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Recent Issues in Poverty Measurement

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Ali Abdel Gadir Ali
Chief, Economic and Social Policy Division
Economic Commission for Africa, Addis Ababa
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A. Introduction

1. I am asked to contribute a short presentation on the current "frontiers in poverty measurement". I have decided to appropriately tailor my presentation to suit the interests of this distinguished gathering. As such , therefore, if one defines a "frontier" as being judged by the most recent contributions to relevant learned journals, then perhaps one would indeed be able to pronounce on what is happening in these frontiers. This is the approach we will adopt.

2. As is generally well known the measurement of poverty involves two distinct, but interrelated exercises: "identification" of the poor and the "aggregation" of the information regarding the identified poor to derive an overall index of poverty. Most of the measurement issues discussed in the literature deal with what can be termed the micro foundations of poverty based on household level investigation. Macro poverty studies use aggregative indicators of poverty such as per capita income, life expectancy and infant mortality. These and other indicators are related to a particular understanding of the "standard of living" defined in terms of "capability and functioning".

3. In both theoretical and empirical work the "identification" exercise is undertaken by specifying a cut-off point on the standard of living: e.g. income or consumption expenditure (income-based welfare approach) or capabilities and functioning (capability-based approach). Most current literature follows the income based approach where the cut-off point is the Poverty Line defined as the level of income below which people are identified as poor. Questions as to the appropriate Poverty Line to use seem to be the current preoccupation of the frontier in poverty measurement.

4. Evidence for the above preoccupation of the frontier of poverty measurement can be summarized as follows:

(a) in the context of the USA recent contributions (see, for example, Beston and Warlick (1998), Foster (1998), Haveman and Bershadker (1998) and Jorgenson (1998)) have been motivated by the recommendations of a National Research Council Panel on poverty in the USA (Citro and Michael (1995)). Among other things, the Panel recommended revisiting the definition of "resources" at the disposal of the unit of analysis (family, household or individual) as well as a major rethinking of the poverty threshold used to measure poverty.

... to the meeting on "Values Norms and Poverty: A Consultation on WDR2001: Poverty

Weaknesses with respect to the current practice of setting the threshold have to do with the type of equivalence scales used, variations in the cost of living across regions and that the poverty threshold remained unchanged in real terms despite a 30% increase in the median net income of four-person families;

(b) in the context of Europe Atkinson (1998) provided a comprehensive review of the most important poverty issues by taking stock of various estimates of poverty rates in Europe. The European Commission defines poverty as "having an income below 50 per cent of the average in the country in question".

(c) in the context of capacity building for poverty analysis in Africa Ravallion (1998) provides a comprehensive review of the major theoretical and empirical issues involved in constructing and using poverty lines.

5. Under the "aggregation" exercise the most widely used index of poverty is the head-count ratio which is defined as the ratio of the identified poor to the total population. Despite a number of shortcomings, judged from a welfare economics point of view, this index continues to be used by governments, policy makers and international organizations. One obvious objection to the head-count ratio is that it is silent about the severity (or depth) of poverty in the sense of how close are the poor to the poverty line.

6. The above and other shortcomings of the head-count ratio gave rise to a number of alternative poverty measures designed to capture the depth of poverty and its severity (by taking into account the distribution among the poor). The simplest among these is the poverty-gap ratio (which the sum of the gaps between the income of the poor and the poverty line appropriately weighted). The class of additively separable poverty measures is a special case of the Foster-Greer-Thorbecke measure (which essentially introduces a the poverty-gap itself as weights implying higher weights to the poorest among the poor).

7. Given different views about the weights to be assigned, the question that remained was whether a method can be devised which would indicate that one situation is preferred to another for all measures in a specified class. For the additively separable measures, with well-behaved marginal valuation curves (i.e. well defined and non-increasing in income) then a sufficient condition for there to be less poverty is that the poverty deficit curve should lie below (or not above) for all income levels up to the poverty line. Current work is focusing on further exploration of the power of the dominance criteria (see, among others, Atkinson (1998)).

8. It is perhaps clear from the above, rather cursory remarks, that we see the "frontier of poverty measurement" as going back to the drawing board to revisit the exercise of "identification" and the determination of the cut-off point (the Poverty Line) defined on a relevant concept of the "standard of living". In doing this a number of conventional measurement issues are being re-opened: absolute versus relative standards, expenditure versus income, households versus families and the choice of equivalence scales. New issues requiring attention from a "measurement" point of view include, among others, accounting for "time poverty" and appropriately measuring social exclusion. From an African perspective, however, the data problems remain critical despite the massive efforts by the World Bank to generate comparable data sets.

9. In section (B) I will briefly introduce the newly re-opened issue of the "relative" [illegible] section I will

provide an African example of poverty change over time where the issue of the relative and the absolute assumes a policy importance.

B. Relative Versus Absolute Poverty Lines

10. It is perhaps surprising that the frontiers of poverty measurement continue to deal with this old issue of the relative versus the absolute. This time around, however, the issue is being dealt with in the context of the "poverty threshold" itself i.e. the poverty line. The new debate is rekindled by the recommendations of the poverty Panel of the National Council for Research which noted, among other things, that the USA poverty threshold remained unchanged in real terms despite a 30% increase in the median net income of four-person families.

11. As is well known an absolute poverty line is a fixed cutoff level of income or expenditure that is applied across all potential resource distributions. In comparisons over time and across countries the poverty line is unchanged (except for provisions for changes in price levels and exchange rates respectively). Under this approach the poverty line is typically calculated in an initial period (using an appropriate method and the data available at the time) and is kept constant in the future. This was the procedure followed in the USA and it is also the procedure which, until recently, was proposed to developing countries by the World Bank (1990)).

12. A relative poverty line, on the other hand, is defined as a percentage of a standard of living generated by a given distribution of resources: the mean, the median or any other parameter of the distribution believed to reflect the standard of living. The result is a poverty line that moves one to one with the standard of living. This is the practice adopted by the European Community where the poverty line is defined as 50% of average income in the member states.

13. As noted by Foster (1998:337) the "key distinction between absolute and relative thresholds is not seen in the specific values obtained at a given date, but in how the values change as the distribution changes". In the African context the distinction is crucial for changes in poverty over time, specially in the wake of the economic reform programs that have been implemented in the continent over the past one and a half decades. An absolute poverty line tends to overestimate the contribution of growth in income to the reduction of poverty while a relative poverty line tends to make changes in poverty dependent exclusively on changes in the distribution. In view of this we have called for a hybrid approach that makes the poverty line a function of the standard of living chosen (average income or expenditure)[1].

14. A poverty line that changes with the standard of living can be justified on Sen's approach to the standard of living. According to this approach a person's standard of living should be judged by the capability to function: goods and commodities are not directly valued as a source of utility but because they have characteristics that enable persons to function in certain ways in society. The goods required to achieve a specified set of capabilities can be expected to change over time and a poverty line fixed in real terms does not take this into account. In Sen's approach poverty is absolute in the space of capabilities but relative in the space of commodities or characteristics.

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1. Consider the general formulation of the poverty measure as $P = P(\mu/z, m)$, where μ is the standard of living, z is the poverty line and m is an inequality parameter (e.g. the Gini coefficient). Logarithmic differentiating with respect to time gives the rate of change of poverty as follows: $d\ln P/dt = (1-\varepsilon)\,\eta\, d\ln\mu/dt + v\, dlnm/dt$. For the absolute approach $\varepsilon=0$ while for the

15. Foster (1998:339) noted that thresholds that are hybrid in nature could be constructed. Thus for example a weighted geometric average of a relative threshold ($z_r = \alpha\mu$) and an absolute threshold (z_a) would take the form $z = A(\alpha\mu)^{\varepsilon}$, where A is the absolute threshold (z_a) raised to the power (1- ε). This construction gives rise to the importance of the elasticity of the poverty line with respect to the living standard (ε) to which we have alluded above. Given the current state of revisiting the conceptual issues relating to the cut-off point "then the subject of public discourse would more properly be (ε), the income elasticity of the poverty line. The choice of (ε) would then answer the normative question : "To what extent should the poor share in economic growth?" (Foster (1998:340)).

C. Poverty Decomposition: An Example from Nigeria

16. Given the major determinants of poverty measures (mean income and the degree of inequality in the distribution) changes in poverty over time can be decomposed in two components corresponding to these determinant: a growth component and a distribution component. As is well known, the most widely used poverty decomposition methodology is due to Datt and Ravallion (1992). The Datt-Ravallion (DR) method decomposes a given change in poverty into a growth component [G(t, t+ n; r)] a redistribution component [D(t, t + n; r)] and a residual [R(t, t + n; r)], where r is a reference period . It is argued that the most reasonable candidate for the reference period is the initial period involved in the decomposition, i.e. period t. In all the applications that followed the original paper, however, most authors followed Datt-Ravallion's convention of holding the poverty line constant between the two periods involved i.e. adopting an absolute approach to poverty line specification.

17. In a recent paper Canagarajah, Ngwafon and Thomas (CNT) (1997) applied DR decomposition method to Nigeria for the two years 1985 and 1992 (for the details of their results see Appendix 1). On the basis of this type of analysis they concluded that "the national head-count started at 43 percent in 1985 and fell by 8.9 points to 34.1 percent in 1992/93. By components, distributionally neutral growth accounted for a decline of 4.2 points, while distributional shifts accounted for an increase by 14.1 points; the residual effect contributes to decreasing poverty by 18.8 points. The growth component dominates for all poverty measures and contributes more to poverty reduction". The objective of this section is to show that this conclusion depends sensitively on the procedure of holding the poverty line constant at the 1985 level chosen by CNT.

18. We note the following two observations on the data:

(a) real per capita expenditure (in 1985 PPP dollars) is calculated as $716 per annum in 1985. Adopting the annual growth rate of 4.2% of CNT real per capita expenditure in 1992 would have amounted to $ 955 per annum;

(b) instead of CNT method for the determination of the poverty line (0.67 of mean expenditure of 1985) we allow the poverty line to change with income in accordance with an estimated equation based on reported national poverty lines for a sample of developing countries. According to this procedure the poverty line is $ 384 for 1985 and $ 432 for 1992 per person per year[2];

2. The estimated poverty line equation is as follows:

$$\ln z = 3.067 + 0.00666\,\mu - 0.00000446\,\mu^2 \; ; \; R^2 = 0.95$$
$$(34.2) \quad (7.9) \quad (-4.1)$$

19. Table (1) reports our poverty estimates for Nigeria for 1985 and 1992 using the most widely used measures of poverty. The estimate for 1985 is common to the two contrasted methods; but two results are reported for 1992 where the two methods would differ in the treatment of the poverty line. According to our results poverty has increased in Nigeria on account of all poverty measures. According to the method used by CNT poverty declined on account of the head-count ratio but increased on account of the poverty-gap and the squared poverty-gap ratios.

Table (1): Poverty Measures for Nigeria (Summers and Heston 1985 PPP): 1985 and 1992 (percentages)

Year	Head-Count	Poverty-Gap	FGT-P(2)	Gini Coefficient
1985:μ=$716;z=$384	30.65	9.58	3.98	38.07
1992:μ=$955;z=$432	31.19	12.81	6.92	44.93
1992:μ=$955;z=$384*	27.18	10.76	5.63	44.93

* CNT method.

20. Simulated poverty measures required for the decomposition analysis are given in table (2). To appreciate what is being done we also report the Gini coefficient and where it should be noted that the distribution component is common to the two methods. The rest of the table is self-explanatory.

Table (2): Simulated Poverty Measures for Nigeria: 1985 and 1992 (percentages)

Simulation	Head-Count Ratio	Poverty-Gap Ratio	FGT-P(2)	Gini Coefficient
P^{92*} :μ=$955;z=$384: CNT Growth	18.44	4.56	1.51	38.07
P^{92*}:μ=$955;z=$432: Ali Growth	23.08	6.37	2.34	38.07
P^{92**}:μ=$716;z=$384: Common Distribution	37.55	16.19	9.12	44.93

Note: CNT: is Datt-Ravallion simulation keeping z constant.
Ali: is the proposed alternative decomposition allowing for z to change with income.

21. Table (3) reports the detailed decomposition results for the two methods.

Table (3): Decomposition of Poverty Change in Nigeria: 1985 and 1992
(percentage points)

Poverty Change	Head-Count Ratio	Poverty-Gap Ratio	FGT-P(2)
CNT Total Change	27.18 - 30.65 = - 3.47	10.76 - 9.58 = 1.18	5.63 - 3.98 = 1.65
CNT Growth Effect	18.44 - 30.65 = -12.21	4.56 - 9.58 =-5.02	1.51 - 3.98 = -2.47
Distribution Effect	37.55 - 30.65 = 6.90	16.19 - 9.58 = 6.61	9.12 - 3.98 = 5.14
CNT Residual	-3.47 - (-12.21+6.9) = 1.84	1.18 - (-5.02+6.61) = - 0.41	1.65 - (-2.47 + 5.14) = -1.02
Ali Total Change	31.19 - 30.65 = 0.54	12.81 - 9.58 = 3.23	6.92 - 3.98 = 2.94
Ali Growth Effect	23.08 - 30.65 = -7.57	6.37 - 9.58 = -3.21	2.34 - 3.98 = - 1.64
Ali Residual	0.54 - (-7.57 + 6.9) = 1.21	3.23 - (-3.21 + 6.61) = - 0.17	2.94 - (-1.64 + 5.14) = - 0.56

Source: based on tables (1) and (2).

22. According to the method used by CNT the decline in poverty on account of the head-count ratio is a result of a very high decline due to growth (where poverty declined by 12.21 percentage points) and a moderate increase on account of an increased Gini coefficient. If the poverty line is allowed to change with income a complete reversal of head-count result is obtainable. The head-count ratio, according to our method, increased in Nigeria during the period under consideration, albeit marginally by 0.54 percentage points. The growth effect worked in such a way as to reduce poverty by 7.57 percentage points with no dominance over the distribution effect which increased poverty by 6.9 percentage points. As is well known the head-count ratio is not distribution sensitive. For the other two measures (which are known to be distribution sensitive) the distribution effect dominates under the two methods despite the fact that that the CNT method continues to overestimate its contribution.

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Appendix A.1. Data and Poverty Estimates for Nigeria

A.1.1. Data: The data for this paper is taken from Canagarajah, Ngwafon and Thomas (CNT) (1997: 13, table 4.1). The available data pertains to two national consumer surveys and is assessed as being of high quality.

Table (A.1): Income Distribution in Nigeria by Decile Shares: 1985/86 and 1992/93
(percentages)

Decile	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
1985	2.43	3.81	4.81	5.83	6.99	8.49	10.35	12.75	16.55	27.99
1992	1.33	2.66	3.84	5.09	6.37	7.98	10.16	13.23	17.96	31.37

Source: CNT (1997: 13 table 4.1)

A.1.2. CNT Poverty Estimates: CNT (1997: 18 table 46) estimates of poverty in Nigeria are based on a poverty line of N 395.41 in constant 1985/86 Naira is used. We summarize their results in table (A.2). The results are reported in terms of the standard three poverty measures: the head-count ratio which measures the spread of poverty; the poverty-gap ratio which measures the depth of poverty; and the squared poverty-gap ratio (or FGT (2) ratio) which measures the severity of poverty.

Table (A.2): CNT Results on Poverty in Nigeria 1985/86 and 1992/93

Details	1985/86	1992/9	Annual Rate of Change (%)
Per capita Expenditure	593	793	4.2
Poverty Line($0.67\mu_{85}$)	395	395	0.0
Head-Count Ratio (%)	43.0	34.1	-3.3
Poverty-Gap Ratio(%)	15.7	14.7	-0.9
Squared PG (%)	7.9	7.5	-0.7
Gini Coefficient (%)	38.7	45.0	2.2

Source: CNT (1997: tables 4.1 and 4.6; see also table 4.12).

According to the above information per capita consumption expenditure in real terms recorded an annual rate of increase of 4.2%. During the period the income distribution worsened as reflected by a 2.2% annual rate of increase in the Gini coefficient. Within the context of these trends, poverty in Nigeria is reported to have declined on account of all poverty measures. The highest rate of decline in poverty is reported for the head-count ratio which declined from 43% in 1985 to 34% in 1992 recording an annual rate of decline of 3.3%.

A.1.3. CNT Decomposition Results: CNT (1997: 37, table 4.25) original decomposition results at the national level are reproduced in table (A.3) below.

Table No.(A.3): CNT Decomposition Results for Nigeria: 1985/86 and 1992/93
(percentage points)

Poverty Measure	Total Change	Growth Component	Distribution Component	Residual
Head-Count	-8.9	-4.2	14.1	-18.8
Poverty-Gap	-1.0	-5.9	6.7	- 1.8
Squared PG*	-0.4	-5.2	3.8	1.8

* Note that the change in this measure is an increase of 0.6 percentage points. The reported change, if correct, means that P_2 for 1992/93 is equal to 7.5 % rather than the reported 8.5%.

CNT (1997: 37) conclude that "the national head-count started at 43.0 percent in 1985/86 and fell by 8.9 points to 34.1 percent in 1992/93. By components, distributionally neutral growth accounted for a decline of 4.2 points, while the distributional shifts accounted for an increase by 14.1 points; the residual effect contributes to decreasing poverty by 18.8 points. The growth component dominates for all measures and contributes more to poverty reduction".

Appendix A.2. Decomposition Methodologies

A.2.1. Datt-Ravallion Method:

The most widely used poverty decomposition methodology is due to Datt and Ravallion (1992). The method decomposes a given change in poverty between two periods t and (t + n) into a growth component [G(t, t+ n; r)] a redistribution component [D(t, t + n; r)] and a residual [R(t, t + n; r)], where r is a reference period . Thus defining the poverty measure in period t as:

(A.1) $P_t = P(z / \mu_t, L_t)$

where z is the poverty line, μ is mean expenditure (or income) and L is a vector fully describing the Lorenz curve, the above components are defined as follows:

(a) Growth Component: the change in poverty due to a change in the mean income while holding the Lorenz curve constant at the reference level L_r;

(b) Redistribution Component: the change in poverty due to a change in the Lorenz curve while keeping the mean income at the reference level μ_r .
Thus, we have Datt-Ravallion's decomposition as:

(A.2) $P_{t+n} - P_t = G(t, t + n; r) + D(t, t + n; r) + R(t, t + n; r)$

where

(A.3) $G(t, t + n; r) = P(z/\mu_{t+n}, L_r) - P(z/\mu_t, L_r)$

(A.4) $D(t, t + n; r) = P(z/\mu_r, L_{t+n}) - P(z/\mu_r, L_t)$

Datt and Ravallion note that the residual "exists whenever the poverty measure is not additively separable between μ and L, i.e., whenever the marginal effects on the poverty index of changes in the mean (Lorenz curve) depend on the precise Lorenz curve (mean). In general the residual does not vanish. Nor can it be apportioned between the growth and redistribution components" (p.277-78).

On our part we note that the time subscript on the poverty line is dropped in all of the equations, implying Datt and Ravallion assume that the poverty line remains constant over the period of decomposition. This, it will be shown, will always lead to an overestimation of the growth effect.

A.2.2. An Alternative Decomposition Method

Suppose that P is a poverty index which is a function of a poverty line, z, mean income, μ , and an inequality of income distribution parameter, m , say the Gini coefficient. It is assumed that the poverty index is homogeneous of degree zero in the poverty line and mean income, a property common to the most widely used poverty measures. The poverty index can be written as:

(A.5) $P_t = P(\mu_t / z_t, m_t), \qquad \partial P/\partial \mu < 0, \ \partial P/\partial m > 0$

Plausible restrictions on the poverty index function are that : (a) its partial with respect to mean income is negative implying that, for a given inequality, an increase in mean income (in the poverty line) will be expected to lead to a reduction (to an increase) in poverty, and (b) its partial with respect to the inequality index is positive implying that an increase in inequality, for a given mean income, will be expected to lead to an increase in poverty. Following the literature we shall in what follows treat m as referring to the Gini coefficient.

Total logarithmic differentiation of (A.5) will give rise to the following decomposition of a percentage change in the poverty index, where η is the elasticity of the poverty index with respect to mean income and v is its elasticity with respect to the distribution parameter:

(A.6) $dP/P = \eta(\mu/z, m)\,[\,d\mu/\mu - dz/z] + v(\mu/z, m)\,dm/m$

Equation (A.6) can be considered as a complete decomposition of a change in poverty between a growth component and a distribution component if it is assumed that the poverty line is constant. This is indeed the assumption that is generally invoked in the literature. If instead it is assumed that the poverty line changes with mean income, as seems reasonable specially in the context of growing economies, then a complete decomposition of the change in poverty can be obtained as follows (where we suppress the arguments of the elasticities for convenience):

(A.7) $dP/P = \eta\,[1 - \varepsilon]\,d\mu/\mu + v\,dm/m$

where ε is the elasticity of the poverty line with respect to mean income. The growth component of the change in poverty is now conditional on the size of this elasticity. In general the poverty line is inelastic with respect to mean income (i.e. $\varepsilon < 1$) and as such, for a constant degree of inequality, growth will be expected to lead to a reduction in poverty. In Datt-Ravallion method $\varepsilon = 0$ and hence the growth component is overestimated by a factor of $\eta\varepsilon$.

The above implies that to correctly ascertain the relative contributions of growth and distribution to a change in poverty care should be taken in treating the effect of the change in mean income on the poverty line. Thus, DR decomposition should be corrected as follows:

(A.8) $P(\mu_{t+n}/z_{t+n}, m_{t+n}) - P(\mu_t/z_t, m_t) = [P^*(\mu_{t+n}/z_{t+n}, m_t) - P(\mu_t/z_t, m_t)] + [P^{**}(\mu_t/z_t\, m_{t+n}) - P(\mu_t/z_t\, m_t)] + R$

Equation (A.8) embodies our proposed alternative decomposition.