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Full Length Research Paper

The dynamic relationship among poverty, inequality, and growth in rural Ethiopia: A micro evidence

Fekadu Gelaw

Department of Agricultural Economics, Haramaya University, Ethiopia. E-mail: fekadugelaw@yahoo.com.

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The Ethiopian government has boldly set very rapid and sustainable growth and its equitable distribution as its prime development objective to end poverty in the foreseeable future. For this reason, promoting agricultural and rural development has been purported by the government as its top development agenda since it took power some 19 years back. Yet the extent to which the government realizes this objective remains in doubt. This paper attempts to analyze the dynamic relationships among poverty, inequality and growth. While many of the available studies use aggregate cross-country data sets, this study, however, uses household panel data-set. The decomposition result indicates that the observed growth was neither rapid nor sustainable. Poverty and inequality have not also declined considerably except between 1995 and 1997. The study also systematically generated 90 observations of indices from the five rounds to estimate Fixed Effect (FE) regression model. The estimated growth and inequality elasticities of poverty were found equal to 3.32 and -3.68, respectively. What this means is that poverty could still remain high if the country fails to achieve rapid and sustainable growth, on the one hand, and simultaneously reduce inequality, on the other.

Key words: Inequality, poverty, growth, fixed effects.

INTRODUCTION

Development had been conceived almost exclusively in terms of growth targets, that is, with very little regard to the beneficiaries of the intended growth. Distribution was central to the classical economists, yet its implications for the long-term development were de-emphasized until the seminal work of Simon Kuznets. Kuznets (1955) postulated that growth, in the early stage of an economy (predominantly agrarian), would first lead to increases, and then to a decrease, in income inequality, which then provided the "Kuznets's curve" or inverted-U curve. Since then, many studies have attempted to assess the relationship between growth and inequality.

Based on cross-country comparisons, studies before 1990s supported Kuznet's hypothesis. Recent studies however, based on larger data set, have consistently refuted the inverted-U curve of Kuznets on the ground that either there is no systematic relationship between the two or the relationship is country-specific (e.g. Bourningon, 2002; Deininger and Square, 1998; Li et al., 1998; Bruno et al., 1996; Ravallion and Datt, 1995).[1]

More recently, the recurring issue in discussion on development is whether the main focus of development strategies should be placed on growth, or poverty, and/or inequality (Bourguignon, 2004; Fuentes, 2005). The concern on poverty then resurfaced the old growth-inequality issue back into the development agenda. Availability of household panel data in recent times in many developing countries has also created fertile conditions.

The resurface of the old issue from poverty perspective

[1] These studies were made based on the compilation of the Dieninger-Square (1996a) international inequality database which contains 682 'high-quality' observations of Gini coefficient and quantile shares), than used by Kuznets,

has also brought about important developments in the field. Firstly, it has broadened the spectrum of studies into analyses of relationships such as inequality-poverty, poverty-growth, inequality-growth and inequality-growth-poverty. Secondly, it has changed the orientation of inequality-growth studies from finding strong theoretical explanation for causal link between the two (inequality on growth or growth on inequality) into assessing the possible implications of growth-inequality relationships to poverty reduction. Thirdly, it has brought about methodological ferments in the area. Fourthly, it has encouraged different countries to construct longitudinal household survey data sets rather than relying on macro level data.

Many studies attempts to establish intertemporal relationship between poverty, inequality and growth based on cross-country data. These studies have generated many insights. However, the validity of such studies has been called into equation for many reasons. This is because there are a number of concerns on the quality of cross-country data and the methods used as well. Spatial and temporal comparison is difficult due to measurement errors (sampling and non-sampling) and heterogeneity in survey design and processing (Atkinson and Brandolini, 2000) and currency differences (Ravallion and Chen, 1997). In additions, the methods used tend to neglect country heterogeneity (Bhatta, 2001; Deininger and Squire, 1998) and hence policy recommendations emerging from such cross-country analysis are less relevant (Ravallion, 2001; 2003; Son, 2007). Moreover, the relationships themselves could be outcomes of policies (Kanbur and Lustig, 1999). A given policy in a given country or at a given time may have affected inequality and growth to be related negatively and yet other policies in other countries or at other times may have affected positively. Thus, the relationships are the results of a number of complex forces which sometimes move in the same direction but sometimes countervail each other even to the point that their effects cancel out each other.

As growth and inequality could be independently the outcomes of many interacting factors such as policies, cultural and religious settings, stage of development, political setting, etc., the heterogeneity that may exist between countries would be higher than within a country. Thus, country specific studies based on household panel data would be more robust and hence such studies could be more relevant in guiding policy.

Growth could be generally beneficial in reducing poverty if it raises the income of the poor by about as much as it raises the income of everybody else as Dollar and Kraay (2000) claimed. However, aggregate growth rate, measured by the percentage change in mean income, can be pro-poor, neutral or even against poor depending on the correlation between growth and inequality. If income distributions remain relatively stable over time, economic growth generally raises incomes of all members of society, including the poor (Adams, 2003; Li et al., 1998). But such bold conclusion is dangerous because it leads to an easy leap to a stylized assumption that, since growth is distribution neutral in the reduced form, the same is true in the structural form (Kanbur and Lustig, 1999).

Dollar and Kraay (2000), based on a cross-country study, found that average income of the poorest fifth of society rises proportionately with average incomes and they concluded that growth generally does benefit the poor as much as everyone else. Growth has the potential to benefit the poor, yet it may not always pro-poor. Whether growth is pro-poor or not depends on who benefits more from that growth - the poor or the rich. Given a certain growth rate, quite different poverty outcomes are possible. If, for instance, the average gain by the poor is more than the non-poor, most probably poverty could decline. But even then, it is also quite possible that poverty could increase depending on how the average gains are distributed within each group.

Though growth is generally essential for poverty reduction, growth alone may not be sufficient for poverty reduction. It is hard to predict poverty reduction outcome of growth without considering how the benefits of growth are distributed among the population. This is because in a worst scenario, if the average income of the rich grows at higher rate than the overall growth, it is likely (if not certainly) that poverty increases. Similarly, decline in inequality alone (assuming no growth) may not also ensure poverty reduction as it depends on the outcome of the intricate churning of various income groups.

Generally, economists recognize the importance of both growth and distribution in determining the direction and magnitude of poverty reduction outcome. Since there are many intricate issues underlying poverty outcomes, it is important, as Ravallion (2001) pointed out, to 'look beyond averages'. From these reviews, it is evident that it is necessary to test for systematic growth-inequality relationship before analyzing the inequality-growth-poverty relationships. Household panel data are more robust in addressing these issues.

Analyzing inequality-growth-poverty relationships is very important for a country like Ethiopia where the state of poverty is deep-rooted, pervasive and persistent. The per-capita income of the country is not only the lowest on earth but also it is far below international poverty line of one dollar a day. A comprehensive study by the World Bank indicates that the problem is more pronounce among rural than urban households. Poverty is also high among uneducated, agriculturalists, and pastoralist peoples. Moreover, due to the recurrent drought and other natural calamities such as pest, disease, frost etc., the rural households are highly vulnerable to poverty (World Bank, 2005).

In the view of such extreme poverty, a benevolent government should place poverty reduction objective at the top of its development agenda. The Ethiopian

government has boldly set very rapid and sustainable growth and its equitable distribution as the prime objective of development policies to end poverty in the foreseeable future. Promoting agricultural and rural development has been purported by the current government as its top development agenda since it took power about 19 years back.

Ethiopia is a country of great cultural and agro-ecological diversity. It is not uncommon to observe wide variations in natural resource endowments, density of infrastructural public serves, etc among locations. While some areas are endowed with good natural geography and infrastructural public services, others are poor in both. On top of this, the country is politically divided along ethnolinguistic lines and administrative, economic, political and fiscal powers have been more or less transferred to local body. Such political divisions could impose barrier to free mobility of labor and other resources or migration (temporary or permanent) of people towards better economic opportunities. People would then have no other option but to stay in their own "enclaves". Researches also indicate that removing such mobility restrictions would reallocate labor and other resources across areas and, in effect, lower income inequality (Kim and Margo, 2004).

Thus, ensuring equal opportunity to public services, allowing free mobility of resources and yet counterbalancing undesirable market outcomes seems to be the main challenges of the country. The main question then is to what extent the country has been moving forward in achieving fast growth, reducing inequality and reducing poverty.

The main objectives of this paper was thus to assess the levels of poverty, inequality and growth across time and space and to analyze their dynamic relationships. Section I describes the levels of poverty, inequality and growth at regional level and Peasant Associations levels. Section II analyses and discusses the inequality-growth-poverty interrelationships observed over the past survey periods. Finally, Section III summarizes key findings and concludes by indicating their policy implications.

THE DATA

The study used Ethiopian Rural Household Survey (ERHS) panel data. The ERHS is comprehensive and wide data set in that it was collected from 18 rural villages in six rounds.[2] Though PA is the lowest level in the administrative hierarchy, it is less homogeneous. Thus, village was used as a homogeneous sample unit. In the selection of villages, attempts were also made to represent major sedentary farming systems common in the country. Introductory note by Dercon indicates that one to three sample villages were included from each stratum, namely; the grain-plough areas of the Northern and Central highlands, the *enset*-growing areas and the sorghum-hoe areas. But it should be noted that inaccessibility, security and other factors have also hindered from strictly representing each stratum with sufficient numbers of sample villages. The data was more or less balanced as the attrition rate was as low as about 7%.

It used five rounds collected in 1994a, 1995, 1997, 1999 and 2004.[3] Measurement of inequality, poverty and growth was made based on the level of real consumption expenditure per adult equivalent.[4] Expenditure/ consumption was preferred for the reason that expenditure/consumption data are more reliable and simple to compute than income (Deaton, 1997; Dercon, 2005; Duclos and Araar, 2006). Income is often a more sensitive topic than consumption, especially since the latter is more obvious to friends and neighbors than the former Deaton (1997). Moreover, estimating income requires knowledge on assets and profits which are difficult to estimate.

METHODOLOGY

Measurements of inequality, poverty and growth

The two common measures of inequality are Gini coefficient and the General Entropy class. The Gini index is the oldest and famous measure. It computes the average distance between the cumulated population shares and cumulated income shares. In other words, it is the ratio of the area between the Lorenze curve and the diagonal equality line to the total area of the triangle. The standard Gini coefficient satisfies four axioms but fail the decomposability axioms if the vectors of income overlap (Litchfield 1999). Cowell (1980) introduced other decomposable inequality measures called General Entropy (GE) class. Thus this study also used GE class to decompose inequality over time and space. The GE class of inequality measures as introduce by is defined as:

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right] \qquad \alpha \neq 0,1$$

Equation 3

Where y_i is the income of the i^{th} household and $\bar{y}$ is the mean income and α is the distributional parameter.

As the value of α approaches to zero, the GE class is more sensitive to changes at the lower end of the distribution and equally sensitive to changes across the distribution for α equal to one

[2] From the six rounds, data collected in the second round (1994b) was not considered in this study for the sake of consistency.

[3] Though this survey contains panel data of 7 rounds, the first round (1989/90) and the third round (1994b) are dropped in this study. The data of 1989/90 does not much conform in scope, content and sample number with the other rounds. The 1994b data, though perfectly conform with the rounds preceding (1994a) and the other successive rounds, its timing is different from other rounds and the 1994a is sufficiently representative.

[4] The consumption expenditure includes food and non-food items. Non-food consumption items were restricted to direct consumables (matches, soap, linen, clothes) but exclude school and health expenditure, as well as taxes and extraordinary contributions (Dercon and Hoddinott, 2004).

(which is the Thiel index) and sensitive to changes at the higher end of the distribution for higher values (Foster, 1983).

The GE class for each distributional parameter α can thus be expressed as

$$GE(0) = \frac{1}{n}\sum_{i=1}^{n} log\left(\frac{\bar{y}}{y_i}\right) \qquad \alpha = 0 \qquad \text{Equation 3a}$$

$$GE(1) = \frac{1}{n}\sum_{i=1}^{n} \frac{y_i}{\bar{y}} log\left(\frac{y_i}{\bar{y}}\right) \qquad \alpha = 1 \qquad \text{Equation 3b}$$

$$GE(2) = \frac{1}{n\bar{y}^2}\sum_{i=1}^{n} (y_i - \bar{y})^2 \qquad \alpha = 2 \qquad \text{Equation 3c}$$

The most appealing feature of the GE class is its decomposability across groups and across time. The total inequalities obtained from GE (0) in Equation 3a were decomposed across villages for each round (that is, static decomposition). The method decomposes the overall inequality at a point in time into inequality *within* group *(I_w)* and inequality *between* groups *(I_b)* using (Litchfield 1999)

$$I = I_w + I_b \qquad \text{Equation 4}$$

$$I_w = \sum_{j=1}^{k} v_j^{\alpha} f_j^{1-\alpha} GE(\alpha)_j \qquad \text{Equation 4a}$$

$$I_b = \frac{1}{\alpha^2 - \alpha}\left[\sum_{j=1}^{k} f_j \left(\frac{\bar{y}_j}{\bar{y}}\right)^{\alpha} - 1\right] \qquad \text{Equation 4b}$$

Where f_j is the population share of group *j*, j = 1, 2 … k, v_j is the income share of group *j;* and y_j is the average income in group *j*.

Decomposition was also made to identify the sources of inequality between two time periods. In this case, the changes in total inequalities between two rounds can be decomposed into three components using Equation 5a - c.

$$\Delta GE(0)_I = \sum_{j=1}^{k} \bar{f}_j \Delta GE(0) \qquad \text{Equation 5a}$$

$$\Delta GE(0)_A = \sum_{j=1}^{k} \overline{GE(0)}_j \overline{\Delta f} + \sum_{j=1}^{k} \left[\overline{\lambda_j} - \overline{\log(\lambda_j)}\right] \Delta f_j \qquad \text{Equation 5b}$$

$$\Delta GE(0)_Y = \sum_{j=1}^{k} \left[\left(\bar{v}_j - \bar{f}\right]_j\right) \Delta \log(\mu(y))_j \qquad \text{Equation 5c}$$

Where y is income, Δ is the difference operator, λ is the mean income of groups *j* relative to the overall mean, that is $\frac{\mu(y_j)}{\mu(y)}$ and the over-bar represent a simple average.

The above decomposition method divides the temporal changes in total inequalities (that is changes between rounds) into three effects: changes in inequality within groups or "pure inequality" effects (Equation 5a); changes in the proportion of people in the groups or "allocation" effect (Equation 5b) and changes in relative incomes of the groups over time or "income" effects (Equation 5c). The decomposition is, therefore, important in identifying the sources of temporal inequality changes.

For poverty measure, the FGT classes of aggregate poverty measures, developed by Foster et al (1984) were used.

Unobserved effects model

The main purpose of this study was to analyze the dynamic relationships of inequality-growth-poverty. The three variables could be a result of individual characteristics of groups. These variables could be unobservable or data may not available on these characteristics. When panel data set is available, unobserved effects model can help to isolate the effects of group (village) specific time *invariant* characteristics such as natural geographic potential, infrastructural service levels, etc. The basic Unobserved Effects Model (UEM) can be written, for a randomly drawn cross section observation *i*, as (Wooldridge, 2003):

$$Y_{it} = X_{it}B + c_i + u_{it} \quad t = 1, 2, \ldots T \qquad \text{Equation 6}$$

Where Y_{it} is the vector of dependent variable, X_{it} is 1*K vector of explanatory variable that can contain variables that change across *t* but not *i,* that change across *i* but not *t,* and variables that change across *t* and *i.* The term c_i is the unobserved individual effect term.

Whether a Random Effects (RE) or Fixed Effects (FE) model fit the panel data in question depends on whether the c_i is correlated with the explanatory variables or not. If the test result accepts the null hypothesis that the c_i is uncorrelated with the explanatory variables, the UEM turns out to be RE model or FE model otherwise.

The specific model can thus be;

$$Lnpgap_{it}^{*} = \delta Lnrcon_{it}^{*} + \beta Lngini_{it}^{*} + c_i + u_{it}^{*} \qquad \text{Equation 7}$$

Where $Lnpgap_{it}^{*}$ is the natural log of mean poverty gap in the i^{th} village at time *t*, $Lnrcon_{it}$ the mean real per capita consumption in the i^{th} village at time *t*, $Lngini_{it}$ is natural log of mean Gini coefficients in the i^{th} village at time *t*, and δ and β are parameters to be estimated and u_{it} are disturbance terms.

The choice between the two can be made as proposed by Gugirati (2005) using Hausman test. Accordingly, Fixed Effects model was found to be appropriate. The test result rejected the null hypothesis that the c_i is uncorrelated with the explanatory variable.

Thus taking the linear relationships of mean values of the variables and subtracting from Equation 7 eliminates unobserved time invariant variable, c_i and results a Fixed Effects (FE) model as:

$$Lnpgap_{it}^{*} = \delta Lnrcon_{it}^{*} + \beta Lngini_{it}^{*} + u_{it}^{*} \qquad \text{Equation 8}$$

Table 1. The level of poverty over the five survey periods using headcount, poverty gap and poverty severity.

	N	Mean poverty line*	Proportion of the poor			Mean real per capita consumption	Real GDP per capita growth rates (%)**
			Head count index	Poverty gap	Poverty severity		
1994a	1434	44.54	48.2	0.183	0.105	70.5	500.6
1995	1398	50.29	54.6	0.232	0.130	61.6	523.2
1997	1405	44.86	32.5	0.110	0.053	91.5	601.6
1999	1353	48.97	35.7	0.122	0.060	87.7	601.6
2004	1297	48.46	35.6	0.125	0.064	91.7	755.8

Source: own computation based on five rounds of ERHS between 1994-2004.
* The poverty line was estimated using the same data set.
** World Bank database.

RESULTS AND DISCUSSION

Descriptive results of growth, inequality and poverty

The results of the study show that poverty level in Ethiopia was generally high. Table 1 describes overall inequality, poverty and growth (measured by real per capita consumption expenditures). The Ethiopian Government boldly sets attaining *very fast* and *sustainable* growth along with creating equitable distribution as the prime objectives. However, micro evidences of this study indicate that there has been neither *fast* nor *sustainable* growth in per capita consumption of rural households. In addition, inequality has not declined over the past periods. Similarly, poverty has not also declined considerably.

Poverty levels were high in terms of all the three measures (head count, poverty gap and poverty severity). A research made by the World Bank, using absolute poverty line of one Dollar a day, indicates that poverty level in 1999 amounted to 26.3%. But the level dramatically increased to 80.7% when another absolute poverty line of 2 dollars a day was used. Yet, when a national poverty line was used the level was equal to 44.2%. The national poverty line adopted by the government was then found to be about 1.5 US$ per day at 1993 PPP (World Bank, 2005).

As presented in Table 1, the level of poverty fluctuated between 32.5 and 54.6% over the five rounds. The levels of poverty more or less moved with the levels of per capita consumption levels. Surprisingly, national data in those periods were in partial contradiction with micro-evidences of this study because poverty levels were almost negatively related with the real GDP per capita levels. Agriculture being the dominant sector of the economy and the fact that about 90 percent of the agricultural output come from subsistent agriculture, it is highly difficult to justify such large disparities. Befkadu and Berhanu (2000) argue that overall macroeconomic performance of Ethiopian is highly correlated with the performance of the agricultural sector.

levels of poverty in 1981, 1995 and 2000 were equal to 48.0, 45.5 and 44.2%, respectively (Iradian, 2005). World Bank (2005) also indicated that rural poverty incidence remained largely constant with signs of a 1 - 2% point decrease over the decade o f the 1990s.

The agricultural production system is in the country is very traditional, subsistent and virtually rain-fed. Cereal production constitutes about 88% of the total crop production in the country (CSA, 2005). Weather shocks such as recurrent drought, flood, frost and other natural hazards such as pest and disease usually bring substantial production and consumption shocks. Particularly when God generously provides the rain and a favorable weather conditions to crops and livestock, consumption rises and hence poverty level declines.

The presence of high fluctuation in aggregate poverty levels could indicate high mobility of households in and out of poverty. It is thus important to assess the extent of vulnerability households to poverty. Vulnerability was assessed in terms of how frequent households fell into poverty. When looking at the number of times households fell into poverty, (Table 2), the majority of rural households (about 83%) were found to be poor at least once in five rounds. That means 83 percents of households could have fallen into poverty 20% of the time. While the former shows the proportion of vulnerable households, the later shows the extent of vulnerability of households to poverty.

The result also implied that the mobility of households into and out of poverty was so high. Excluding persistently poor and non-poor households, the remaining 75.4% of households moved in and out of poverty though the length of their stay may vary. This could be attributed to idiosyncratic and common shocks like fluctuating rainfall and household-specific crop-failure each of which is quite common in most rural areas of the country. Risk and vulnerability studies conducted by the World Bank also indicates that 10% of the population of Ethiopia remained poor while another 35% moved into and out of poverty between 1995/1996 and 1999/2000.

The results were fairly similar with other studies. The

Table 2. Poverty profile of households over the survey rounds.

Frequency of being poor	Number of households	Percent	Cumulative percentage
Never been poor	213	17.4	17.4
Poor once (20% of the time)	270	22.1	39.5
Poor twice (40% of the time)	283	23.1	62.6
Poor thrice (60% of the time)	202	16.5	79.2
Poor four times (80% of the time)	167	13.7	92.8
Poor in all rounds (100% of the time)	88	7.2	100.0

Source: Own computation based on data 1994 - 2004 Ethiopian rural household survey.

Table 3. Summary of disaggregated poverty level at village levels.

Rounds	Head count index			
	Mean	St. Dev	Max	Min
1994a	48.1	23.4	89.0	19.0
1995	54.8	23.5	93.0	14.0
1997	30.2	22.0	73.0	0.0
1999	35.4	23.3	86.0	0.0
2004	32.3	20.2	68.0	4.0

Source: Own computation based on data 1994 - 2004 Ethiopian rural household survey.

Disaggregating poverty figures further by sample villages could give better picture about the geographic distribution of poverty. There were large variations in the levels of poverty across sample villages in all the survey periods. Taking the average of lower bound poverty levels of the five rounds, average poverty level was as low as 7.4%. A similar calculation for the upper bounds provided a value as high as 82% (nearly of all-poor). Thus at any point in time there could be areas where nearly all households are non-poor and at the same time there could be areas where almost all households are poor. When the average of each village over the five rounds was taken, poverty levels were greater than 50% in 7 villages, namely: Adado, Dinki, Korodega, Gelben, Haresaw, Imdibir and Aze Debo. Particularly, poverty level was persistently deep in areas like Adado. These indicate that some areas need immediate action in the move towards reducing poverty. Table 3 provides descriptive results of disaggregation.

The Ethiopian Government claims that it has been giving special priority to backward regions through anti-poverty programs and budget subsidy allocation system. Nevertheless, the null hypotheses that geographic disparities in poverty levels has converged over rounds was rejected. Such large geographic inequities can be associated with perverse geographic inequities in the outcomes of a decentralized anti-poverty program (Ravallion, 2007) or information problems create prospects for capture by local elites (Bardhan and Mookherjee, 2000). Information asymmetry by the central government and the associated targeting problem could also explain the persistence of disparities.

Another important variable closely linked to poverty levels is the pattern of distribution. Table 4 shows the levels of overall consumption inequalities in the five rounds. Both the General Entropy class ($\alpha = 0, 1$) and the quantile distributions showed a similar pattern with that of Gini index.

Iradian (2005) reported Gini index in the years 1981, 1995 and 2000 were 0.32, 0.40 and 0.41, respectively. The lower value of 0.32 in 1981 could be that the country was in a different economic system - 'socialist' system. The figure for African countries ranges from a highest Gini index of 0.67 in S. Leone in 1991 to a lowest value of 0.27 in Ghana in 1997 (Odedokun and Round, 2001).

Such inequality decompositions, and related statistics, can sometimes underpin policy analysis (Kanbur, 2003). Table 5 shows summary of geographic decomposition results (see the detail is in Appendix 1). The summary result shows that while the *within-villages* inequalities explained 72.2 - 78.9% of the total inequality, the *between-villages* inequality explained the remaining.

Apart from cross-sectional inequality decomposition, further temporal decomposition of the changes in inequality is helpful in identifying sources of inequality changes. As shown in Table 6, the changes in overall inequalities between any two periods were mainly due to allocation and pure inequality effects. Income effects had

Table 4. The level of inequality over the five survey periods using Gini index, Thiel index and variance log.

	N	Gini index	General entropy (GE(0))	Thiel index (GE(1))	Share of the group from the total per capita consumption		
					Poorest 40%	Medium 40%	Richest 20%
1994a	1476	0.442	0.349	0.344	13.75	36.10	50.15
1995	1421	0.443	0.346	0.374	13.80	35.71	50.49
1997	1409	0.405	0.291	0.323	15.77	38.42	45.80
1999	1451	0.419	0.304	0.306	15.33	37.73	46.93
2004	1366	0.436	0.333	0.343	13.10	35.49	51.42

Source: own computation based on five rounds of ERHS between 1994 - 2004.

Table 5. Summary of the results of inequality decomposition by villages.

Rounds	Inequality level - GE(0)				
	Total inequality	Within inequality	(%)	Between inequality	(%)
1994a	0.36	0.27	75.0	0.09	25.0
1995	0.36	0.26	72.2	0.10	27.8
1997	0.30	0.23	76.7	0.07	23.3
1999	0.30	0.22	73.3	0.08	26.7
2004	0.38	0.30	78.9	0.08	21.1

Source: own computation based on five rounds of ERHS between 1994 - 2004.

Table 6. Inequality decomposition between two successive survey periods.

	1994 -1995	1995-1997	1997-1999	1999-2004
$GE(0)_{t+1}$	0.346	0.291	0.304	0.333
$GE(0)_t$	0.349	0.346	0.291	0.304
ΔGE	-0.002	-0.056	0.013	0.029
$\%\Delta GE(0)$	-1.7	-16.6	2.0	12.6
$\%\Delta$proportion of the poor	13.1	-40.6	9.65	2.0
Pure inequality effects	0.002 (74.3)	-0.014 (-27.1)	0.001 (7.6)	0.022 (75.6)
Allocation effects	0.008 (355.0)	-0.037 (-70.0)	0.008 (62.1)	0.000 (-0.3)
Income effects	-0.011 (-529.3)	-0.002 (-(2.9)	0.004 (30.4)	0.007 (24.7)
	-0.002	-0.053	0.013	0.029

Source: own computation based on five rounds of ERHS between 1994 - 2004.
+Note that numbers in bracket indicate the percentage of each effect to the absolute change in overall inequality.

little contribution in explaining the overall inequality except in between 1994 and 1995. For instance, between 1995 and 1997, 70 and 27% of the total decline in inequality were mainly due to allocation and pure inequality effects, respectively. Income effect explained only 3% of the change in overall inequality[5]. Given the lower attrition rate in the survey periods and no scope for mobility of households from one village to another, such higher allocation effects precisely indicates that the changes in inequalities were caused by the mobility of the households poor and non-poor groups.

The above decomposition results, however helpful in describing the sources of inequalities, they fail to link inequality with poverty. Decomposing the inequality changes further by poor and non-poor groups could

[5] The negative sign indicate the decline in inequality from one survey period to the next survey period.

Table 7. Inequality decomposition by poor and not-so-poor groups.

Year	Inequality within				Inequality between		Overall inequality
	Not-so-poor		Poor				
	G(0)	(%)	G(0)	(%)	G(0)	(%)	
1994	0.151	43.4	0.116	33.2	0.082	23.5	0.349
1995	0.155	44.7	0.115	33.3	0.076	22.0	0.346
1997	0.160	55.0	0.076	26.0	0.055	19.0	0.291
1999	0.161	53.0	0.076	24.9	0.067	22.1	0.304
2004	0.186	55.7	0.094	28.2	0.054	16.1	0.333
Mean of all rounds	0.163	50.3	0.095	29.1	0.067	20.5	0.325

Source: own computation based on five rounds of ERHS between 1994 - 2004.

Table 8. Decomposition of total inequality by poor and not-so-poor between successive survey periods.

Survey periods	Groups	change in inequality within each group due to						Overall change within each group
		Pure inequality effects		Allocation effects		Income effects		
		change	(%)	Change	(%)	Change	(%)	
1994-1995	Not-so-poor	0.002	-1.8	-0.084	88.1	-0.013	13.7	-0.095
	Poor	0.000	-0.1	0.091	98.3	0.002	1.8	0.093
1995-1997	Not-so-poor	0.003	0.9	0.277	88.2	0.034	10.9	0.314
	Poor	-0.017	4.7	-0.314	85.6	-0.036	9.7	-0.368
1997-1999	Not-so-poor	0.001	-2.9	-0.038	110.7	0.003	-7.8	-0.034
	Poor	0.000	0.1	0.046	97.0	0.001	2.9	0.048
1999-2004	Not-so-poor	0.016	80.5	0.000	2.3	0.003	17.3	0.020
	Poor	0.007	66.0	-0.001	-5.4	0.004	39.5	0.010

better picture about the relationships between inequality and poverty changes.

As presented in Table 7, on average, the inequality *within* the poor group explained about 29% of the overall inequality. Given the consumption levels of the poor is censored - bounded from above by the poverty line and from below by nearly zero value, one normally expect very low inequality *within* poor[6]. Thus, it is important to recognize that the rural poor in Ethiopia were *not equally poor*. In contrast, on average, inequalities *within* the non-poor group explained about 50% of the overall inequalities. While the inequalities between the poor and non-poor groups explained the remaining 21%. The inequalities between the two groups were less that Gini index of less than 0.10. Such narrow distribution implies that any small idiosyncratic shock in consumption, caused by, say, crop failure which is most common in the rural areas of the country, would send many into poverty.

Similar temporal decomposition of the *changes* in inequalities into poor and not-so-poor group provided even better picture about the sources. As provided in column 3 of Table 8, the changes in inequalities within each group between the surveys were due to allocation effects (that is change in inequalities caused by changes in the proportions of population of each group). In a balanced panel data, this exactly shows the extent to which the mobility of households in and out of poverty contributed to changes in inequalities of each group. The result shows that such mobility of households explained more than 85% of the changes in inequalities (except between 1999 - 2004).

Finally, the result indicates that the contributions of changes in relative income to the changes in inequality

[6] this actually may not hold in measuring income inequality as there could be negative incomes

were smaller than that of the not-so-poor and even in some period they were negative.[7] Change in relative income is an important indicator for evaluating whether growth in a country has been pro-poor or not. According Kakwani and Pernia (2000), economic growth may be called pro-poor if the poor enjoy the benefits of growth proportionally more than the non-poor. The focus is on the relative change in the income of the poor, not on what happens to poverty as a result (Shimeles and Bigsten, 2003). The results indicate that poor households in the past gained no more benefits than the not-so-poor. An important finding is that growth did not improve the consumption levels of the poor as it did to the not-so-poor group. Implying that growth was not pro-poor and in some periods it was rather pro-non-poor.

Table 9. Estimated result of fixed effect (FE) regression model for growth and inequality.

Lnpgap	Coef.	Std. Err.	t	P>t
Lnrcon	-3.32	0.42	-7.88***	0.00
Lngini	3.68	1.03	3.59***	0.05
Constant	15.96	2.25	7.10***	0.74
sigma_u	.66			
sigma_e	1.17			
Rho	0.24	(fraction of variance due to u_i)		

***significant at 1%, **significant at 5%.
R-sq: within = 0.491.
Between = 0.736.
Overall = 0.504.
Corr (u_i, Xb) = -0.4542.
F (2.70) = 33.77.
Prob > F = 0.00.

The relationship between poverty, growth and inequality

When poverty reduction is the overriding policy objective, poorer and relatively an equal country may be willing to tolerate modest increases in income inequality in exchange for faster growth - more so than richer and highly unequal countries (Bourguignon, 2004). Trading inequality for higher poverty reduction could be accepted as the next best policy option if growth elasticity of poverty is sufficiently larger than inequality elasticity of poverty.

It is not conceivable to assess the dynamic relationship of the three important variables - poverty-growth-inequality - using only five observations of indices derived from the rounds. Due to this, the study systematically generated fairly sufficient number of observations through decomposition by geographic area - in this case by villages. The method is similar to past cross-country comparison studies. Accordingly, the decomposition of aggregate inequality, growth and poverty indices by sample villages generated 90 observations of mean indices (5 rounds multiplied by 18 villages). This method is robust than cross-country studies because it does not suffer from heterogeneity in method of data collection, sampling design and processing and method of analysis.[8] Cross-village data set suffer less from heterogeneity problem than cross-country data set as they are located within the same political boundary.

Nevertheless, villages also differ in many socio-economic and agro-climatic characteristics. To take account of individual time invariant characteristics such as resource endowments, institutional setting, density of public infrastructure, unobserved effects model was used in the study.

Many empirical studies suggest growth and inequality as important variables in explaining poverty. The FE specification in Equation 8 assumes explanatory variables are independent. The available evidences indicate little relationship between growth and inequality because such complex factors as structural and geographic features (e.g. Odedokun and Round, 2004 in Round, 2007), 'ethno-linguistic fractionalization' and socio-political factors (Fielding and Torres, 2006) are rather strong determinants of inequality as compared to growth in the African context. Still others seem to confirm the presence of systematic relationships between them.

Thus, it was necessary to test whether there is correlation between growth and inequality. The correlation test accepted the null hypothesis that the correlation between growth and inequality is equal to zero. It was then plausible to use of the FE linear regression models.

The estimation results of the Fixed Effects model are presented in Table 9. The results show that growth in real per capita consumption and change in inequality measured by Gini coefficient were found to be significant in explaining poverty gap in the rural Ethiopia. While the growth elasticity of poverty was equal to -3.32, the inequality elasticity of poverty gap was equal to 3.68.[9] This means that a one percentage growth in real per capita consumption reduces poverty gap by 3.32% while the same one percentage increase in inequality increases poverty. Thus, one percent increase in both mean real

[7] The value in the bracket in the last term Eq. 7c shows how far the mean income of the group was from the overall mean income and will be negative for the poor and positive for not-so-poor. When the value multiplied by the positive change in log of mean income (growth), the value will be negative for the poor and positive for the not-so-poor groups.

[8] As an example, in Argentina the headcount poverty was in 2002 close to 60 percent when calculated on the basis of the nationally-defined poverty line, while internationally comparable poverty indicators based on a dollar-a-day poverty line would place the poverty rate around 3 percent (Lopez and Luis Servén, 2006). In addition, cross-country comparisons were made using mixed data sets of expenditure and income which may not be fully captured by consumption smoothing model especially in developing countries.

[9] Negative/positive sign in the parameters means increase/decrease in explanatory variables decrease/increase poverty gap.

per capita consumption and inequality, increases poverty gap. It implied that reducing poverty in rural Ethiopia requires not only fast and sustainable growth but also concrete measures towards reducing inequalities.

Studies on the relationship between inequality, growth and poverty are less comparable due to their difference in data type and methods of analysis. Their findings are also less conclusive. Yet, many studies recognized that the net outcome of poverty reduction depends on the relative elasticities of growth and inequality. Bourguignon (2004) illustrated, taking Ethiopian case, that the contribution of inequality in *increasing* poverty was large enough (about 37%) while that of growth was some -31% and the net outcome was that poverty increased by 6%. Thus, the relative contributions of change in inequality and growth can determine the direction and magnitude of change in poverty. But drawing such country-specific conclusion from cross-country studies may seem unreasonable.

While the positive contribution of growth to poverty reduction is more or less conclusive, the negative contribution of inequality is less conclusive. Many country-specific studies recognize the negative effects of inequality on poverty (Bigsten et al., 2003; Zhang and Wan, 2006; Suryadarma et al., 2005; Smolensky et al., 1994; Jeong, 2005). But few studies also argue that its effect is marginal if the country is initially a low-inequality country (Shimelis and Bigsten, 2003) or if inequality remains stable (Adams, 2003; Dollar and Kraay, 2000). Some studies also argue that its negative effects should be admissible because attempting to reduce inequality negatively affects poverty by reducing growth (Lopez and Servén, 2006). This could happen if growth and inequality have positive relationships.

The result has important policy implication in that if appropriate measures are not taken in reducing inequality, part of positive benefits of growth could be offset by negative consequences of inequality on poverty. It should be noted that the regression result alone is not sufficient to make evaluate whether growth in the past was pro-poor or not as growth and inequality were found to be independent. Since elasticity coefficients measures partial contributions of each variable to poverty reduction, the actual effect on poverty depends on the magnitude of observed growth and change in inequality. As presented in the descriptive results, there has been neither fast nor sustainable growth. In addition, there level inequality has not also declined in the past. This explains why poverty remained high in the past.

CONCLUSION

In Ethiopia, the poorest country on earth, poverty is deep-rooted, pervasive and persistent. Thus, poverty reduction has been the overriding objective of development policies. Nevertheless, as the result indicated, the overall poverty declined only by 12.6% in 10 years time. Nevertheless, this decline was merely the outcome of a one time drastic decline (40%) observed in 1995 - 1997. Poverty increased in all the rest of the periods. The overall inequality was high in all rounds.

Inequality and poverty variations across locations were not only large there were also no tendency for decline over time. Three-fourth of the overall inequalities was due to *within* village inequalities and the remaining one-fourth was due to *between* village inequalities. ‘Allocation’ and ‘pure inequality’ effects were the major causes for changes in inequalities while the contributions of ‘income effects’ was very marginal.

Moreover, the result also revealed that growth in the past was neither fast nor sustainable. As a result its overall contribution to poverty reduction has been small. Moreover, growth did not improve the relative mean consumption level of the poor as it did to the not-so-poor. The Fixed Effect (FE) estimation result showed that both growth and change in inequality were equally important in explaining changes in poverty. Growth, poverty and inequalities were highly volatile. In general, the country was far behind achieving the three interrelated objectives of attaining fast growth, reducing inequality and reducing poverty in sustainable ways. Practical measures need to be taken by the government to reduce spatial differences in the level of poverty and income inequalities. Thus, reducing inequality between villages, reducing vulnerability of households to poverty, attaining fast and steady growth and targeting very poor rural areas should be the key targets to achieve the country’s overriding objective of reducing poverty.

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APPENDIX

Appendix 1. The gini index by peasant association and woreda in the five survey periods.

Peasant Associations	Logmean consumption					GE(0)					Headcount index				
	1994a	1995	1997	1999	2004	1994a	1995	1997	1999	2004	1994a	1995	1997	1999	2004
Haresaw	4.09	4.17	4.53	4.40	4.57	0.22	0.40	0.28	0.23	0.24	0.52	0.56	0.32	0.28	0.41
Geblen	3.51	3.51	4.43	4.13	4.55	0.22	0.24	0.24	0.26	0.44	0.83	0.80	0.36	0.52	0.34
Dinki	4.20	3.83	4.02	4.29	4.43	0.50	0.19	0.19	0.32	0.26	0.67	0.66	0.59	0.54	0.39
Yetemen	4.58	4.11	4.52	4.25	4.93	0.28	0.20	0.10	0.18	0.19	0.26	0.57	0.12	0.44	0.15
Shumsha	4.64	4.59	4.73	4.79	4.98	0.30	0.21	0.29	0.19	0.22	0.26	0.23	0.17	0.10	0.17
Sirbana	4.66	4.40	4.62	5.14	5.18	0.26	0.15	0.21	0.18	0.21	0.22	0.24	0.22	0.00	0.08
Adele Ke	4.53	4.86	4.86	4.32	4.47	0.18	0.40	0.14	0.20	0.41	0.19	0.14	0.07	0.39	0.54
Korodega	3.53	3.72	4.11	4.50	4.20	0.21	0.17	0.14	0.23	0.24	0.79	0.78	0.49	0.22	0.52
Trirufe	4.47	4.09	4.30	4.75	4.73	0.35	0.23	0.19	0.30	0.38	0.38	0.52	0.40	0.24	0.31
Imdibir	3.77	3.37	4.08	3.90	3.75	0.15	0.32	0.23	0.16	0.23	0.72	0.93	0.54	0.69	0.70
Aze Debo	4.32	3.89	4.31	3.46	4.83	0.22	0.40	0.24	0.17	0.34	0.37	0.73	0.43	0.86	0.33
Adado	4.21	3.91	4.55	4.21	4.03	0.21	0.21	0.21	0.19	0.26	0.42	0.70	0.24	0.46	0.68
Gara God	3.22	3.17	3.88	3.87	4.56	0.34	0.26	0.33	0.24	0.42	0.89	0.92	0.73	0.67	0.43
Doma	3.77	4.50	4.08	4.49	4.62	0.31	0.45	0.30	0.30	0.30	0.78	0.41	0.55	0.30	0.35
Fagy and Bokafya*	4.59	4.36	5.34	4.90	5.44	0.33	0.25	0.48	0.20	0.52	0.34	0.42	0.10	0.17	0.09
Koremargefia*	4.39	4.41	5.00	4.84	5.12	0.27	0.30	0.16	0.18	0.25	0.37	0.33	0.04	0.20	0.11
Karafino*	4.66	4.04	4.75	4.78	4.73	0.30	0.13	0.12	0.23	0.18	0.32	0.42	0.06	0.16	0.18
Milki*	4.70	4.29	5.04	4.95	5.49	0.24	0.18	0.17	0.24	0.25	0.32	0.50	0.00	0.13	0.04
National (overall)						0.36	0.36	0.30	0.30	0.38					
Within inequality						0.27	0.26	0.23	0.22	0.30					
Between inequality						0.09	0.10	0.07	0.08	0.08					

*these villages were considered as one village in the survey but their agro-ecology and other socio-economic characterizes are different and are separated as independent village in the study