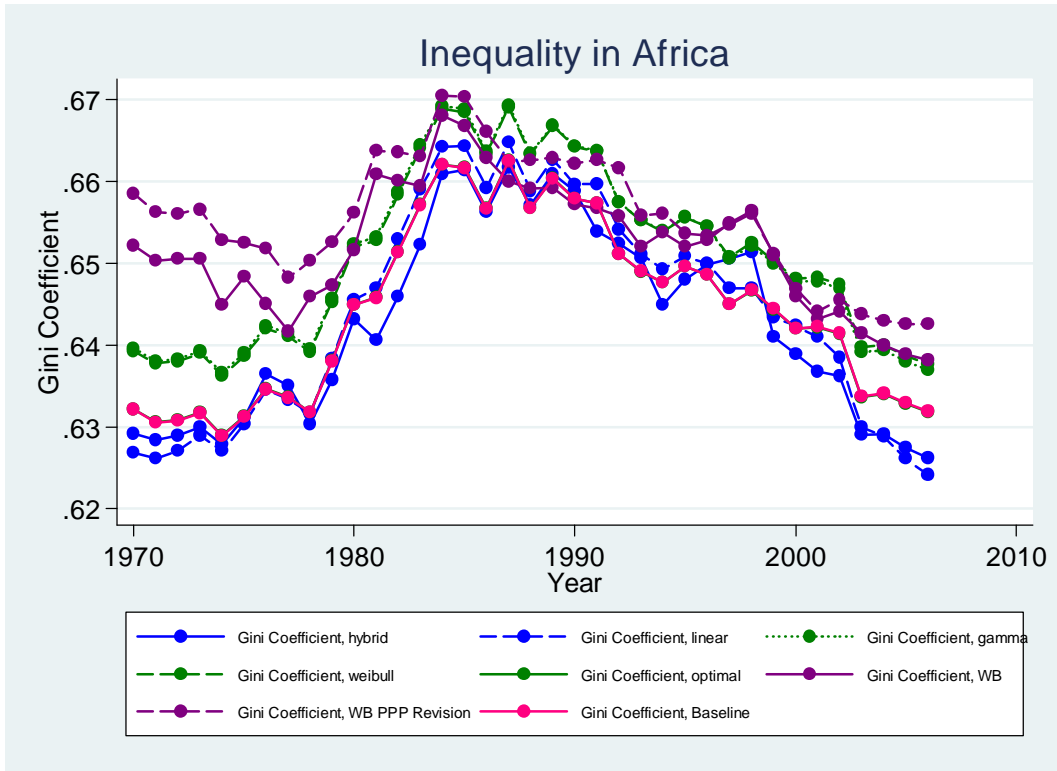


Figure 26

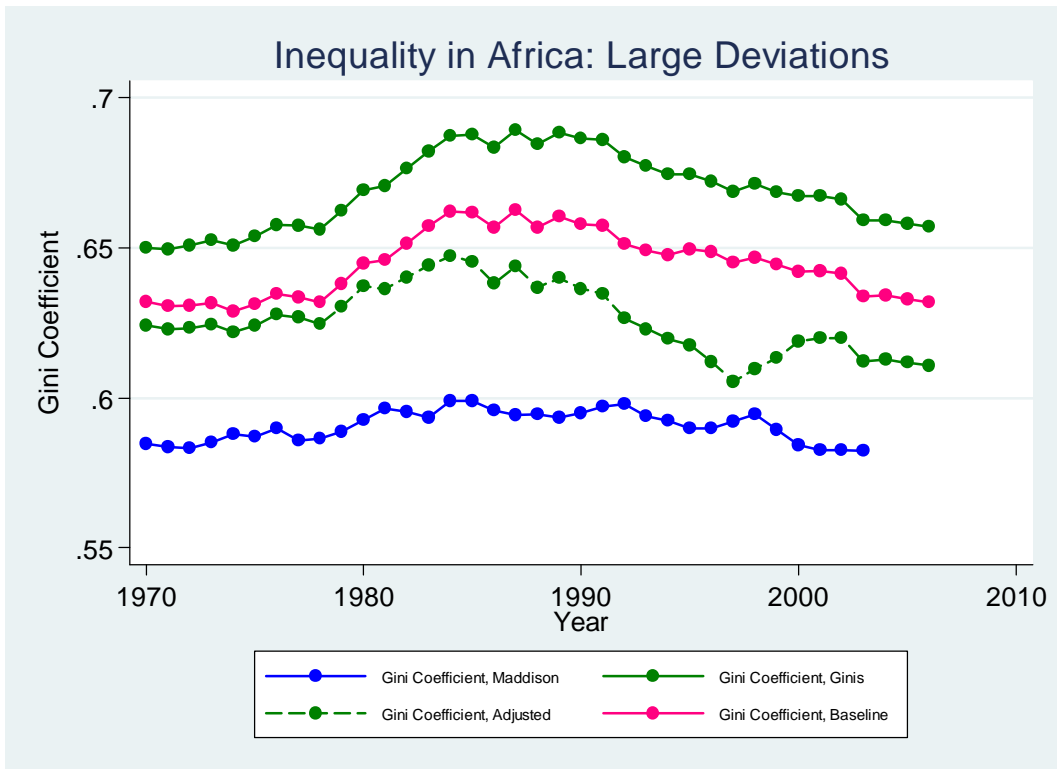


Figure 27

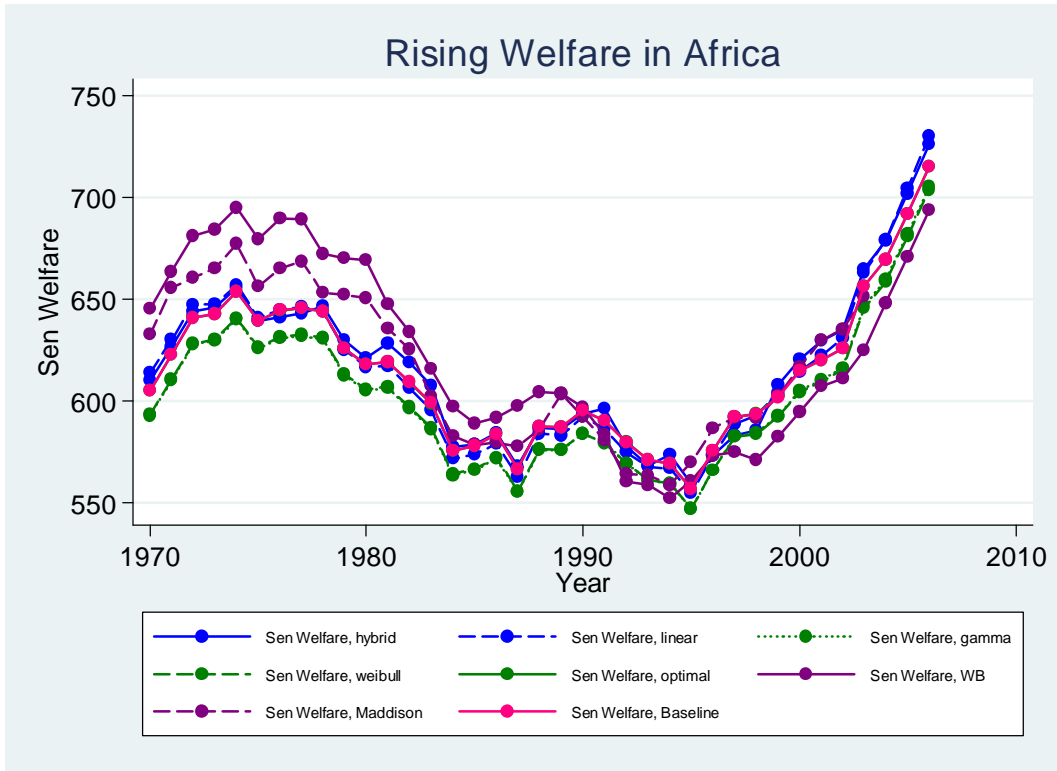


Figure 28

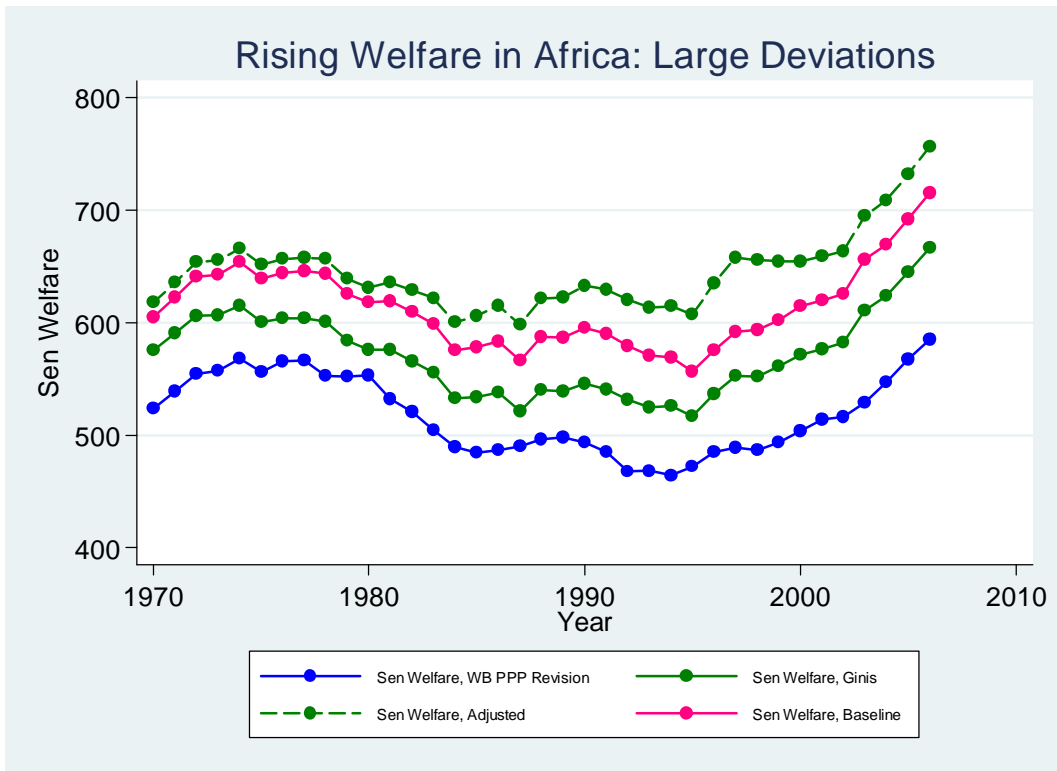




Figure 29

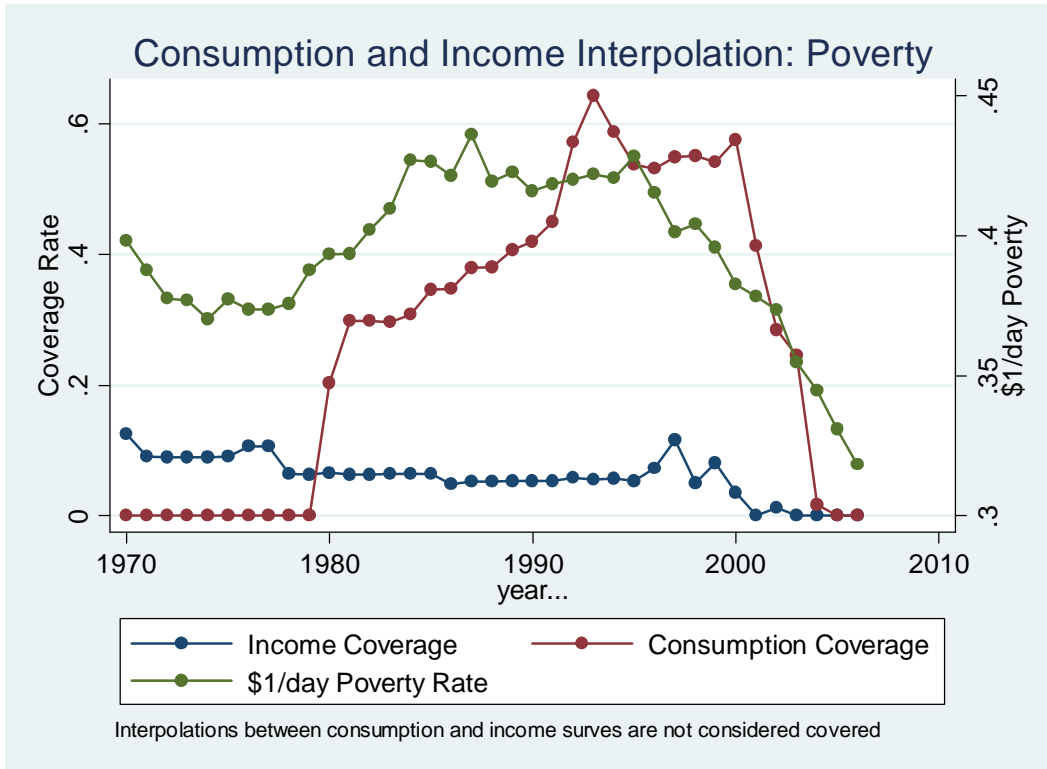
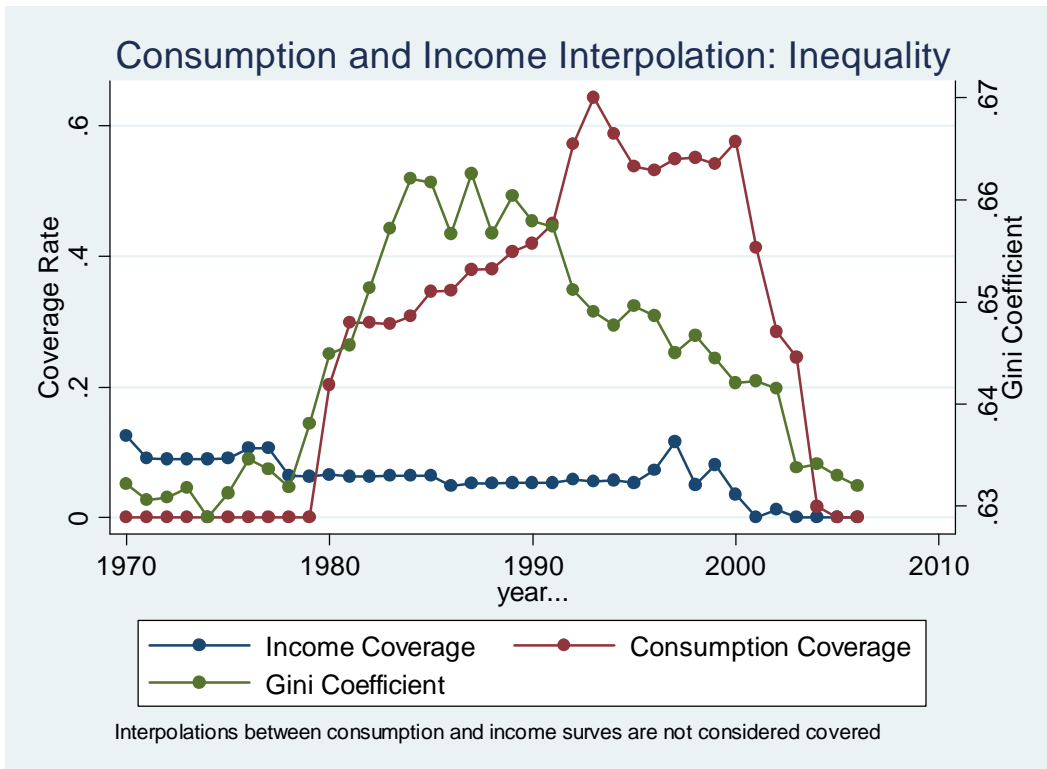


Figure 30



## 8 Conclusion

Our main conclusion is that Africa is reducing poverty, and doing it much faster than we thought. The growth from the period 1995-2006, far from benefiting only the elites, has been sufficiently widely spread that both total African inequality and African within-country inequality actually declined over this period. In particular, the speed at which Africa has reduced poverty since 1995 puts it on track to achieve the Millennium Development Goal of halving poverty relative to 1990 by 2015 on time or, at worst, a couple of years late. If Congo-Zaire converges to Africa once it is stabilized, the MDG will be achieved by 2012, three years before the target date. These results are qualitatively robust to changes in our methodology, including using different data sources and assumptions for what happens to inequality when inequality data is not available.

We also find that the African poverty reduction is remarkably general: it cannot be explained by a large country, or even by a single set of countries possessing some beneficial geographical or historical characteristic. All classes of countries, including those with disadvantageous geography and history, experience reductions in poverty. In particular, poverty fell for both landlocked as well as coastal countries; for mineral-rich as well as mineral-poor countries; for countries with favorable or with unfavorable agriculture; for countries regardless of colonial origin; and for countries with below- or above-median slave exports per capita during the African slave trade. This observation is particularly important because it shows that poor geography and history have not posed insurmountable obstacles to poverty reduction. The lesson we draw is largely optimistic: even the most troubled parts of the poorest continent can set themselves firmly on the trend of limiting and even eradicating poverty within the space of a decade.

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## Appendix Table I: Classification of Countries

Country	Landlocked	Mineral Rich	Favorable Agriculture	British Colony	French Colony	Portuguese Colony	Belgian Colony	High Slave Exports	War in 1997
Angola	0	1	0	0	0	1	0	1	1
Burundi	1	0	0	0	0	0	1	0	1
Benin	0	0	1	0	1	0	0	1	0
Burkina Faso	1	0	0	0	1	0	0	1	0
Botswana	1	1	0	1	0	0	0	0	0
Central African Republic	1	1	1	0	1	0	0	0	0
Cote d'Ivoire	0	0	1	0	1	0	0	1	0
Cameroon	0	1	1	0	1	0	0	0	0
Congo, Rep.	0	1	1	0	1	0	0	1	1
Comoros	0	0	0	0	1	0	0	0	0
Cape Verde	0	0	0	0	0	1	0	0	0
Ethiopia	1	0	0	0	0	0	0	1	0
Gabon	0	1	0	0	1	0	0	0	0
Ghana	0	0	1	1	0	0	0	1	0
Guinea	0	1	1	0	1	0	0	1	0
Gambia, The	0	0	1	1	0	0	0	1	0
Guinea-Bissau	0	0	1	0	0	1	0	1	0
Equatorial Guinea	0	1	0	0	0	0	0	0	0
Kenya	0	0	1	1	0	0	0	0	0
Lesotho	1	1	1	1	0	0	0	0	0
Madagascar	0	0	0	0	1	0	0	1	0
Mali	1	0	0	0	1	0	0	1	0
Mozambique	0	0	0	0	0	1	0	1	0
Mauritania	0	1	0	0	1	0	0	1	0
Mauritius	0	0	0	1	0	0	0	0	0
Malawi	1	0	1	1	0	0	0	1	0
Namibia	0	1	0	1	0	0	0	0	0
Niger	1	1	0	0	1	0	0	0	0
Nigeria	0	1	1	1	0	0	0	1	0
Rwanda	1	0	0	0	0	0	1	0	1
Senegal	0	0	1	0	1	0	0	1	0
Seychelles	0	0	0	0	1	0	0	0	0
Togo	0	0	1	0	1	0	0	1	0
Tunisia	0	0	0	0	1	0	0	0	0
Tanzania	0	1	0	1	0	0	0	1	0
Uganda	1	1	1	1	0	0	0	0	1
South Africa	0	1	1	1	0	0	0	0	0
Congo, Dem. Rep.	0	1	1	0	0	0	1	1	1
Zambia	1	1	1	1	0	0	0	0	0
Zimbabwe	1	0	1	1	0	0	0	0	0
Sao Tome and Principe	0	0	1	0	0	1	0	0	0
Chad	1	1	0	0	1	0	0	1	0
Sierra Leone	0	1	1	1	0	0	0	1	0
Liberia	0	1	0	0	0	0	0	0	0
Sudan	0	1	1	1	0	0	0	1	1
Somalia	0	0	0	0	0	0	0	0	1
Swaziland	0	0	1	1	0	0	0	0	0
Eritrea	0	0	0	0	0	0	0	1	0
Total	48	19	23	17	18	5	3	24	8

Note: "1" indicates country belongs to category, "0" that it does not belong, red numbers indicate imputation on basis of CIA World Factbook. Sources: for geographical variables, Nijkam (2008) and the CIA World Factbook, for the war variable, Correlates of War (2008).

## Tables

### Table I: African Poverty Rates and Projections

Year	\$1/day Poverty	\$2/day Poverty	Year	\$1/day Poverty	\$2/day Poverty
1970	0.398	0.652	1999	0.396	0.654
1971	0.388	0.643	2000	0.383	0.652
1972	0.378	0.634	2001	0.378	0.649
1973	0.377	0.634	2002	0.374	0.645
1974	0.370	0.628	2003	0.355	0.630
1975	0.377	0.637	2004	0.345	0.622
1976	0.374	0.634	2005	0.331	0.609
1977	0.374	0.634	2006	0.318	0.595
1978	0.376	0.634	2007	0.308	0.587
1979	0.388	0.644	2008	0.298	0.579
1980	0.393	0.649	2009	0.288	0.572
1981	0.394	0.648	2010	0.278	0.564
1982	0.402	0.653	2011	0.268	0.557
1983	0.410	0.660	2012	0.258	0.549
1984	0.427	0.673	2013	0.248	0.541
1985	0.426	0.671	2014	0.238	0.534
1986	0.421	0.666	2015	0.228	0.526
1987	0.436	0.672	2016	0.218	0.518
1988	0.419	0.663	2017	0.208	0.511
1989	0.423	0.662	2018	0.198	0.503
1990	0.416	0.658	2019	0.188	0.496
1991	0.419	0.659	2020	0.178	0.488
1992	0.420	0.666	2021	0.168	0.480
1993	0.422	0.671	2022	0.158	0.473
1994	0.421	0.672	2023	0.148	0.465
1995	0.428	0.679	2024	0.138	0.457
1996	0.415	0.666	2025	0.128	0.450
1997	0.401	0.657			
1998	0.404	0.657			

Note: red numbers are projections based on linear extrapolation at the average poverty reduction rate between 1995 and 2006.

**Table II: African Poverty Reduction, Sensitivity Analysis**

Variation	Poverty Rate in 1990	Poverty Rate in 2006	Percentage Poverty Reduction 1990-2006	Projected Poverty in 2015	Projected Poverty Reduction, 1990-2015	Year in which MDG Attained
Baseline	41.6%	31.8%	-23.5%	22.8%	-45.2%	2017
Hybrid Extrapolation	41.5%	30.9%	-25.6%	21.3%	-48.7%	2016
Linear Extrapolation	41.5%	29.2%	-29.6%	17.9%	-56.8%	2013
Ginis	45.4%	35.7%	-21.4%	27.1%	-40.3%	2020
Adjusted	38.0%	28.3%	-25.6%	19.8%	-48.0%	2016
Gamma, Ginis	45.4%	36.7%	-19.1%	29.6%	-34.9%	2024
Gamma, Regular	41.6%	32.8%	-21.1%	25.2%	-39.4%	2020
Gamma, Adjusted	34.6%	26.5%	-23.5%	19.3%	-44.3%	2017
Weibull, Ginis	44.9%	36.5%	-18.7%	29.4%	-34.6%	2024
Weibull, Regular	41.3%	33.0%	-20.2%	25.6%	-38.0%	2021
Weibull, Adjusted	34.1%	26.4%	-22.4%	19.8%	-42.0%	2019
Optimal, Ginis	45.4%	35.7%	-21.4%	27.0%	-40.4%	2020
Optimal, Regular	41.6%	31.8%	-23.6%	22.8%	-45.3%	2017
Optimal, Adjusted	37.9%	28.2%	-25.7%	19.7%	-48.1%	2016
World Bank	40.2%	33.1%	-17.6%	25.5%	-36.6%	2021
Maddison	39.4%	35.3%*	-10.4%*	27.2%	-31.1%	2026
World Bank, PPP Revision	48.6%	40.5%	-16.6%	33.6%	-30.9%	2027
Excludes Nigeria	40.6%	33.2%	-18.3%	25.9%	-36.2%	2022
Excludes Ethiopia	38.4%	32.2%	-16.1%	25.0%	-34.9%	2022
Excludes Congo-Zaire	41.3%	27.9%	-32.3%	17.7%	-57.0%	2012
Excludes South Africa	44.4%	33.6%	-24.3%	23.9%	-46.3%	2017
Excludes Sudan	41.5%	32.0%	-22.9%	23.0%	-44.6%	2017
Excludes Tanzania	40.2%	32.0%	-20.4%	24.3%	-39.4%	2020
Excludes Kenya	41.5%	31.5%	-24.2%	21.6%	-48.0%	2016
Excludes Uganda	41.0%	31.4%	-23.4%	22.4%	-45.4%	2017

Note: We assume that poverty declines linearly at the average rate of decline between 1995 and 2006

\* The Maddison GDP series we use goes up to 2003 instead of 2006.

**Table III: African Poverty Reduction, excluding Congo-Zaire: Sensitivity Analysis**

Variation	Poverty Rate in 1990	Poverty Rate in 2006	Percentage Poverty Reduction	Projected Poverty in 2015	Projected Poverty Reduction, 1990-2015	Year in which MDG Achieved
Baseline	41.3%	27.9%	-32.3%	17.7%	-57.0%	2012
Hybrid Extrapolation	41.2%	26.9%	-34.6%	16.1%	-60.8%	2011
Linear Extrapolation	41.2%	25.1%	-39.0%	12.5%	-69.6%	2009
Ginis	45.1%	32.1%	-28.8%	22.4%	-50.3%	2015
Adjusted	37.7%	24.2%	-36.0%	14.5%	-61.7%	2011
Gamma, Ginis	45.3%	33.6%	-25.7%	25.5%	-43.6%	2018
Gamma, Regular	41.4%	29.4%	-28.9%	20.7%	-49.9%	2015
Gamma, Adjusted	34.5%	22.5%	-34.7%	14.2%	-58.8%	2012
Weibull, Ginis	44.7%	33.4%	-25.4%	25.3%	-43.4%	2018
Weibull, Regular	41.2%	29.7%	-27.9%	21.3%	-48.3%	2016
Weibull, Adjusted	33.9%	22.6%	-33.4%	14.8%	-56.3%	2013
Optimal, Ginis	45.0%	32.0%	-28.8%	22.3%	-50.4%	2015
Optimal, Regular	41.3%	27.9%	-32.4%	17.7%	-57.1%	2012
Optimal, Adjusted	37.6%	24.0%	-36.1%	14.3%	-61.9%	2011
World Bank	41.1%	31.1%	-24.1%	22.6%	-44.9%	2017
Maddison	38.4%	31.4%*	-18.3%*	21.3%	-44.4%	2018
World Bank, PPP Revision	47.1%	36.8%	-21.9%	29.2%	-38.0%	2022

\* The Maddison GDP series we use goes up to 2003 instead of 2006