Can Africa Reduce Poverty by Half by 2015?*

by

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Abstract
This study uses simulations to explore the possibility of halving the percentage of people living in extreme poverty in Africa by 2015. It is shown that initial levels of inequality and per capita consumption determine the cumulative growth and inequality reductions required to achieve the target. The study finds that on average Africa only needs a relatively modest annual rate of growth in per capita household consumption to halve poverty by 2015 if inequality remains unchanged. The trade-off between growth and changes in inequality varies greatly among countries and their policy-choices are thus quite different. In some cases small changes in income-distribution can have a large effect on poverty, while in others a strong focus on growth is the only viable option.

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1. Introduction

The international community has formulated Millennium Development Goals to be reached by 2015. The first of these goals (MDG1) is that the proportion of people with an income less than $1/day shall be reduced to half of what it was in 1990. From 1990 to 2001 the headcount-ratio of poverty for all LDCs fell from 27.9% to 21.1%, but for Africa it actually increased from 44.6% to 46.4% (Chen and Ravallion, 2004).[1] It is not surprising then that several recent studies (e.g. UNDP, 2003, Naschold, 2004) have argued that most African countries will fail to reach the target.[2]

The change in poverty for a given rate of economic growth defines the elasticity of poverty with respect to growth, which depends on the level of the poverty line, per-capita income or consumption expenditure, and its distribution among the population (Kakwani, 1993; Datt and Ravallion, 1992). Although it varies with the level of economic development and income-distribution (Bourguignon, 2002, 2004), for simplicity, most studies have used a constant elasticity of poverty with respect to growth. Exceptions are Chen and Ravallion (1998), who demonstrated that the elasticity of poverty varies with regard to such initial conditions as level of poverty and income inequality. They also showed that countries with high initial poverty and inequality require higher rates of growth to meet the MDG1. This study examines these insights regarding the determinants of the elasticity of poverty to assess the challenge of achieving MDG1 in Africa. Specifically, the study examines the validity of the widely accepted view that a very high growth rate of GDP (7% and above) is required to reach MDG1 for most countries in Africa, and whether the recent resurgence of growth in African economies might be a reason for some optimism. In addition, the study considers how the effectiveness for distributional policies to achieve poverty reduction varies with initial conditions. We show that the attainment of MDG1 is very much dependent on the income/inequality trade-off in each country, which varies with the initial level of both income and inequality, consistent with previous findings. Focusing on growth alone might not generally be the best way to halve poverty by 2015, since a slight decline in inequality might lead to a substantial

[1] These estimates are based on nationally representative household surveys in 97 countries.
[2] The studies largely extrapolated linearly from data on poverty-changes over short periods. Most used estimates of the elasticity of poverty with respect to growth as the basis for extrapolation.

decline in poverty in some cases. Thus it is necessary to study and understand the growth-inequality-poverty nexus empirically.

This paper finds that on average Africa only needs a relatively modest annual rate of growth in per capita household consumption to reach MDG1 if inequality remains unchanged. Also, if current growth rates are maintained, nearly half of the countries in our sample can even afford some increase in inequality and still be able to reduce poverty by half in 2015. In light of this the paper argues that the difficulty African economies have had in sustaining positive per capita income growth rates is a key problem when it comes to reaching MDG1 in Africa.

The next section explains the analytical framework used, while Section 3 briefly describes the data sources, poverty lines and estimating-equations. Section 4 discusses the results. Section 5 presents some of the challenges in meeting MDG1 in the African context, and Section 6 summarizes and concludes the paper.

2. Analytical Framework

Since the statement of the International Development Goals by the OECD in the mid-1990s, several studies have used the elasticity of poverty with respect to growth to evaluate the growth required to halve poverty by 2015 (Demery and Walton, 1998; ECA, 1999; Hanmer and Naschold, 1999, 2000).

Any poverty measure can be defined over per capita income and a measure of income-inequality (Kakwani, 1993; Ravallion, 1992), and there are a few different approaches available to estimate the elasticity of poverty with respect to growth. One is an econometric approach, where data on poverty, inequality, and per capita income are used to generate elasticity coefficients from a regression of the log of poverty on logs of per capita income and a measure of inequality, often the Gini coefficient. This approach is frequently used (e.g., Ali and Thorbecke, 2000; Fosu, 2006) in cross-country studies, where data on poverty and inequality are not available for more than one period in a given country. Another approach is simply to use the ratio of change in poverty to change in income over a given period as a measure of the elasticity of poverty with respect to growth (e.g., Ravallion, 2001). In the absence of data on

poverty and growth spells, it is possible to decompose changes in a poverty-measure into growth and inequality components based on the characteristics of the Lorenz function (e.g., Kakwani, 1993; Datt and Ravallion, 1992; Bourguignon, 2002; and Kraay, 2004). The data-requirement for this approach is minimal (one-period information on inequality is sufficient). That is, it is possible to construct growth requirements to reach MDG1 using Lorenz parameters under the assumption that growth remains distributional neutral over the target period and work out the implications of changes in inequality on the growth requirement to meet MDG1. This approach does not require assuming constant elasticity of poverty with respect to growth over the target period, which generally overstates the amount of growth required to reach MDG1. In addition, with an appropriate transformation of Lorenz functions, it is possible to establish a one to one relationship between the growth and reduction in inequality required to attain a target level of poverty. The discussions below about the possibility of achieving MDG1 in Africa are based mainly on the last mentioned approach, since for most African countries the data available on inequality is limited to one period. But some results based on the other approach are also reported, both to gain further insights about the elasticity of poverty with respect to growth and to check the robustness of the reported values.

Following Kakwani (1993) and Datt (1998), we use the Lorenz function as the basic building block for analyzing the growth rate required to halve poverty[3] by 2015. It has the following properties:

$$L = L(p, \pi) \quad L'(p) > 0, L''(p) < 0 \tag{1a}$$

$$P = P(\mu / z, \pi) \tag{1b}$$

L is the share of the bottom p percent of the population in aggregate consumption and π is a vector of parameters of the Lorenz curve estimable from a specific functional form that characterize income distribution. P is a poverty measure obtained from the

[3] We use the Foster, Greer and Thorbecke (1984) indices of poverty, which among suggested in the literature, meet most of the desirable properties. See Hagenaars (1987) for an excellent review of the literature on the measurement of poverty.

slope of the Lorenz curve at poverty line z and per capita income μ, and parameters of the Lorenz function. There are two frequently used functional forms to capture Lorenz curves: the General Quadratic Lorenz function (Villasenor and Arnold, 1989) and the Beta Lorenz function (Kakwani, 1980) for which there is a widely available freeware (POVCAL)[4] to estimate the underlying parameters and poverty indices commonly used in the development literature (see also Datt, 1998 for further details). Once the parameters of the Lorenz function are estimated it is possible to use established results to compute the amount of growth required to reach MDG1 without changes in income distribution, and alternatively the amount of reduction in inequality needed to reach MDG1 without growth. To operationalize this, we use the well-known result that the slope of the Lorenz curve at the poverty line z and per capita income μ_0 is:

$$L'(P_0) = \frac{z}{\mu_0} \tag{2}$$

which thus implies that:

$$P_0 = L'^{-1}(\frac{z}{\mu_0}) \tag{3}$$

At half of P_0, the Lorenz function would be:

$$\frac{P_0}{2} = P_* = L'^{*-1}(z/\mu_*) \tag{4}$$

Thus, to compute the per capita income level μ_* consistent with poverty level $0.5*P_0$ without a change in the Lorenz curve, one only needs to use equation (3) and (4) such that:

$$\frac{L(P_0)}{L(P_*)} = \frac{\mu_0}{\mu_*} \tag{5}$$

[4] www.worldbank.org/html/prdph/lsms/tools/povcal

Since the LHS of equation (5) and the numerator on the RHS are known parameters, it is possible to compute the cumulative growth required to reach MDG1 by 2015 assuming that the Lorenz curve remains unchanged. Analogously, we can evaluate the amount of inequality reduction required to meet MDG1 if growth does not occur at all. Following Kakwani (1993), we know that the slope of the Lorenz curve at which poverty is half its original level without a change in mean per capita income must satisfy the condition:

$$L'^*(P_0/2) = z/\mu_0 \tag{6}$$

In addition, (6) can be rewritten as:

$$L'^*(P_0/2) = \frac{z}{\mu_0(1+\beta)} = L'(P_0/2) - \lambda\{1 - L'(P_0/2)\} \tag{7}$$

Using equations (6) and (7), we can solve for λ, which is proportional change in the Gini index needed for a certain growth rate β. Actually, equation (6) and (7) can generate a set of per capita income and Gini values consistent with headcount ratio at half of the original poverty level, which may be seen as coordinates of an iso-poverty curve (e.g. Bigsten and Shimeles, 2003, ECLAC et al, 2002). For a given λ, it can be shown that the Gini coefficient of the new Lorenz curve is given by:

$$G(Y^*) = (1-\lambda)G(Y) \tag{8}$$

where G(Y) is the original Gini coefficient (observed from the data), which is defined over a vector Y representing the structure of income (ranked from the poorest to the richest), and Y^* is a vector that represents the simulated income distribution consistent with poverty level at the MDG target poverty level. The relations between β and λ then form the core of the growth-inequality nexus to meet MDG1. The set up given in equations (6) and (7) allows for the consideration of several scenarios to reach MDG1. Apart from the extremes, one can, for instance, work out the rate of change in the Gini-coefficient required to meet MDG1 if the economy follows a historical

growth trend up to 2015. Or alternatively it is possible to compute the growth rate required to reach MDG1 in spite of a certain deterioration of income distribution.

It should also be noted that the relationship between poverty, inequality, and per capita income is not linear. Therefore it is not admissible to hold the elasticity of poverty with respect to either income or the Gini coefficient constant. Following Datt (1998), both elasticities vary with the parameters of the Lorenz curve and poverty levels. To show this, we may rewrite equation (1b) as follows:

$$P = P(\mu / z, G(\pi)) \tag{9}$$

where $G(\pi)$ is Gini coefficient, which is a function of the parameters of the Lorenz function. Totally differentiating P with respect to μ and G, and rearranging we get:

$$\frac{dP}{P} = \frac{\partial P}{\partial \mu}\frac{\mu}{P}\frac{d\mu}{\mu} + \frac{\partial P}{\partial G}\frac{G}{P}\frac{dG}{G} \tag{10a}$$

Setting

$$\frac{\partial P}{\partial \mu}\frac{\mu}{P} = \varepsilon,$$

$$\frac{\partial P}{\partial G}\frac{G}{P} = \theta,$$

we can rewrite equation (10a) as follows:

$$\frac{dP}{P} = \varepsilon\frac{d\mu}{\mu} + \theta\frac{dG}{G} \tag{10b}$$

where ε is the elasticity of poverty with respect to growth and θ is the elasticity of poverty with respect to the Gini-coefficient. We can also introduce the concept of iso-poverty function (the rate of change in inequality required to keep poverty constant for a 1% change in per capita income) if we set the change in poverty equal to zero in equation (10b).

$$0 = \varepsilon \frac{d\mu}{\mu} + \theta \frac{dG}{G} \Rightarrow \frac{dG/G}{d\mu/\mu} = \nu = -\frac{\theta}{\varepsilon} \qquad (10c)$$

ν proxies the "growth-inequality" trade-off for small changes around the original poverty level.

For the headcount ratio, ε and θ can be computed from the Lorenz function as follows (e.g. Datt, 1998):

$$\varepsilon = -\frac{L'(H)}{L''(H)H}, \theta = \frac{1 - L'(H)}{HL''(H)} \qquad (11)$$

It is clear from equation (10) that the rate of change in the headcount ratio following a percentage change in per capita income and the Gini-coefficient is a non-linear function of the parameters of the Lorenz function and level of poverty.[5] Thus, to make simulations on the relative roles of growth and distribution to meet MDG1 equations (6) and (7) are the most appropriate, since they implicitly address the variability of the elasticity of poverty with respect to per capita income and inequality. This is our main approach. However to examine the extent of growth-inequality-trade-off at the original poverty level, it is possible to use equation (10b) and we report some of the results for selected African countries to get some insight on current role of income distribution.

3. Data and Estimation Methods

The paucity of data on poverty and income distribution has been a major constraint on empirical poverty analysis in Africa. Ideally, poverty data should come directly from household budget surveys, but in most cases only grouped distributional data are available compelling the analyst to use of per capita income or consumption data from sources in the national accounts. Certainly this may introduce a serious bias in the

[5] We may note that $\nu = \frac{1 - L'(H)}{L'(H)}$

estimation of poverty as well as relevant elasticities.[6] Until complete data that is comparable over time and across countries is available, we will not be able to get the full picture on the growth-inequality-poverty nexus in Africa.

In this study, we attempted to use nearly all official data available on income distribution and per capita income to examine the growth-inequality-poverty nexus. We relied much on distributional as well as per capita consumption data which the World Bank compiled for its WDI (2004).[7] This data is constructed for a subset of 31 African countries primarily to get an aggregate picture of poverty by sub-region during 1981-2001 with substantial imputations for missing data. In most cases available distribution data and growth rates on per capita household final consumption were applied to obtain the parameters of the Lorenz function. We used slopes of the Lorenz functions to generate the implied per capita consumption expenditure for some of the regressions we reported in the Appendix. It appears that per capita household consumption expenditure from budget surveys was used where possible. So there is reason to believe that the poverty figures are comparable over time and to a certain extent across countries. We complemented the analysis using distributional data from WIDER,[8] and per capita household final consumption from national accounts.[9] The headcount ratio for $1/day/person is used to generate the coefficients of the iso-poverty functions specified in equations (6) and (7) to compare with results from the WDI (2004) data. In addition, this data was also used to compute the "growth-equity" trade off at the original poverty level to complement results based on equation (11). The relevant elasticities ε, θ (discussed in the previous section) were generated using POVCAL software.

4. Discussion of Results

Table 1 reports two scenarios to attain MDG1 in Africa. One is a neutral growth scenario where income distribution is held constant until 2015, and the other scenario shows the reduction in inequality needed to meet MDG1 if growth is stalled at zero.

[6] See Ravallion (2002) for an elegant demonstration of the seriousness of the problem of combining data from household surveys and national accounts.
[7] This data is available from the external website of the World Bank at http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp
[8] This data set can be downloaded from http://www.wider.unu.edu/wiid/wiid.htm
[9] Per capita household final consumption data were all in constant 2000 PPP and obtained from WDI, 2006)

These two scenarios span the range of pro-poor growth patterns discussed in the recent literature (e.g. Bigsten and Shimeles, 2003; Kakwani and Pernia 2000; White and Anderson, 2000). Intermediate cases also provide useful and realistic insights on the growth-inequality-poverty nexus. The results, based on WDI (2004) data indicate that the average growth rate in per capita consumption required to meet MDG1 with a neutral pattern of growth is around 2.1%, while the median is slightly lower (1.9%), with notable variation across countries, from a high of 4.9% for Central African Republic to a low of 0.7% for Morocco and South Africa. Considering a long-term average population growth rate of around 2.4% (WDI, 2006), the growth in consumption expenditure needed is about 4.5%.

"Table 1 about here"

Alternatively, Table (2), which is based on the WIDER distributional data set and per capita household final consumption expenditure from national accounts, provides a lower rate of per capita consumption growth required (1.7%), mainly due to differences in per capita consumption expenditure used and reference period. These estimates referred mainly to data from the early and mid-1990s, and thus ignored growth episodes in latter periods.[10] We may note that both data sets generate some counter-intuitive poverty figures, such as those for Ghana using the WIDER data set, where extreme poverty plummeted in a span of few years. However, in terms of summary statistics for the key variables, the two data sets provided comparable figures. In the WIDER data set countries such as Mali and Ethiopia would need a very high rate of per capita growth in consumption expenditure (4.8% and 4.2%, respectively) to reach MDG1 without a change in inequality, while Northern African countries such as Tunisia and Algeria needed a very low rate of growth (0.8%) to meet the MDGs. Thus, in terms of broad characterisation of African economies, the two data sets have much in common. The results from both data sets clearly indicate that by holding inequality at its current level, most African countries would be able to achieve MDG1 with relatively modest (but sustained) growth rates.

"Table 2 about here"

[10] Also, the sub-samples in both data sets are slightly different.

If countries cannot achieve the required growth rates, then poverty reduction is in principle possible through reduction in inequality. However, it is hard to pursue redistribution policies in a stagnating or shrinking economy than in a growing one so the feasibility of this route must to be serious considered. Still, it may anyway be interesting to see the order of magnitude in the reduction of inequality needed to reduce extreme poverty by half in 2015 in stagnant economy. From Table 1 we observe that Algeria, Cote d'Ivoire, Egypt, South-Africa and Swaziland would need only a five percent decline in the Gini coefficient up to 2015 to reduce poverty by half. Similarly, countries such as Algeria, Botswana, Cote d'Ivoire, Lesotho, Namibia and South Africa need the same small change in inequality to reduce poverty by half in the absence of growth according to Table 2. On average, a 14 percentage point decline in the Gini is needed to meet the MDG1 target without growth in Africa. Thus, since it is hard to envision the policy packages that would bring about this kind of dramatic decline in inequality without negative growth effects, growth still seems to be critical for reaching MDG1.

So the redistribution scenario on its own certainly may not provide useful insight into the challenge of meeting MDGs in Africa. If however we combine the ratio of growth required under a neutral growth scenario with the inequality reduction needed without growth to meet MDG1, we have what might be considered the "growth-inequality" trade-off (or slope of the iso-poverty curve at the intercept).[11] This makes it possible to get a sense of what happens to the required growth in case inequality rises in the run up to 2015. Figure 1 illustrates this point for the WDI (2004) data set where countries such as Swaziland (8%), South-Africa (6%), Tunisia (6%), Namibia (6%), Algeria (5%), Morocco (5%), Botswana (4%) and Lesotho (4%) need a very high rate of additional growth in per capita consumption to meet MDGs if the Gini coefficient rises by just 1% until 2015. Thus, rising inequality is indeed very costly for these countries. Conversely, the cost in terms of increased growth requirements of rising inequality is not so dramatic for countries such as Ethiopia, Burundi, Rwanda and Madagascar. Thus, for such countries the focus for a poverty reduction policy should

[11] The iso-poverty curve is non-linear by construction depending largely on initial poverty level and curvature of the Lorenz function.

be on growth. This seems to be the most efficient way of achieving MDG1, even if the growth there is combined with some increase in inequality.

"Figure 1 about here"

We found the same feature based on elasticities of poverty with respect to both growth and inequality as depicted in equation (11) using the WIDER data set. By taking the ratio of elasticity of poverty with respect to per capita consumption and the Gini-coefficient as a proxy for the slope of an iso-poverty curve at the original poverty level (see equation 10c). Appendix Table 1 reports the growth-inequality "trade-off" for 21 African countries. It might be easier to reduce poverty (to move to a "higher" iso-poverty curve) through growth in some cases, while in others through reduction of inequality. There might be a range of desirable combinations of pro-growth and inequality-reduction policies, depending on the country and its circumstances.

An interesting scenario to consider is what would happen to MDG1 if recent growth performance (1999-2000) were to remain unchanged until 2015. According to Figure 2, about 8 countries from a sub-sample of 31 had a negative per capita consumption growth in recent periods. Certainly, for these countries, completely unrealistic reductions in inequality would be needed to meet MDG1. On the other hand, more than half of the countries in the sub-sample have actually had a per capita growth rate higher than the one required under the neutral growth scenario, suggesting the possibility that these countries indeed even can afford some rise in inequality until 2015 and still reduce poverty by half. A few countries have a growth rate lower than that required under neutral growth so that they require some reduction in inequality (at unchanged growth rates) to meet MDG1 in 2015.

"Figure 2 about here"

The preceding paragraphs summarized the key results following the simulations of the changes in growth and inequality needed to reach MDG1 by 2015 in Africa. It would also be useful to reflect on the determinants of the rates of growth and reduction in inequality required to meet MDG1. As shown in Section 2 above, the growth required

to reach MDG1 is a complex function of initial poverty, inequality, per capita consumption, as well as the poverty line. So it is possible to find some anomalies in the growth-inequality-poverty nexus. There are some instances where poverty declined in the face of economic contraction (for instance Algeria, Cote d'Ivoire, and Mauritania)[12] and others where it increased during economic expansion (Lesotho)[13]. In general however, as depicted in Figures 3 and 4, the growth required to reach MDG1 rises with initial inequality and falls with initial income, confirming findings reported in Chen and Ravallion (1998).

"Figure 3 about here"

"Figure 4 about here"

Differences in initial conditions provide some useful characterizations on the relative roles of growth and redistribution in meeting MDG1. Richer economies with high inequality can reduce poverty significantly through a slight decline in income inequality, while poorer countries generally need to focus more on growth than on redistribution. However, if such countries in addition exhibit high inequality, efforts to use growth policies while ignoring distributional concerns may be politically infeasible. Therefore, countries with low initial income and high income-inequality will be hard pressed to reach the MDG1 target, since they face the double challenge of trying to achieve fast growth and to contain income inequality.

5. The Sustainability of Growth and Persistence of Poverty

There is abundant empirical research trying to explain Africa's poor economic performance. A wide range of factors have been identified ranging from macroeconomic instability (caused by external or domestic shocks) to a set of initial conditions, such as geography (Sachs and Warner, 1997); ethnic fractionalisation and conflict (Collier and Hoeffler, 1998); 'bad' policies (Sachs and Warner, 1997; Easterly, 2000); poor governance (Barro, 1997); weak institutions (Acemoglu, Johnson, and Robinson, 2003; Rodrik et al, 2002); and low human capital. Recently, Sachs et al. (2004) have argued that there are three types of poverty traps in Africa:

[12] See Table 2

[13] See also Easterly (2000) for such types of episodes in Africa.

the savings trap, the demographic trap, and the low capital-threshold trap. Thus Africa seems to suffer from many deep-seated, structural problems that propagate poverty and which make it hard for African countries to attain high growth rates and once they are attained to sustain them over extended periods of time (Collier and O'Connell, 2004).

The fact that most countries in Africa need only a rather modest per capita income growth rate to reach MDG1 with inequality held constant, and that quite a few counties have registered growth rates over certain periods that would allow them meet the MDGs even with some degree of increase inequality, it seems reasonable to focus attention on the sustainability of growth. A recent study on growth dynamics for developing countries (Berethelemy, 2006) reported that of the 49 African countries covered in this study, only five countries (Botswana, Lesotho, Mauritius, Tunisia and Seychelles) registered multiple peaks (equilibrium points) at a growth rate in per capita income exceeding of 3.5% during a period of fifty years. A few others (16 African countries) had only one such equilibrium after the initial per capita income, and most of the remaining ones only experienced growth cycles, with incomes essentially stagnating around the initial values. It is obvious that the nature of growth dynamics in each country determines whether or not the required growth to meet MDG1 is feasible.

Since our data on poverty and inequality has been generated in most cases from very few time periods, it is not possible for us to distinguish whether these figures are consistent with a certain equilibrium per capita income. Nor can we say whether they are generated by shocks or, if so, how much of such shocks persist for a long time. Still, we attempted to use the cross-country data compiled for WDI (2004) to examine if poverty rates for the sample countries exhibit some degree of persistence. As reported in Appendix Table 2, the current growth rate of the headcount ratio is indeed affected by lagged values of poverty itself (true state dependence), and growth rates in lagged values of per capita consumption expenditure and the Gini-coefficient. Our statistical test confirms that the instruments used to estimate the coefficients of lagged

values are valid, and there are no serial correlation problems in our estimation.[14] This result it at least consistent with the notion that there is poverty persistence in Africa.

Islam and Shimeles (2006) examined whether poverty is state dependent at the household level in rural as well as urban Ethiopia based on panel data for 1994-2004. Their results indicated a clear state dependence after controlling for such factors as unobserved individual unobserved effects and serially correlated shocks (errors). The implication is that once pushed into poverty due to short-lived shocks, households in Ethiopia continue to experience poverty due to the fact of being once in poverty in the past. That is poverty propagates itself. Therefore, to sustain aggregate growth and reduce poverty, policies need not only to take care of the chronic component of poverty but also protect households from shocks that push them into poverty.

6. Conclusions

This paper has examined the challenge of halving poverty by 2015 in Africa using available data on per capita consumption expenditure and its distribution. A distribution-neutral growth scenario was compared with different pro-poor growth scenarios, where reduction in inequality was considered as one possible measure to reach MDG1. The results suggest that with a modest but sustained growth in per capita consumption expenditure and unchanged inequality, most countries in Africa can achieve the target of reducing poverty by half. If recent growth rates in per capita consumption can be sustained until 2015, more than half of the countries in our sample, most of which are in SSA, will reach MDG1. It was also shown that the growth-redistribution mix needed to reach the target depends on initial poverty and inequality. Poorer countries, with relatively lower initial inequality need to accelerate growth to reach the MDGs, while countries with high initial inequality can go very far with small changes in inequality.

The recent resurgence of African growth following the commodity boom suggests that per capita income growth may even be higher than what we have seen in the period analysed here. A key policy concern will then be what the distributional consequences of this resource-based growth will be. Typically the immediate distributional

[14] We used Generalized Methods of Moments to estimate equation (1) in Appendix Table 2.

consequences of this type of growth have been less favourable for the poor, at the same time as African economies generally are unable or unwilling to pursue redistribution policies. Moreover, so far African economies have often failed to sustain growth over extended periods of time. The ability of countries to maintain stability and to deal with shocks and their persistence will be crucial for their chances of halving poverty by 2015.

Future research should include changes in the structure of the economy and composition of household income to determine the sources of growth and inequality. Micro-simulations can be used to analyse how investments in physical and human capital, for example, contribute to growth and income inequality, and thus to poverty. In Africa, such analyses have so far been constrained in many countries by lack of household or individual data on living standards. Recent household-budget surveys, for example the Living Standard Measurement Surveys of the World Bank, provide a basis for a deeper analysis of the challenges of achieving Millennium Development Goals in Africa.

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Table 1: Intercepts of iso-poverty functions for selected African countries: mean 1981-2001 based on WDI data set.

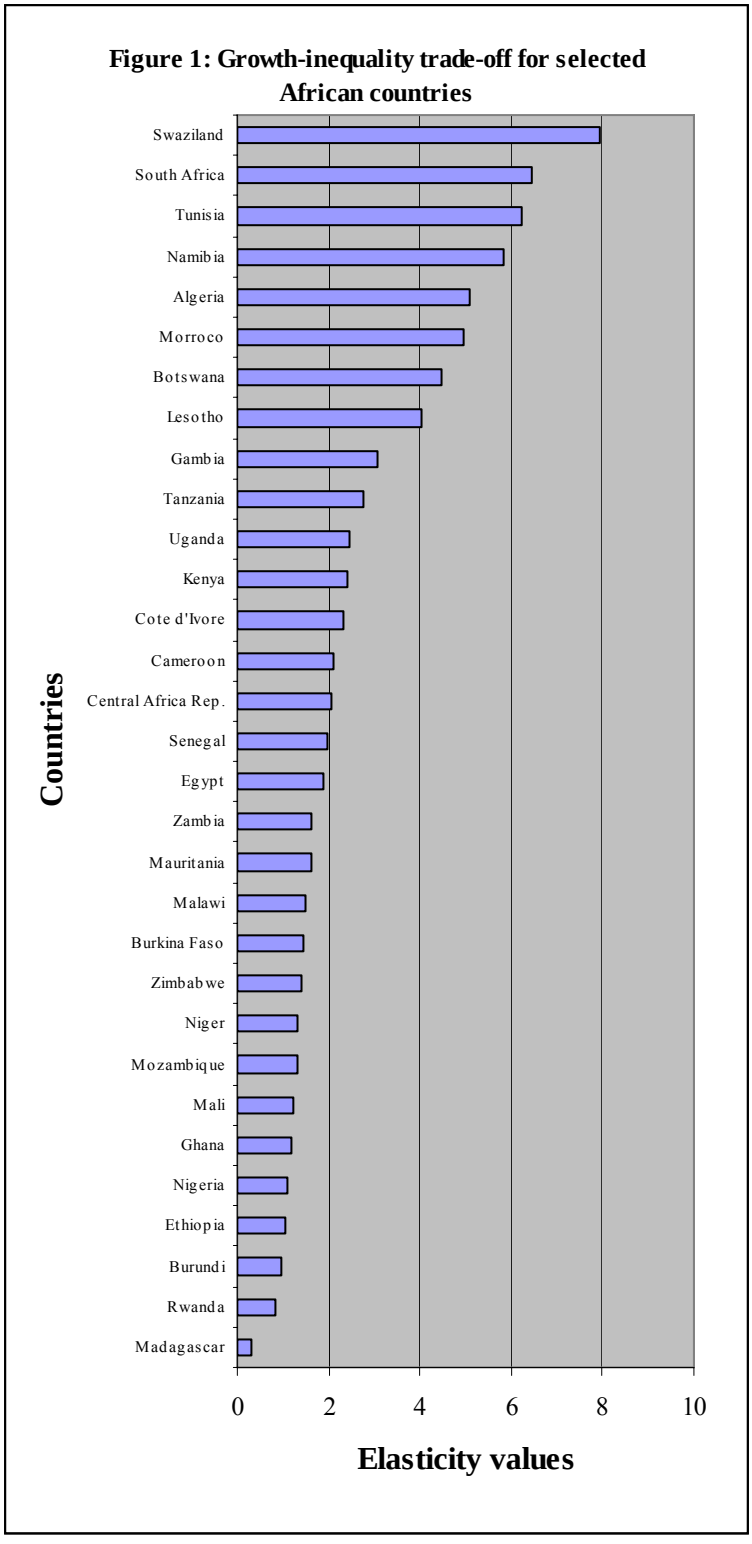
Country	Gini coefficient in 2001	Head count at 1$ a day in 2001	Per capita consumption in 2001 (1993 PPP)	Annual growth rate in per capita consumption required to halve poverty without change in inequality (%)	Annual reduction in Gini required to halve poverty without growth (%)	Counterfactual Gini coefficient in 2015 consistent with reducing poverty by half without growth
Algeria	35.45	1.37	1695.89	1.02	0.20	33.81
Botswana	66.42	22.07	1999.96	2.36	0.53	57.57
Burkina Faso	46.84	48.69	716.48	2.68	1.85	21.21
Burundi	42.41	57.57	431.07	2.05	2.13	18.08
Cameroon	61.33	17.09	1057.75	1.32	0.64	38.20
Central Africa Rep.	44.58	64.44	490.66	4.94	2.37	21.61
Cote d'Ivoire	43.74	16.75	1007.86	0.84	0.36	40.56
Egypt	34.41	3.01	1025.55	0.50	0.27	32.24
Ethiopia	30.00	23.10	606.44	1.09	1.02	22.19
Gambia	50.23	21.97	1219.75	1.86	0.61	43.07
Ghana	40.71	47.46	510.27	1.94	1.66	23.27
Kenya	44.95	29.82	794.49	1.86	0.77	36.84
Lesotho	63.16	39.01	1219.42	3.40	0.84	50.76
Madagascar	47.45	61.02	276.18	0.98	3.29	26.69
Malawi	50.03	49.66	600.35	2.23	1.49	30.23
Mali	50.49	64.25	443.09	3.62	2.94	6.35
Mauritania	39.03	21.90	832.87	1.91	1.19	25.84
Morocco	39.50	0.53	1984.19	0.66	0.13	38.22
Mozambique	39.61	33.70	632.87	1.58	1.21	27.50
Namibia	74.33	32.88	1056.42	2.40	0.41	68.07
Niger	50.61	64.71	362.99	2.85	2.14	24.52
Nigeria	5.06	69.92	385.62	3.43	3.14	0.18
Rwanda	28.90	28.45	569.10	1.06	1.27	20.00
Senegal	41.28	15.12	954.53	1.80	0.92	31.15
South Africa	57.77	10.67	2356.56	0.67	0.10	56.53
Swaziland	60.45	8.47	3121.34	1.73	0.22	57.26
Tanzania	59.01	50.45	700.12	3.41	1.24	40.76
Tunisia	40.94	0.27	2837.93	0.76	0.12	39.79
Uganda	43.11	84.31	256.64	4.44	1.79	33.45
Zambia	52.59	63.32	432.67	4.03	2.49	16.89
Zimbabwe	50.12	58.17	503.35	2.33	1.65	29.38
Mean	46.27	35.81	1002.66	2.12	1.26	31.85
Median	44.95	32.88	716.48	1.91	1.20	32.23

Source: Computations based on WDI (2004)

Table 2: Intercepts of iso-poverty functions for selected African countries based on WIDER data set

Country	Year	Gini (%)	Headcount: at 1 $ a day per person in 2000 PPP	Per capita Consump-tion in 2000 PPP	Annual growth required to meet MDGs without increase in inequality (%)	Annual reduction in inequality required to meet MDG1 without growth (%)	Counterfactual Gini in 2015 consistent with achievement of MDG1 without growth
Algeria	1988	39	2	1767	0.95	0.21	37
Algeria	1995	35	1	1766	0.81	0.19	34
Botswana	1985	54	23	1287	1.32	0.40	48
Botswana	1986	54	19	1460	1.21	0.32	49
Burkina Faso	1994	48	66	438	3.01	5.55	15
Burundi	1992	33	26	649	1.16	1.13	26
Cote d'Ivoire	1985	41	18	988	1.02	0.47	36
Cote d'Ivoire	1986	39	22	620	0.52	0.63	32
Cote d'Ivoire	1987	40	24	797	0.96	0.64	33
Cote d'Ivoire	1988	37	21	796	1.06	0.71	30
Cote d'Ivoire	1993	37	21	773	1.14	0.81	31
Ethiopia	1995	40	90	235	4.24	**	**
Gambia, The	1991	56	33	1011	3.11	1.07	43
Gambia, The	1992	48	19	1079	1.65	0.64	41
Ghana	1987	35	22	736	1.11	0.83	28
Ghana	1988	36	22	736	1.15	0.85	28
Ghana	1989	37	20	792	1.06	0.71	30
Ghana	1992	34	5	1079	0.63	0.29	32
Ghana	1993	34	4	1079	0.36	0.17	33
Ghana	1997	33	4	983	0.50	0.27	31
Kenya	1992	54	26	1203	1.82	0.60	47
Kenya	1994	58	15	1259	0.32	0.13	56
Lesotho	1986	56	20	1648	1.58	0.34	51
Lesotho	1987	56	20	1648	1.63	0.35	51
Lesotho	1993	58	21	2658	0.92	0.13	56
Madagascar	1993	43	41	602	1.93	1.91	28
Mali	1989	37	73	320	2.29	**	**
Mali	1994	51	77	325	4.80	**	**
Mauritania	1988	43	51	440	2.07	4.07	14
Mauritania	1993	50	30	854	1.45	0.84	42
Mauritania	1995	39	22	797	1.54	1.00	32
Mozambique	1996	40	39	583	1.89	2.11	26
Namibia	1993	74	32	2462	2.35	0.31	69
Senegal	1991	54	56	552	2.98	2.82	27
Senegal	1994	41	41	590	1.75	1.90	28
South Africa	1993	62	9	3992	1.32	0.11	61

Tanzania	1991	59	55	628	3.46	2.36	33
Tanzania	1993	38	30	666	1.40	1.25	29
Tunisia	1990	40	1	2364	0.82	0.13	39
Uganda	1989	33	27	628	0.90	0.97	26
Uganda	1992	41	34	666	1.40	1.23	31
Uganda	1993	39	30	666	1.43	1.27	30
Zambia	1991	44	30	764	1.51	1.01	34
Zambia	1993	46	37	749	2.66	1.57	33
Zambia	1996	50	54	539	3.28	3.49	25
Zimbabwe	1990	57	28	1243	1.28	0.43	51
Average		45	30	1042	1.65	1.1	32
Median		41	25	794	1.40	0.7	33



Source: Authors' computations

Figure 2: Actual per capita consumption growth vs neutral growth required to reach MDGs

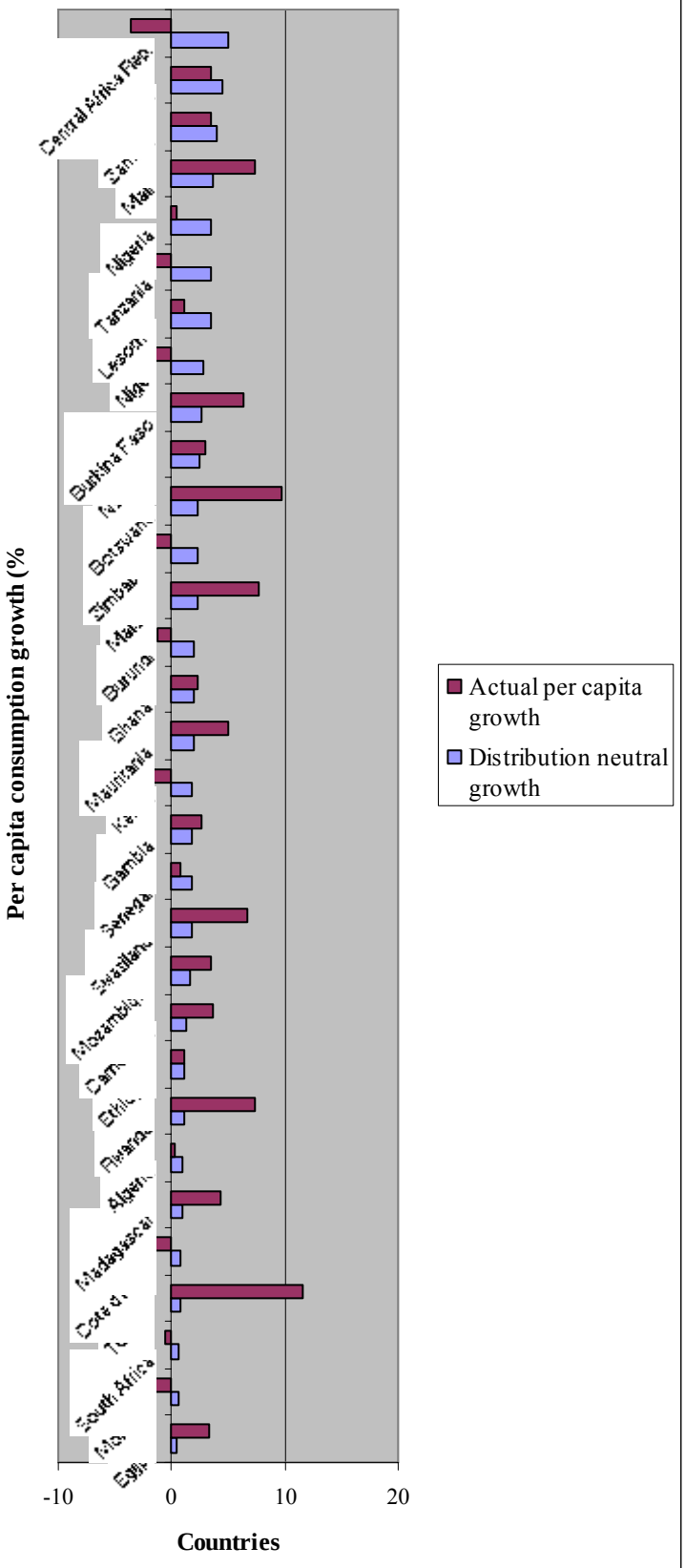


Figure 3: Annual growth rate required to halve poverty and initial Gini (1981)

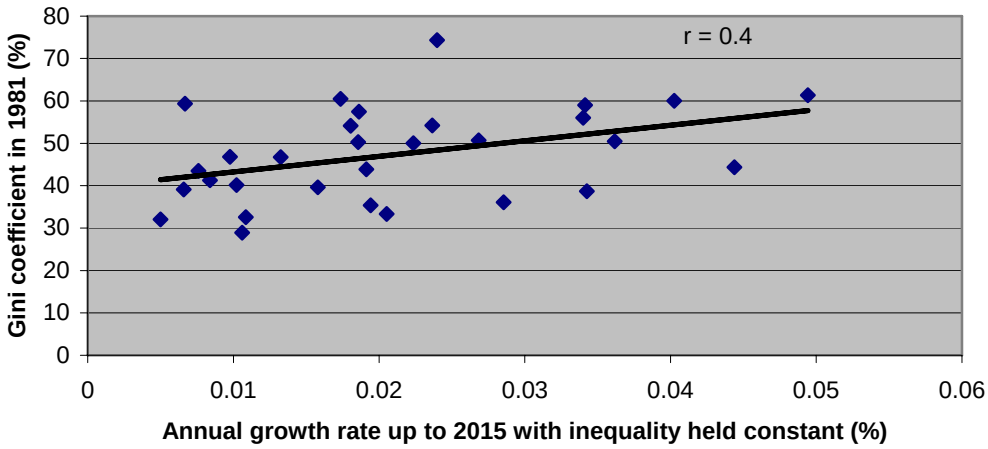
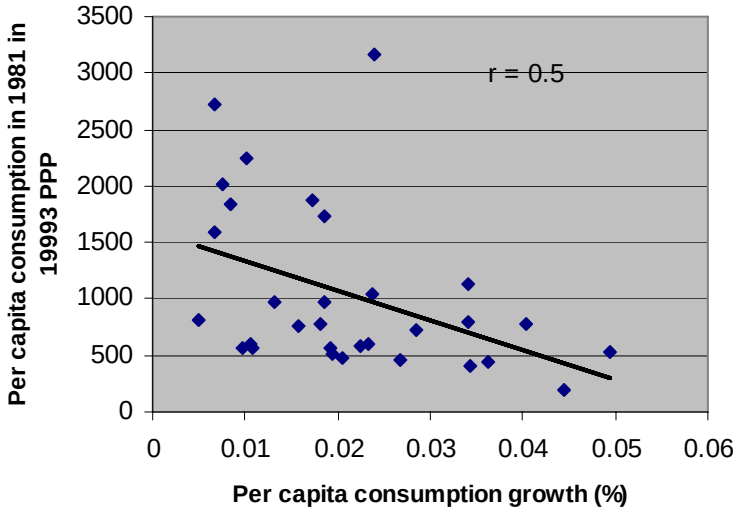


Figure 4: Per capita consumption growth required to halve poverty without a change in inequality and initial per capita consumption



Appendix Table 1: Equity-growth 'trade-off' for selected African countries

Country	Year	ε	θ	ν*	Gini coefficient
Botswana	1993	-1.03	3.4	3.30	67.4
Burundi	1992	-1.1	0.26	0.24	42.5
CAR	1993	-0.45	0.15	0.33	61.3
Cote d'Ivoire	1993	-2.5	7.1	2.84	45.5
Ethiopia	1995	-2.7	1.8	0.67	30.1
Ghana	1997	-1.5	1.6	1.07	40.2
Kenya	1994	-2	2.4	1.20	42.4
Lesotho	1993	-0.77	2.1	2.73	62.3
Madagascar	1993	-0.74	0.18	0.24	48.2
Mali	1994	-0.52	0.007	0.01	50.5
Mauritania	1995	-1.7	1.8	1.06	39.6
Mozambique	1996	-1.6	0.94	0.59	40.6
Namibia	1993	-0.72	3.7	5.14	77.0
Niger	1995	-0.64	0.07	0.11	50.5
Nigeria	1997	-1	0.66	0.66	51.7
Rwanda	1995	-2.2	2.5	1.14	45.5
Senegal	1994	-1.98	2.7	1.36	41.8
South Africa	1993	-2.4	13.1	5.46	58.2
Tanzania	1993	-1.4	0.74	0.53	38.2
Zambia	1996	-0.76	0.13	0.17	53
Zimbabwe	1990	-0.8	0.4	0.50	50

*Elasticity ratio between growth and change inequality needed to keep poverty constant at 1 dollar a day per person. .

Appendix Table 2: Persistence of poverty based on WDI (2004) Panel data

Dependent Variables	Growth rate in headcount ratio (h_{it})
Constant	-.015
	(-1.45)
Growth rate in lag of headcount(h_{it-1})	0.545
	(3.85)**
$\Delta\, hfc_{it-1}$ (growth rate in the lag of household final consumption per capita from national accounts)	1.125
	(2.73)**
$\Delta\, g_{it-1}$ (growth rate in the lag of Gini coefficient)	-0.983
	(-4.03)**
R^2	
Sargan's Over Identification Test (p-value)	0.4548
Number of observations	166

Absolute value of z statistics in parentheses
* significant at 5%; ** significant at 1%