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Monetary versus Non-Monetary Pro-Poor Growth: Evidence from Rural Ethiopia between 2004 and 2009

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Abstract The aim of this paper is to contribute to the debate on the pro-poor growth measurement techniques using monetary versus non-monetary indicators. In this context, an alternative method for introducing non-monetary indicators into monetary pro-poor growth analysis is presented. The method is based on the definition of a "Conditional Growth Incidence Curve" for each group of households with a common selected non-monetary characteristic. Additional information provided by the "Conditional Growth Incidence Curve" is useful for a more detailed pro-poor growth analysis. Empirical illustration using data from rural Ethiopia between 2004 and 2009 shows the utility and the limits of each measurement technique.

JEL D30, I30, O12

Keywords Pro-poor growth; multidimensionality of poverty; growth incidence curve

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1 Introduction

During the 1950's and 1960's, economic growth was considered as the main element affecting development strategies. The increase in gross national product was supposed to ensure the achievement of other objectives such as reducing unemployment and poverty.

However, since the late 1960s, the importance attributed to the rapid economic growth effect on social development came under increasing criticism and considered insufficient. Authors such as Seers (1970), Myrdal (1968, 1971), Adelman and Morris (1973), Paukert (1973), Ahluwalia (1976a, 1976b) find that a rapid economic development is not sufficient to increase the volume of employment. Contrary, such a development leaves out a part of the population and emphasizes the inequalities among citizens.

It is from the 1990s that the debate about the relationship between economic growth, poverty and inequality has increased in the context of the analysis of the economic growth that benefits the poor, called pro-poor growth.

The report of the different institutions AFD , BMZ , DFID and the World Bank (2005) on lessons and Insights from 14 countries shows that the main determinant of poverty alleviation is the combination of economic growth and reduction in inequality.

Several studies support this conclusion. Kraay (2005) shows that the impact of economic growth on poverty alleviation is more pertinent in the long than the short-term future. Ravallion (2004) highlighted the divergence of the sensitivity of poverty to economic growth across countries. He shows that this sensitivity depends on the initial level of inequality i.e. for countries with very low economic inequality; a 1% increase in income can lead to an average reduction of poverty by 4.3% but only 0.6% for countries with high inequality. Bourguignon (2004) shows that a reduction of inequality (which reduces the Gini index from 0.55 to 0.45) leads to a 15% decrease in poverty over 10 years. Bourguignon (2004) concludes that if a country has higher inequality level, poverty will reduce slower than a country with lower inequality given the same growth rate.

Nowadays, pro-poor growth has become a necessary condition for any development policy. Given the interest in analyzing the relationship between growth, inequality and poverty, different methods have been developed for measuring pro-poor growth.

In this context, the purposes of this paper are twofold. Firstly, to present a theoretical and empirical comparison of the different methods for measuring pro-poor growth, following a classification according to its monetary and non monetary aspect. Secondly, to present an alternative method making it possible to introduce non monetary indicators into monetary pro-poor growth measurement.

This paper is organized as follows: in section (2), the author presents a theoretical comparison of the different methods for measuring pro-poor growth. In section (3), an empirical validation using Ethiopian data between 2004 and 2009 is given. Finally, the author gives concluding remarks.

2 Measuring pro-poor growth by monetary versus non monetary indicators

2.1 Monetary pro-poor growth

Initially, the pro-poor growth has been measured by monetary indicators such as income or expenditure. Different measurement methods have been developed in the literature, according to tow possible definitions of pro-poor growth. The first definition, considers the pro-poor growth as absolute if and only if poor people benefit from overall economic growth in absolute terms .i.e closely related to the incomes of poor people and thus depends solely on the rate of change in poverty (Ravallion and Chen (2003)). The second is called relative, when the poor benefit from growth proportionally more than the non-poor i.e. which focuses both on reducing poverty and inequality (McCullock and Baulch (2000); Kakwani and Pernia (2000)).

For measuring pro-poor growth using the absolute concept, Ravallion and Chen (2003) defined the Rate of Pro-Poor Growth (RPPG) as the mean growth rate of the poor given by the actual change in poverty per unit time (measured by the Watts index dW_t), divided by the change in poverty that would have been observed under neutral distributional growth dW_t^* times the ordinary rate of growth γ_t (mean growth rate for the whole population). Thus, the Rate of Pro-Poor Growth at time t is given by:

$$RPPG = \frac{dW_t}{dW_t^*}\gamma_t \tag{1}$$

Ravallion and Chen (2003) consider growth as pro-poor if the RPPG is higher than the ordinary rate of growth γ_t .i.e. the actual change in poverty exceeds the change in poverty that would have been observed under neutral distributional growth.

In the same context, Fiestas and Cord (2004) proposed another measurement technique of absolute pro-poor growth called Growth-Elasticity of Poverty (GEP), which reveals what percentage fall in poverty was achieved for each percentage

increase in income per capita. The GEP is thus a measure of how effectively growth is translated into poverty reduction:

$$\varepsilon_{H/\mu} = \frac{\partial H}{\partial \mu}\frac{\mu}{H} \tag{2}$$

Where H is the headcount index and μ is the mean income.

On the other hand, several methods have been proposed for measuring pro-poor growth using its relative definition: the Poverty Bias of Growth (PBG), the Poverty Growth Curve (PGC), the Pro-Poor Growth Index (PPGI) and the Poverty Equivalent Growth Rate (PEGR). Indeed, all these methods pay a particular focus on reducing inequality.

The Poverty Bias of Growth (PBG), proposed by McCulloch and Baulch (2000), is based on comparing the actual distribution of income with the one that would have occurred under the equitable distribution. It is derived from the negative of the inequality component obtained from the Kakwani's (2000) poverty decomposition methodology.

$$\zeta = -(\Delta P)_I \tag{3}$$

Where $(\Delta P)_I$ is the inequality component in the change in poverty according to Kakwani's (2000) poverty decomposition.

The Poverty Growth Curve (PGC), proposed by Son(2004), uses the Lorenz curve $L(p)$ that describes the percentage share of income (expenditure) enjoyed by the poorest p% for defining the generalized Lorenz curve $\mu L(p)$, where μ is the mean income (or expenditure).

Formally, the PGC is the graphical representation of the function g(p):

$$g(p) = g + \Delta ln(L(p)) \tag{4}$$

Where $g = \Delta Ln(\mu)$ is the growth rate of the mean income of the whole population. If g(p)>0 for all p, then growth process reduces poverty, which satisfies the general definition of pro-poor growth. If g(p)> g for all p, then both poverty and inequality decline.

The PGC is then derived from the study of the sensitivity of the generalized Lorenz curve to the evolution of poverty by comparing the generalized Lorenz curve in two dates. If the second curve is entirely above (below) the first, this indicates that poverty has decreased (increased). Growth is then seen as pro-poor (anti-poor) if the curve is decreasing (increasing) for each percentile of the income distribution.

The PPGI is developed by Kakwani and Pernia (2000). They start from the fact that the increase in growth reduces poverty but if this growth was accompanied by an increase of inequality, the decrease in poverty will be affected by the inequality

effect and will be weakened. Thus, using the poverty decomposition proposed by Kakwani (2000), they assume the poverty decomposition into rate of growth and change in income distribution. Then, they define the PPGI as the ratio of the total poverty elasticity of growth γ to the growth elasticity of poverty in the case of distribution-neutral growth γ_g:

$$PPGI = \frac{\gamma}{\gamma_g} \tag{5}$$

Growth is pro-poor if PPGI >1 i.e. the total poverty elasticity of growth exceeds the growth elasticity of poverty in the case of distribution-neutral growth.

However, as the PPGI does not take into account the level of the actual growth rate, Kakwani and Son (2008) proposed the Poverty Equivalent Growth Rate (PEGR) by multiplying PPGI by the growth rate of mean income $\Delta Ln(\mu)$:

$$PEGR = \frac{\gamma}{\gamma_g}\Delta Ln(\mu) \tag{6}$$

Thus, growth is considered as pro-poor (anti-poor) if PEGR is greater (less) than $\Delta Ln(\mu)$. If PEGR is between 0 and $\Delta Ln(\mu)$, the growth is accompanied by an increasing inequality but poverty still reduces.

However, the most popular measurement techniques of monetary pro-poor growth are called aggregate measures, such as the Datt-Ravallion decomposition (Datt et Ravallion (1992)) and the Growth Incidence Curve (Ravallion et Chen (2003)), which consider both absolute and relative aspects of the relationship between growth, inequality and poverty and allow analyzing the structure of the growth distribution, regardless of the considered definition of pro-poor growth.

The technique of Datt and Ravallion (1992) is based on the finding that if the poverty line in real terms is fixed (for a few years as far as reasonable), poverty decrease when the mean income is higher (for a given level of inequality) and will be higher (in most cases) when inequality is higher (for a given mean income).

Thus, Datt and Ravallion (1992) proposed to decompose the change in poverty into changes due to economic growth in the absence of changes in inequality, and changes in inequality in the absence of economic growth. Let $P(\mu_t, L_t)$ be the level of poverty at date t corresponding to a mean income μ_t and a Lorenz curve L_t, then:

$$\Delta P = [P(\mu_2, L_r) - P(\mu_1, L_r)] + [P(\mu_r, L_2) - P(\mu_r, L_1)] + R \tag{7}$$

The first component indicates the growth component of a change in the poverty measure due to a change in the mean income while holding the Lorenz curve constant at some reference level L_r. The second is the redistribution component which is the change in poverty due to a change in the Lorenz curve while keeping

the mean income constant at the reference level μ_r. R is the residual term. Thus, the addition of the change due to growth, the change due to inequality and the residual should equal the change in poverty that is being measured.

On the other hand, the Growth Incidence Curve (GIC) indicates the growth rate in income or consumption between two points in time at each percentile of the distribution.

Let $y(p)$ be the income (or consumption) of the $p'th$ percentile of the distribution. The Growth Incidence Curve is the graphical representation of the function $g(p)$ which indicates the growth rate in income between two dates $t-1$ and t for each percentile :

$$\text{GIC:} \quad g_t(p) = \frac{y_t(p)}{y_{t-1}(p)} - 1 \tag{8}$$

If $g_t(p) > 0$ for all p then growth is pro-poor in absolute terms. If in addition $g_t(p)$ is decreasing for all percentile p, then inequality has decreased over time and growth is considered as pro-poor in relative terms.

2.2 Non-monetary pro-poor growth

All the above measurement techniques of pro-poor growth are only focussing on monetary indicators and leave out the multidimensionality of poverty. However, as Kakwani and Pernia (2000) indicate, analyzing poverty reduction using just one single indicator such as income can be a mistake because if poverty is a multidimensional phenomenon, pro-poor growth will also be multidimensional.

To this end, empirical studies such as Klasen et al. (2008)and Klasen (2008) introduced non-monetary indicators into pro-poor growth analysis by applying Ravallion and Chen's (2003) growth incidence curve to non-monetary indicators.

In this context, Klasen et al. (2008) have developed the "Non Income Growth Incidence Curve" (NIGIC) which follows the concept of the GIC but is based on the relative growth of selected non-income household's characteristic instead of income to measure pro-poor growth. Thus, the NIGIC cannot match the results of a pro-poor growth analysis as defined initially.

In addition, on one hand, its application is limited to non monetary characteristics having a significant variability over time and cannot be applied on, for example, household gender, household size, household head education level etc. On the other hand, it only allows an analysis of the evolution of the selected characteristic without any consideration of the monetary dimension of poverty.

Taking into account the second limitation, Klasen et al. (2008) have presented a second version of the NIGIC which is considered as conditional since they rank the individuals by income and then calculate, based on this income ranking, the population percentiles of the non-income variable. Thus, as Klasen et al. (2008)

indicate, the conditional NIGIC gives an additional tool to investigate how the progress in social welfare was distributed over the income distribution.

However, the construction of the curve according to the change in non-monetary variable has always the limitation of not considering the monetary growth and inequality needed for a pro-poor growth analysis following its fundamental definition and also the limitation related to the characteristic's variability condition.

Given the limitations of the NIGIC, this paper presents an alternative method to introduce non-monetary indicators into pro-poor growth analysis without omission of the monetary growth and inequality effects and can be applied without any variability restriction i.e. with all non-monetary characteristics.

The suggested method consists in first selecting non monetary household characteristics (for example, large household size). Then, cohorts of households are constructed. Each cohort is specific to a selected non-monetary indictor i.e. the households having common characteristic k form a cohort called C^k. For each characteristic k and using only dataset from C^k, a "Conditional Growth Incidence Curve" is constructed.

Let $y^k(p)$ be the monetary indicator of the p^{th} percentile of the cohort's C^k distribution. The "Conditional Growth Incidence Curve" is the graphical representation of the function $g^k(p)$ which indicates the growth rate in income between two dates $t-1$ and t for each cohort's C^k percentile:

$$CGIC^k: \quad g_t^k(p) = \frac{y_t^k(p)}{y_{t-1}^k(p)} - 1 \tag{9}$$

If $g_t^k(p) > 0$ for all p then growth of household's cohort C^k is pro-poor in absolute terms. If in addition $g_t^k(p)$ is decreasing for all percentile p then inequality between households of cohort C^k has decreased over time and growth is considered as pro-poor in relative terms.

Thus, this method is based on the fact that instead of ranking household by income and then constructing the GIC using a non monetary indicator (Klasen et al. (2008)), we classify the households by non monetary indicators and then we construct the GIC using income, which leads to different results and it is more faithful to the fundamental principle of pro-poor growth measurement.

The interpretation of the CGIC keeps the same principle compared to the GIC. In addition, one takes into account the non-monetary characteristics and one can analyze simultaneously the triple effect of monetary growth, inequality, and the non-monetary indicators on change in poverty.

Additional information provided by the "Conditional Growth Incidence Curve" is useful for a more detailed analysis of pro-poor growth. It can be used for a better identification of any economic policy impact on poverty for each group of households. Also, this method allows introducing non-monetary indicators into pro-poor growth analysis by applying all measurement techniques presented in

the literature and not only Ravallion and Chen's (2003) growth incidence curve method.

3 Empirical illustration

This section provides empirical comparison of the approaches to measuring pro-poor growth according to the classification into monetary versus non-monetary aspect. For that, the comparison is focused essentially on the use of the Growth Incidence Curve to illustrate the difference between the results of all the methods.

The used data are from the Ethiopian Rural Household Surveys (ERHS) constructed in 2004 and in 2009 by the International Food Policy Research Institute (IFPRI), in collaboration with Addis Ababa University and University of Oxford. Note that the Ethiopia Rural Household Survey (ERHS) is a unique longitudinal household data set started in 1989. Then seven further waves were constructed in 1994, late 1994, 1995, 1997, 1999, 2004 and 2009. However, as the consumption behavior of rural Ethiopian households varies considerably between seasons, only the tow waves of 2004 and 2009 are used in this study which were constructed during the same period of the year. Therefore, The used data set covers approximately 1300 households in several rural Ethiopian villages. The survey includes household characteristics, as well as many useful information concerning food consumption, agriculture and livestock, health, women's activities, health services, education etc.

First, a pro-poor growth analysis according to its fundamental monetary dimension is made. Figure (1) provides the growth incidence curve using per capita consumption as monetary welfare indicator. Note that data are deflated for taking into consideration the macroeconomic imbalances that resulted in food price crisis in 2008 and a very high inflation in the observed communities attending 125% between 2004 and 2009 according to official figures (see Stefan Dercon, John Hoddinot and Tassew Woldehanna (2011) for more details).

The growth incidence curve is under the x-axis for all percentiles.This indicates that growth was anti-poor in the absolute sense and poverty increased in rural Ethiopia between 2004 and 2009. However, according to the decreasing slope of the curve, one can deduce that the poor households had negative growth rate relatively less than the rich households but not enough for alleviating poverty.

This conclusion is confirmed by the Datt-Ravallion decomposition presented in table (1). Indeed, the decomposition shows that the growth component is positive and thus has contributed to the increase of poverty, while the redistribution component is negative indicating that the inequality level has decreased but finally its effect was counterbalanced by the growth effect.

In order to introduce non-monetary indicators, the author firstly aggregates a number of non-monetary dimensions of well being to build a Composite Welfare

Figure 1: Growth Incidence Curve: Rural Ethiopia 2004-2009

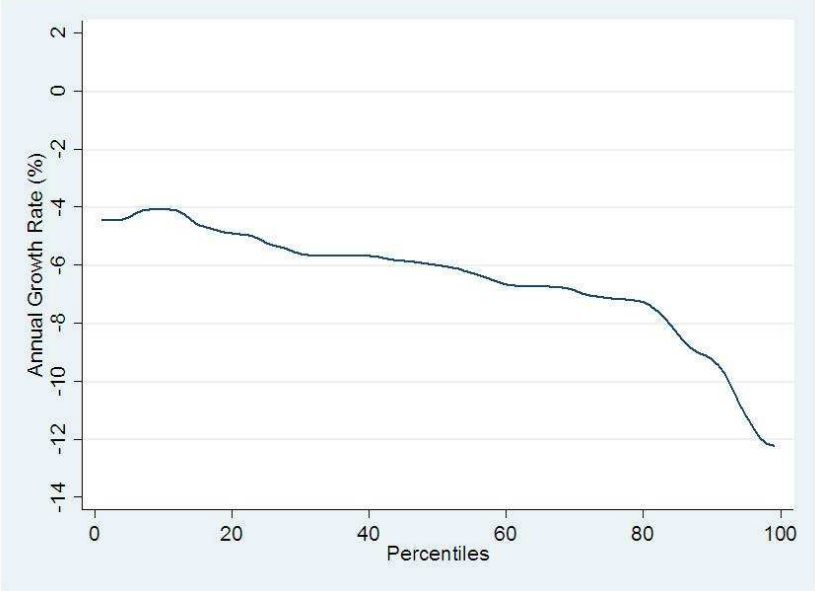


Table 1: Datt-Ravallion decomposition: Rural Ethiopia 2004-2009

Change in poverty	Growth component	Redistribution component	Interaction component
13.642	19.462	-6.508	0.688

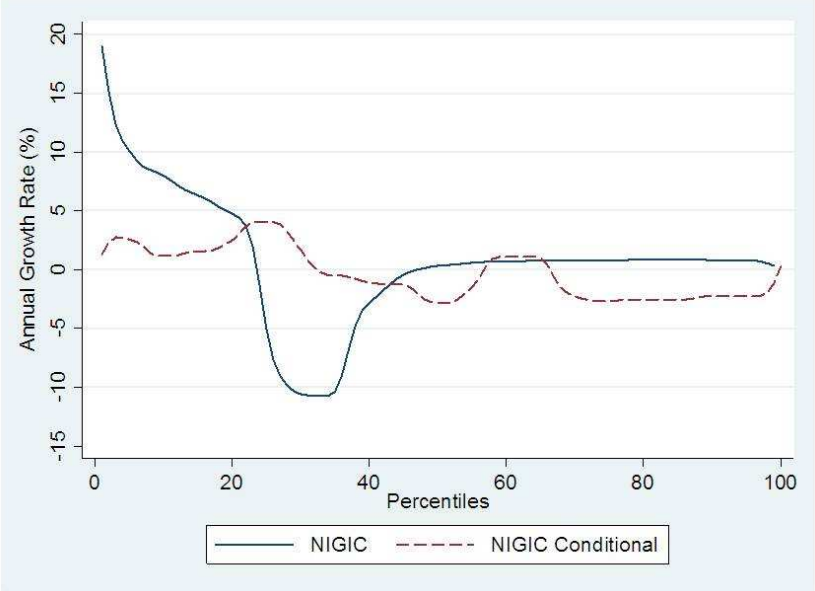
Index (CWI). For that, the Principal Component Analysis (PCA) technique is used, which is a statistical method for data reduction, following the spirit of the Human Development Index to estimate household's welfare using non monetary indicators (See for example Filmer and Pritchett (2001)).

The non monetary variables used to built the CWI are: travel time to water source, travel time to collect fuel, form of used toilet, sex and education level of household head, number of adults in the household and their work opportunity (number of months), number of meals per day for the adults and the children during the worst and the good months, number of owned oxen or cows, number of owned sheep, owned land size. Appendix (1a) and (1b) present statistical details on the Principal Component Analysis results.

Note that the Composite Welfare Index can take negative values which lead to a problem in calculating its annual growth rate. For that, as recommended by klassen and all (2008), the magnitude of the largest negative value among the indicator in the two survey's dates is added to the initial values to determine new CWI used for deducing the Non-Income Incidence curves.

Thus, figure(2) provides the Non-Income Growth Incidence Curve (NIGIC) and the conditional NIGIC, according to klasen et al. (2008)'s methodology, for the Composite Welfare Index.

Figure 2: NIGIC for Composite Welfare Index: Rural Ethiopia 2004-2009



The NIGIC, which is based on a households classification by the annual growth rate of the CWI percentiles, shows that the poorest households (until 25^{th} percentiles), under non-monetary, had positive growth rate of CWI. Households belonging to $25^{th} - 50^{th}$ percentiles had negative growth rate and almost a constant situation for the richer households.

The conditional NIGIC, which is based on a household classification by monetary indicator, shows that the inequality effect was lower compared to the first method (unconditional) since the slope of the curve is lower. In addition, the curve shows that also the poorest households under monetary had positive growth rate of CWI (until the 32^{th} percentiles).

Comparing the results of conditional and non conditional NIGIC with those of the monetary GIC shows that although the financial situation of the poorest households decreased between 2004 and 2009, the living condition seems to be better. However, one cannot in any case say that there was a pro-poor growth in absolute or relative terms in Ethiopia during this period.

In the same context, the multidimensional pro-poor growth can be studied using a single indicator instead of an aggregated index covering several characteristics as the CWI. Therefore, the author continues the non-monetary pro-poor growth analysis by introducing three selected non-monetary indicators which are the

household size, the gender and the education level of the household head. The choice of these characteristics is due to the fact that they are known in the literature as determinants of poverty and thus it is useful to analyze their effect on pro-poor growth measurement. Appendix (2) presents descriptive statistics related to the selected variables.

Note that as the conditional and the non conditional NIGIC are graphical representations of the growth rate in non-income indicators, their results are not relevant in this case since there is no significant variability in the three selected indicators between the two studied dates. In order to ensure this variability, Klasen et al. (2008) use the average years of schooling and restrict the sample to adult household members aged between 20 and 30 to capture more dynamics of changes in the educational system.

For that, the alternative method presented in this paper, the Conditional Growth Incidence Curve (CGIC), is useful particularly for this kind of data. In addition, as opposed to the Klasen et al. (2008)'s methods that allow introducing non monetary indicators to only the GIC, the CGIC's procedure can be applied to all pro-poor growth measurement techniques developed in the literature.

For each selected non-monetary characteristic, two cohorts of households are defined to compare their impact on pro-poor growth measurement. For household size effect, the first cohort regroups large household size (exceeds 6 members) and the second is composed by the rest of households. For the education level of household head, the two cohorts are defined according to lower (illiterate or primary school level) or higher education level. For studying the household head gender effect, the households are classified into two cohorts depending on whether the household head is male or female.

The Conditional Growth Incidence Curve (CGIC) and the conditional Datt-Ravallion decomposition for each selected characteristic are presented in figure (3) to figure (5) and table (2) respectively. Note that the income percentile in each cohort is not the same. For example, the poorest group of the large household size is not the poorest group of small household size at the same time. It is thus important to take into consideration this fact when comparing the curves.

The measured Conditional Pro-poor Growth is different from one household cohort to another. Taking into account the size of household, we found that only the poorest of the larger households have had positive growth rate. For the smaller households, all the curve is under the x-axis which indicates that their growth were anti-poor. Comparing the two curves, we find that the larger household's curve is above the smaller household's curve for all percentiles. All this shows that the monetary evolution of the larger households between 2004 and 2009 is relatively better than the smaller households in term of pro-poor growth conditions, especially the poorest. This can be explained by the importance of the human-capital in rural area and agricultural activities.

The conditional growth Incidence curves for the household head education show that only the poorest households with head having higher education level had positive monetary growth rate. Growth was anti-poor for households with head having low education level but relatively better than the other group.

For the conditional growth incidence curve by household gender, one deduces that this characteristic did not affect significantly the Ethiopian rural households' pro-poor growth conditions between 2004 and 2009. But one can mention the medium class households by the fact that the decrease of monetary growth rate for households with female head was relatively less than households with male head.

The conditional Datt-Ravallion decompositions confirm these conclusions. In addition, they show that the change in poverty is due to the growth effect wherever the household cohort is. The effect of inequality (Redistribution component) contributed to alleviate poverty (which explains the decreasing slope of the curves) except for the larger households and the households with head having higher education level.

Figure 3: CGIC for household size: Rural Ethiopia 2004-2009

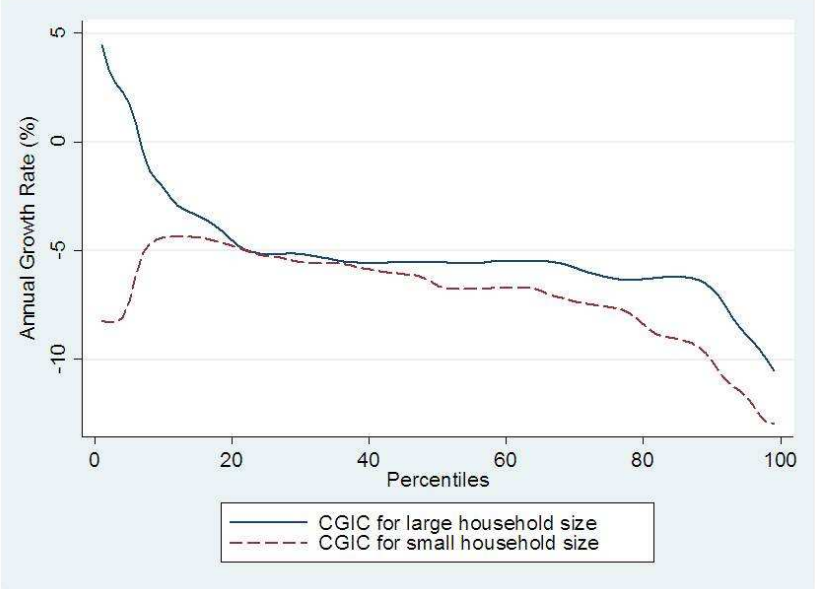


Figure 4: CGIC for Household head education: Rural Ethiopia 2004-2009

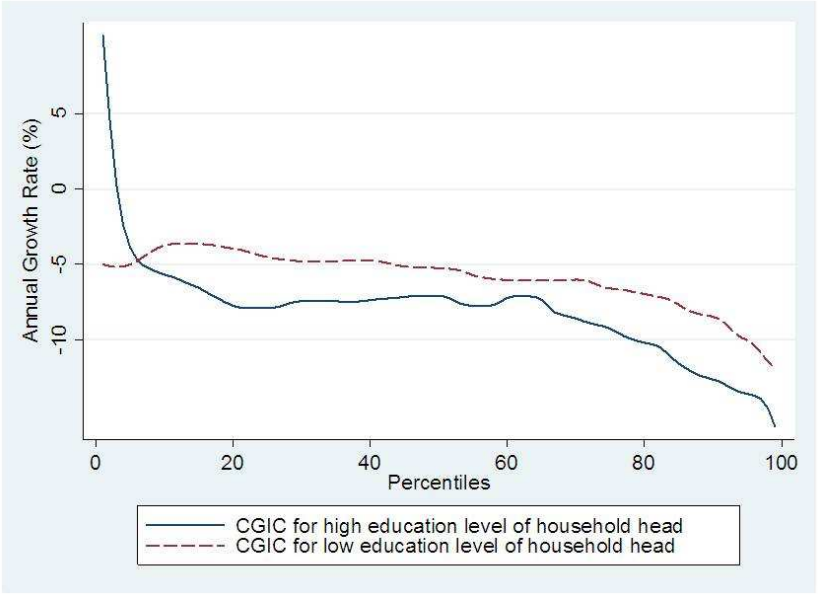


Figure 5: CGIC for household head gender: Rural Ethiopia 2004-2009

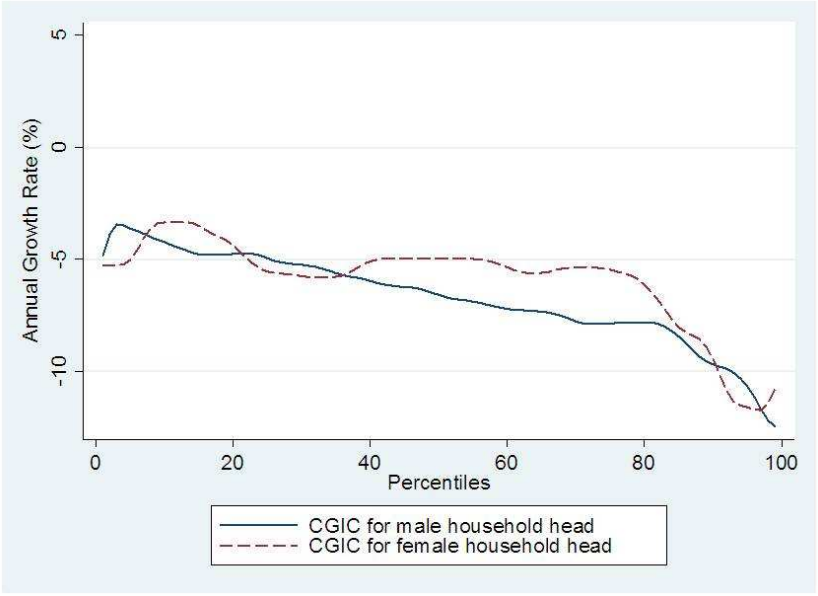


Table 2: Conditional Datt-Ravallion decomposition: Rural Ethiopia 2004-2009

Characteristic		Change in poverty	Growth component	Redistribution component	Interaction component
H Size	>6	7.278	6.857	0.105	0.316
	≤ 6	16.611	25.975	-9.588	0.223
H Head education	Lower	14.682	23.101	-10.780	2.361
	Higher	7.422	8.367	0.405	-1.350
Gender of H Head	Male	16.066	22.863	-8.857	2.060
	Female	11.667	21.905	-8.095	-2.143

4 Conclusion

Using data from rural Ethiopia between 2004 and 2009, a comparative theoretical and empirical analysis of the different techniques for measuring pro-poor growth showed that taking into account the multidimensionality of poverty may yield different results, but completes the fundamental analysis using monetary indicators.

In addition, an alternative method presented in this paper allowed to avoid the limitations of the existent methods in order to introduce non-monetary indicators on pro-poor growth measurement and giving additional information for each group of households having a common selected characteristic. These information can be used for a better identification of any economic policy impact on poverty for each group of households.

On the other hand, the different applied method for analyzing pro-poor growth showed that the growth in rural Ethiopia was anti-poor according to all poverty dimensions during the studied period. But the poorest households seem to have the better evolution according to the non-monetary sense.

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Appendix (1a)

Principal component analysis (PCA) for Composite Welfare Index (CWI) : Ethiopia 2004

Table 3: Principal components/correlation

Component	Eigenvalue	Proportion	Cumulative
Comp1	4.0332	0.2521	0.2521
Comp2	1.6958	0.1060	0.3581
Comp3	1.4934	0.0933	0.4514
Comp4	1.0702	0.0669	0.5183
Comp5	1.0199	0.0637	0.5820
Comp6	0.9664	0.0604	0.6425
Comp7	0.9513	0.0595	0.7019
Comp8	0.8657	0.0541	0.7560
Comp9	0.7715	0.0482	0.8042
Comp10	0.7587	0.0474	0.8517
Comp11	0.7098	0.0444	0.8960
Comp12	0.5698	0.0356	0.9316
Comp13	0.5350	0.0334	0.9651
Comp14	0.3072	0.0192	0.9843
Comp15	0.1899	0.0119	0.9962
Comp16	0.0614	0.0038	1.0000

Table 4: Scoring Coefficients

Variables	Comp1	Comp2	Comp3	Comp4	Comp5
Education level of household head,	-0.014	0.316	-0.351	0.307	-0.057
Owned land size.	-0.004	0.087	0.057	0.398	-0.660
Nbr of owned oxen or cows,	-0.141	0.464	0.243	0.154	0.147
Nbr of owned sheep	-0.186	0.187	0.428	-0.070	-0.078
Nbr of months, household have problems satisfying its food needs	0.340	-0.136	0.127	0.018	0.024
Nbr of meal/day for household' adults during the worst month	0.435	0.153	0.029	-0.074	-0.042
Nbr of meal/day for household' child during the worst month	0.438	0.191	0.089	-0.088	-0.082
Nbr of meal/day for household' adults during the good month	0.460	0.053	0.033	-0.012	-0.009
Nbr of meal/day for household' child during the good month	0.443	0.112	0.082	-0.015	-0.043
Nbr of adult who works during Meher season	-0.038	0.233	0.024	0.232	0.296
Nbr of children who works during Meher season	0.023	0.230	0.222	-0.168	0.455
Nbr of days worked by adult during the last Meher season	-0.098	0.306	0.390	-0.024	-0.065
Sex of household head	-0.035	0.387	-0.105	0.201	-0.129
Time in minutes to get water source	0.090	-0.271	0.347	0.480	0.043
Type of toilet	0.104	0.206	-0.490	0.206	0.286
Time in minutes to get fuel source	0.081	-0.281	0.152	0.554	0.348

Appendix (1b)

Principal Component Analysis (PCA) for Composite Welfare Index (CWI) : Ethiopia 2009

Table 5: Principal Components/Correlation

Component	Eigenvalue	Proportion	Cumulative
Comp1	3.9250	0.2453	0.2453
Comp2	1.7583	0.1099	0.3552
Comp3	1.5609	0.0976	0.4528
Comp4	1.1747	0.0734	0.5262
Comp5	1.0115	0.0632	0.5894
Comp6	0.9935	0.0621	0.6515
Comp7	0.9569	0.0598	0.7113
Comp8	0.8507	0.0532	0.7645
Comp9	0.7420	0.0464	0.8109
Comp10	0.7032	0.0440	0.8548
Comp11	0.6386	0.0399	0.8947
Comp12	0.6159	0.0385	0.9332
Comp13	0.4600	0.0288	0.9620
Comp14	0.3707	0.0232	0.9852
Comp15	0.1790	0.0112	0.9963
Comp16	0.0585	0.0037	1.0000

Table 6: Scoring Coefficients

Variables	Comp1	Comp2	Comp3	Comp4	Comp5
Education level of household head,	-0.029	0.348	-0.272	0.289	0.044
Owned land size.	0.004	0.028	0.013	-0.057	0.918
Nbr of owned oxen or cows,	0.005	0.072	0.089	-0.087	-0.211
Nbr of owned sheep	-0.094	0.255	0.392	-0.246	0.099
Nbr of months, household have problems satisfying its food needs	0.372	-0.147	-0.006	0.091	-0.059
Nbr of meal/day for household' adults during the worst month	0.456	0.120	0.071	-0.091	0.021
Nbr of meal/day for household' child during the worst month	0.452	0.151	0.105	-0.046	0.024
Nbr of meal/day for household' adults during the good month	0.425	0.089	-0.012	-0.026	0.007
Nbr of meal/day for household' child during the good month	0.459	0.134	0.067	-0.014	0.013
Nbr of adult who works during Meher season	-0.094	0.372	0.222	0.220	-0.083
Nbr of children who works during Meher season	-0.011	0.405	0.112	0.342	-0.190
Nbr of days worked by adult during the last Meher season	-0.155	0.262	0.433	-0.055	0.077
Sex of household head	-0.077	0.419	-0.136	0.152	0.137
Time in minutes to get water source	0.042	-0.307	0.398	0.446	0.041
Type of toilet	0.061	-0.021	-0.380	0.511	0.135
Time in minutes to get fuel source	0.025	-0.281	0.413	0.413	0.082

Table 7: Mean of the Composite Welfare Index (CWI) deciles

Variables	Year	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10
CWI	2004	1.27	1.85	3.73	5.29	5.66	5.87	6.08	6.35	6.69	7.21
	2009	2.15	2.51	2.70	3.62	5.50	6.03	6.34	6.62	6.97	7.49
Conditional CWI	2004	5.78	5.65	5.19	5.16	5.03	4.95	4.62	4.87	4.30	4.16
	2009	6.39	6.06	5.94	5.16	4.90	4.70	4.71	4.25	3.84	3.79

Appendix (2)

Descriptive statistics by selected non monetary indicators

Table 8: Descriptive statistics of households consumption by subsample

Variables	Year	Subsample Size	Mean	Standard Deviation
Male HH	2004	960	92.36	91.68
	2009	834	59.09	43.51
Female HH	2004	415	90.98	95.59
	2009	531	60.11	46.24
H Size >=6	2004	679	74.43	65.33
	2009	698	50.60	34.75
H Size <6	2004	696	109.03	110.84
	2009	667	68.79	51.35
lower ed of HH	2004	971	86.61	82.82
	2009	1019	92.85	95.53
higher ed of HH	2004	274	110.25	109.32
	2009	124	63.91	48.40
Total Sample	2004	1375	91.94	92.84
	2009	1365	59.49	44.58

Table 9: Mean of the Consumption deciles by subsample

Variables	Year	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10
Total Consumption	2004	17.57	29.29	39.40	49.35	59.89	72.36	88.24	111.12	153.07	288.52
	2009	14.20	23.13	30.02	36.98	44.34	52.17	62.40	76.75	98.51	156.71
Male HH	2004	18.20	30.04	39.96	49.83	60.82	73.73	90.71	114.16	153.31	281.61
	2009	15.01	23.62	30.98	37.32	43.90	51.46	61.72	75.85	97.11	154.85
Female HH	2004	16.57	27.35	37.97	48.33	58.29	69.25	84.87	103.76	154.10	297.54
	2009	13.10	22.66	28.70	36.19	45.35	53.50	63.75	77.80	101.03	158.43
H Size >=6	2004	14.00	24.59	33.29	40.82	48.76	58.48	69.17	82.94	108.39	201.06
	2009	14.62	20.44	25.10	29.98	36.34	43.59	51.64	60.12	78.01	114.35
H Size <6	2004	19.09	31.02	41.99	52.79	63.81	78.41	95.42	120.51	165.84	305.87
	2009	14.38	24.81	32.50	39.69	47.22	55.64	67.35	82.16	105.10	167.59
lower ed of HH	2004	19.17	34.97	47.18	56.82	67.11	82.80	101.15	134.70	195.13	367.25
	2009	16.01	24.63	31.29	38.79	46.50	55.42	67.72	81.61	105.36	176.69
higher ed of HH	2004	17.25	27.79	37.59	47.33	58.05	70.08	84.99	107.19	145.17	263.71
	2009	13.52	23.00	29.80	37.11	44.72	52.27	62.26	76.17	96.69	151.94