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Poverty Monitoring in Africa

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Abstract

In this paper, we draw on a review of the poverty theoretical literature to derive a framework for estimating and measuring the extent of poverty in Africa. Distinguishing between absolute and relative measures, we use the principles of focus, anonymity, symmetry, monotonicity, transfer sensitivity, and additive decomposability to analyse existing measures of poverty.We apply these criteria to the Foster-Greer-Thorbecke, Sen, Social Welfare, Kakwani, and Dalton. From our review, we find that for Africa, the selection of a specific index must be grounded on the principle of chronic as opposed to transitory poverty, and that any program of poverty eradication that does not take this distinction into account is likely to fail.

I. Introduction[1*]

The magnitude of abject poverty in the developing world was once again brought into sharp focus by the 1990 World Development Report of the World Bank.[2] The debate generated since then about the global poverty process, notably the role of NGOs and other relief organizations, all competing to assert their roles in poverty alleviation, has only served to cloud issues related to the incidence, intensity, severity and persistence of poverty in Africa. Underlying all this is the varying motives and objectives of governments, international institutions and non-governmental organizations which are invariably at variance with and distant from the aspirations and expectations of the poor. Presently aid flows from one bureaucracy to the other, be it government-to-government, multilateral development, financing and technical assistance institutions, IGOs, NGOs, etc. The target group benerficiaries, who are the poor, are very distant actors. The concept of "decentralized cooperation" is been rebuffed by both donors who fear to loose control of ther aid, and the recipient institutions are weary about loosing their traditional sources of resources.[3] These self-serving conflicting concerns are part of the root causes that complicate further and perpetuate the poverty syndrome in Africa.

There is even the lack of a concensus on the concepts of poverty alleviation; reduction; eradication and elimination, which may mean different things to different people and institutions depending on their respective concerns as defined by their programmes. Those attempting to address poverty issues have tended to miss the crucial link between such a conceptualization and its implications for the type of interventions that can be pursued by donor governments, international financing institutions(IFIs), the UN system-wide, IGOs and NGOs. Depending on the definition, these concepts can and do shape the perception and objectives of donors, and by extension, the level and quality of assistance they provide to attack poverty. It is also a very crucial issue in defining the development partnerships and various roles of the actors so that poor countries can distinguish who is doing what and be able to coordinate and optimally exploit external

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[1*] An earlier version of this study, "Poverty in Africa: Towards a Methodological Framework for Analysis" was presented to a Workshop on Monitoring Living Conditions and Poverty co-sponsored by IAOS/AFSA/ECA, Addis Ababa, 20-21 May, 1995.

[2] World Bank, *World Development Report*, 1990: POVERTY. Oxford University Press.

[3] "Decentralized Cooperation in Africa: Finding a New Balance"- Programme Highlights, 1995. A European Centre for Development Policy Management(ECDPM) Publication.

assistance. Poverty is an injustice that derives primarily from this kind of failure of collective human responsibility.[4]

Inherent in the classification of people as poor and non-poor is the assumption that the requisite data and information are available to justify such groupings, monitor shifts in their relative positions, and devise strategies and policies for the alleviation of their conditions. In addition, researchers effortlessly use different and conflicting estimates of the magnitude of poverty in Africa relying as they do only on the perceived reputation of their sources rather than the reliability of the data. What is equally important is that these statistics do not capture the human tragedy taking place in rural hamlets dotted all over the continent. For instance, while Action Aid estimates that 184 million Africans are living in absolute poverty, an OXFAM report put the figure at 218 million, a disparity of 34 million people.

Most of the statistics and conjectures about the poverty phenomenom in African countries are characterized by quick-fix public relation approaches based on findings of narrow and rigid empirical methods. It is therefore reasonble to assume that the faulty analysis of the poverty problem in unexamined implicit models of social change that underlie policy proposals, are themselves part of the root causes of the perpetuation of poverty. A faulty diagnosis of a problem only leads to confused and unsatisfactory prescriptions. It is necessary to examine the structure of poverty inorder to acquire a deeper understanding of how to overcome it. One must, therefore, begin an approach to poverty by questioning accepted methods of analysis. The problem of poverty can only have meaning within an analytical interpretative framework that gives an indepth knowledge of the diversity of the conditions of poverty. Meier(1987) argues that Social Scientist have not succeeded in developing an adequate analytical framework for poverty assessment in poor countries.[5]

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[4] According to our conceptualization, NGOs and similar humanitarian organizations, should concentrate on interventions related to 'poverty alleviation' and some aspects of 'poverty reduction'. 'Poverty eradication', is the responsibility of governments, IFIs(IMF, World Bank, ADB), UNDP, IFAD, and such sector specific UN agencies as FAO, WHO, UNESCO, etc., and the private sector. With such clearly defined roles and responsibilities, development assistance can be better coordinated and targeted.

[5] Paul S. Meier(1987): *The Paradox of Poverty- A Reappraisal of Economic Development Policy*. Ballinger Publishing Company, Cambridge University.

The tasking demands on the World Bank and other IFIs in the area of policy design can be eased if researchers and policy-makers in the region can effectively play a lead role in finding workable modalities

Another dimension of this situation is that the poor are unorganized and lack the ability and political clout to articulate their own needs and aspirations. While the participatory role of the poor is been advanced through such concepts as Rapid Rural Appraisal(RRA) and Participatory Rural Appraisal(PRA), the cultural and sociological factors that shape their lives are ever hardly considered. In fact, the concern purely for income/consumption dimension of poverty is a perception that views it as basically transitional issues of handouts and benevolent actions. Tullock (1986) has described this oversimplification and rationalization of the poverty process as "the veil of ignorance", which makes it impracticable for people to make decisions in full knowledge of real world circumstances. In such a setting, questions need to be raised as to whether we are really sure we all mean the same thing and recognize exactly the same group or situation when we talk of the `poor' and `poverty' in Africa? What is the kind of poverty in Africa: is it "generalized" or "mass"; "chronic or transitory"; "absolute" or "relative" ? Who are the poor and non-poor in Africa? Poor in what?

The poverty conditions prevailing in Africa are clearly distinct from that existing elsewhere in terms of incidence and persistence, underlying causes and, the socio-economic attributes of the poor. Thus, while a common language can be used to discuss the lives of rural people in Asia, Africa and Latin America, it must be recognized that these regions differ too much for case studies and cross-country data analysis to be of much help in arriving at general conclusions"[6]. One potential cause of poverty is found in the very physical localities and geographical characteristics of the milieu where the poor are found.

The persistence of poverty and hunger in Africa in contrast to progress in other developing regions, make one to find awareness that current economic development approaches and practices as applied in the region must be re-thought. The ILO (1993) has pointed out that "even with the universal acceptance of the ideal of a market economy, there remain vast differences in economic structures, in the distribution of assets and in the level of development of market institutions across countries. Given these differences,

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for the eradication of poverty. After all, the essence of capacity-building is for African countries to assume an increasing role in re-defining and situating development and policy approaches in the context of their own enviroment.

[6]T.N.Srinivasan, "Destitution: A Discourse"- *Journal of Economic Literature*, Vol.XXXIII, December, 1994.

there can be no unique prescriptions in terms of development strategy since outcomes will differ across different economies. There is, thus, a clear need for work on appropriate packages of economic and social policies for particular countries if a serious dent is to be made in the alleviation of poverty".

Various estimates and conjectures show that poverty in sub-Saharan Africa has become so pervasive and intense since the 1960s. By all the conventional indicators of social and economic progress, the performance of sub-Saharan African economies have not been encouraging. On top of the lost decade of the 1980s, per capita income has declined consistently each year of the 1990s. For the past 15 years or so the poor in Africa have been whingering about the painful consequences of adjustment measures. A report by a US congressional team strongly suggested that, despite rising per capita growth in adjusting countries in sub-Saharan Africa, structural adjustment has produce little enduring poverty alleviation, and certain policies have worked against the poor.[7] Even the safety-nets to cushion the poor from the adverse consequences of adjustment programmes did not make any significant dent.

Civil wars and other political conflicts in the region had shifted the attention of donors from development per se to the inordinate requirements for conflict resolution. A disproportionate share of development aid now goes to humanitarian assistance for famine and peace-keeping operations including assistance to refugees and displaced persons. These fire-brigade responses to poverty conditions are largely curative, i.e., treating the symptoms, rather than attacking the problem from the root causes.

There is no gain-saying that sub-Saharan Africa's development problems are multi-faceted. Nevertheless, the deep-seated and fundamental issue is "mass poverty". In virtually all major cross-regional comparative analysis of economic and social progress, sub-Saharan Africa is categorized as the "poorest of the poor" among developing regions in the world. 33 out of 47 least developed countries world-wide are in Africa. Since its inception in 1990, all the UNDP reports on Human Development show only Africa countries as occupying the bottom 25 per cent of Human development Index rankings

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[7] "Structural Adjustment in Africa: Insight from experience of Ghana and Senegal". Report of a study team to Great Britain, Ghana, Senegal, Cote d'ivoire and France to the Committee on Foreign Affairs, US House of Representatives. March, 1989. US Government Printing Office, Washington, D.C. Since then, numerous studies on the impact of adjustment in Africa have come out but none has significantly refuted this basic finding of the report.

each year. The World Bank (1990), points out that slow economic growth and rapid population growth in sub-Saharan Africa would mean an increase of nearly 100 million in the number of the poor people as compared with a reduction of 400 million in poverty elsewhere in the developing world. By the turn of the century, sub-Saharan Africa is expected to account for more than 30 percent of the developing world's poor, as against 16 percent in 1985. Based on an assumed four per cent growth rate for the rest of the decade, the magnitude of those in absolute poverty in the African region is estimated under one scenario to more than double from the current 184 million to around 304 million by the year 2000.[8]

Against this backdrop of mass poverty and gloomy forecasts and conjectures, sub-Saharan Africa is faced with a real and vital challenge of coming up with new development approaches for poverty eradication. Since the issue of the World Bank's Report on poverty in 1990, there has been a resurgence of interest of the United Nations, multilateral financing and technical assistance institutions to eradicate poverty in developing countries. As a contribution to the process of seeking for appropriate approaches to the understanding of the real nature and dynamics of poverty and its correlates in Africa, this study evolves from the premise that poverty conditions are region-specific and therefore require specifications in the framework of the social norms, economic structures and level of development of countries in a particular regions.

By reviewing the literature on the conceptual, theoretical and methodological issues of poverty, it seeks to demonstrate not only that, presently, concepts and methods of assessing poverty fail to capture the dynamics of the poverty process in Africa, but that the analytical apparatus in use have grossly underestimated the magnitude of the problem and are in part responsible for the advocacy of policies and programmes which are inappropriate to address poverty conditions in the African region. A preliminary attempt is made to propose an empirically relevant analytical framework that is guided by the specificities and peculiarities of the African economies and can be used for the analysis and estimation of the magnitude and severity of poverty in Africa.

II. The Concept of Poverty

Poverty is a multi-dimensional concept which has appeared for far too long as an addendum to the analysis of income distribution. The slow pace in research to construct a consistent causation between poverty and its various correlates which extends into the

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[8] Action Aid: Bridging the Poverty Gap- An Action Aid Briefing. March, 1993.

broader spectrum of development in Africa is a reflection of the complexity of the poverty phenomenon itself. Since the focus of research in African countries is, for the most, driven by external interests and funding, home-based research, particularly on the conceptual and theoretical issues of poverty, is very minimal. However, the pervasive nature of poverty and its magnitude are now simply too captivating to ignore. To profer workable modalities and appropriate solutions for poverty eradication, a necessary condition and the first logical step will be to conceptualize and critically analyse the problem itself.

It is imperative that researchers should now turn to the conceptualization of poverty in a region- or country-specific context with a view to rendering a clear and systematic construct of the causation between poverty and its correlates in African countries. Such a conceptualization must per force capture the structural and other unique features of the African economies, as well as the cultural, organizational and institutional constraints of sub-Sahara African countries. For example, the Nigerian Economic Society, at its annual conference in 1975, had recognized that the vast resources that was being generated from the Nigerian oil sector had greatly enhanced the country's financial ability to successfully attack the problems of poverty and underdevelopment, but noted that, "having the financial ability is one thing, being able to understand the nature of the problems and design and implement appropriate policies is quite another".[9]

The problem of articulating the poverty process lies at the heart of the wider complexities of articulating the broader process of economic development. Adedeji (1989), argues that "explanations of the development process must be sought not merely in technical and technological interrelationships but also in the ideological underpinnings of the economic strategies involved and their theoretical and value contexts. As societies and their social purposes change, so do the moral and technical presuppositions, together with the concepts and analytical framework and theories with which economic and social behaviour can be studied". This means that societies at different stages of development experience poverty of different magnitudes, intensity, and severity. Therefore, the analytical apparatus must be appropriate enough to conceptualize and define the problem in the context of the African environment.

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[9]Poverty in Nigeria-Proceedings of the 1975 Annual Conference of the Nigerian Economic Society. Ibadan University Press. 1975.

The nature of poverty and the factors that lead to its persistence are subsumed in the web of the interrelated social, economic, political, cultural and environmental processes specific to a given society. Hence, poverty analysis must concern itself with identifying the forces which govern and determine the pattern of ownership of the factors of production since it is that pattern which in turn determines the structure of inter-personal and inter-group differentials in wealth and income in society.[10] The World Bank(1990) states quite correctly that the perception of poverty has evolved historically and varies tremendously from culture to culture. The criteria for distinguishing the poor from the non-poor tend to reflect specific national priorities and normative concepts of welfare and rights.

Current research, which is undertaken in the context of relative deprivation in developed countries, is focused on income and its distribution, consumption and nutrition, which factors underline the concept, definition, measurement and assessment of poverty. The transplanting of this approach to the analysis of poverty in developing countries is couched within the frameworks of concepts, modalities, and variables that basically describe the economic structures and environment of developed countries. Bacquelaine (1993) comments that research on concepts and measuring instruments have developed separately and consequently, all indicators are under the constant influence of Rostowian thought, which implicitly takes the developed countries and their performances as the norm. Poverty is not a marginal or incidental phenomenon, but is structurally related to the way economic and social systems function. That is, systems of production, labour use and distribution do have embedded within them mechanisms which could lead to poverty. It follows that to tackle poverty it is necessary to start with an understanding of these underlying social and economic relations, and to modify them through a range of economic, institutional and legislative interventions.[11]

Another crucial conceptual problem relates to the lack of coherence between poverty issues and policy development in African countries, especially since poverty issues are treated as residuals in policy analysis and programme design. In sub-Saharan Africa, poverty is a widespread phenomenon bordering on the general living conditions obtaining in the society as a whole rather than one of income inequality. The World Bank(1990) argues that "attacking poverty is not primarily a task for narrowly focussed antipoverty projects, vital though these may be. It is a task for economic policy at large". But,

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[10] E.O.Akeredolu-Ale-"Poverty as a social issue: A theorectical note" in Poverty in Nigeria, op.cit.

[11] The International institute of Labour Studies: Poverty: New Approaches to Analysis and Policy. op.cit.

conceptually, policy and programme design is misguided by flaws in distiguishing between such basic terminologies as poverty 'alleviation' (the most commonly-used); 'reduction'; 'eradication' and 'elimination''.

Poverty 'alleviation' denotes a range of short-term palliative measures meant to 'ease' the emergency hardships of the poor population, as in cases of structural adjustment[safety-nets], and man-made and natural disasters[humanitarian assistance for victims of wars and other conflicts; relief for drought-affected and famine]. Poverty 'reduction', while involving palliative measures, are intended to raise the quality of life beyond the necessity for mere 'survival' and 'livelihood' of the poor in a temporary manner through the nexus of wider interventions in education, nutrition, improved health, morbidity and mortality, and, quantitatively, to bring about the graduation of some ultra poor to the class of not-so-poor or non-poor. This strategy demands that the poor have the productive asset they need to maintain sustainable livelihoods and, the opportunity to develop greater autonomy through the interventions and to have control over own resources on which their survival depends.

Poverty 'Eradication', though embracing strategies to alleviate and reduce poverty, the objective is to attack and root out the causes of extreme poverty by creating an enabling enviroment that engenders a sustained level of economic and social progress whereby the population is empowered with the requisite access to productive assets and other investible resources and, a minimum standard of living is guaranteed for the individual by governments as an ethical imperative and moral responsibility of the society.

To illustrate the significance of the above conceptualization of poverty eradication, the incidence and depth of poverty in the United States of America in the late 1930s, was a condition of "mass" poverty.[12] In response to this challenge, the US government waged a war to eradicate poverty i.e. to attack and root out the causes of mass poverty conditions in a relatively affluent society. The strategies were broad-based involving massive employment creation programmes including major Federal government sponsored public works in roads, rail and other infrastructure projects and income-generating activities that focussed on technological development and diffusion. It is quite evident that commitment to consistently implement such strategies supported by adequate

[12]Mass poverty conditions exist in communities and states where nearly all of the people are poor. In such situations half and more of real income is required to acquire food.

longt-term financing instruments, contributed to the successfully eradication of mass poverty in America. The kind of poverty conditions now prevailing in America and other affluent societies is "relative deprivation", which is completely different from "mass" poverty in developing countries.

"Elimination", as a concept in poverty economics, implies to "completely get rid of" poverty altogether. To attain this stage is a daunting task as a goal of development as demonstrated by the experience of developed countries. It is impracticable for as long as, by nature, there are inequities inherent in human existence, physiologically, motivational complexities and drive, differences in resource endowment and unequal access to assets, there will always exist in any society layers of better-off individuals relative to others i.e. relative poverty. It is on the basis of this concept of 'relative deprivation' that social security and welfare systems are designed to address inequities in Western societies. It is an income-centred concept, the income-gap being determined by such arbitrary measure as poverty line; and also welfare-focused, based as it is on a value judgement of what is considered an acceptable standard of living in those societies. It is currently the centrality of the analytical apparatus of researchers for assessing poverty everywhere.

Conceptually, however, the conditions in African countries is one of 'chronic' and 'mass' poverty and not necessarily one of relative deprivation. Despite the overall resource constraints and the competing demands on public budgets, a medium-term strategy should explicitly target the 'reduction' of poverty as the prime objective of development. In that context, government policy must have two distinct goals-to reduce poverty and reduce specific forms of material hardships- to ensure adequate food, housing and health services. To re-orient and implement such a development agenda, it implies that the short-term priorities on debt, budget deficits and restoration of external viability must assume a secondary place without necessarily relegating the significance of these factors in national economic management and responsibilty towards international commitments. The long-term development goal for Africa should be to "eradicate" mass poverty. This would require an alternative analytical apparatus for analysis and policy and strategy formulation which is the task of this study.

In Africa, poverty assessment is usually undertaken in a micro-framework that invariably focuses on the correlation and synergies between poverty and subsidiary issues depending on the objective of the researcher. On the contrary, it can be argued that since poverty is widespread in Africa, the poverty analysis should be at the macro-level and not to be fragmented into narrowly-focussed issues of income inequality and other singular dimensions suited to the specialty interests and programme appoaches of institutions. The

lack of income does not necessarily define poverty in its broader context in the predominantly subsistence-oriented and pastoralist economies of sub-Saharan Africa.In fact, poverty defined as income inequality actually focusses on what should constitute a just pattern of social distribution rather than empowerment as a central concern of poverty eradication.

The link that is been forged in the nexus of population growth and the growing incidence of poverty has not addressed the issues of comsumption patterns and life styles of developed countries, on the one hand, and, the cultures and traditions which underline the poverty process in developing countries. In Africa, there are strong links between poverty and such demographic variables as marrisage patterns, household size and composition, fertility and mortality, perception and preferences for children, as well as knowledge, attitude and practices of family planning. The link between enviromental degradation and poverty alleviation, in terms of the distinction between "welfare poverty" and "investment poverty", is not properly articulated and systematically explored in the sustainable development debate. In the debate, Reardon and Vosti(1995) have taken issue with the Malthusian-inspired discourse on the poverty-enviroment link which is narrowly focussed on the 'vicious circle' between poverty and degradation, and identified five sets of gaps in the literature that is usually ignored[13].

Poverty is also linked both re-cursively and progressively to the wide variations in access to educational opportunities; gender differences; and technological capabilities. Samboja(1994) argues that capital intensive technologies are generally inconsistent with policies aimed at lowering inequality and poverty levels. Partial facts gathered from this macro-approach to poverty assessment often lead to fragmented rather than comprehensive policies. A comprehensive analysis of these linkages needs to be at the heart of an alternative poverty assessment approach for Africa.

The intensity of poverty in sub-Saharan Africa cannot be seen in isolation from the lop-sided structure of the current international economic system. Fair trading and lending practices are crucial to per capita income growth and poverty eradication in Africa where declining terms of trade and highly volatile and variable interest rates on loans, have intensified the severity of the external debt situation and overall resource constraint. Risk

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[13] Thomas Reardon and Stephen A. Vosti:-Links between Rural Poverty and the Enviroment in Developing Countries: Assets Categories and Investment Poverty. *World Development*, Vol.23, No.9, 1995.

aversion on the basis of perceived higher returns on investment in other regions has also led to drastic falls in the flow of foreign private capital, commercial loans and non-concessional flows. African labour markets are depleted by the brain drain as the skilled, experienced and better educated manpower migrate to developed nations. All these factors have contributed immensely to the accentuation of poverty in the region.

From the preceding analysis of the contextual framework of the major factors that have contributed to the intensification and severity of poverty in sub-Saharan Africa, it follows that a coherent process of poverty eradication in the region must focus on a multidimensional policy-mix to bring about a change that is economically, socially and ecologically sustainable. Not only that, poverty 'eradication' must henceforth and perforce should be the core of the analytical apparatus of research and policy analysis, that will guide policy decision-making on poverty in the African region.

III. Definition of Poverty

The fact that current research on poverty is clouded by arbitrariness and the emotive impact of poverty conditions, the definition of poverty does not analytically flow from the context in which it is conceptualized. It is well known that the choice of one specific definition of poverty has major consequences on the resulting cluster of those found to be poor. In the current literature, poverty is defined in terms of the inadequacy of income, or more generally, of disposable resources, to support a minimum standard of decent living. This definition is fraught with conceptual difficulties in analyzing poverty conditions in developing countries. What is meant by the minimum standard of living? How do we arrive at the minimum acceptable level? The standard of living is a multidimensional concept that involves various commodities an individual consumes and the activities he engages in or could engage in.

Another problem stems from the definition of such concepts as "absolute"and "relative" poverty as defined on the basis of the standard of living obtaining in a given society. Absolute poverty implies that there is a poverty threshold below which living becomes mere physical survival. This is a static phenomenom applicable at the advanced stage of development where, with rapidly changing living conditions, the measure of poverty changes to reflect the new values of relative deprivation, often expressed in terms of individuals or households within certain percentile of income distribution in the given society. Defining poverty in these terms is analytically misleading in the African enviroment.

Again, there are the issues of desegregated and aggregated poverty processes which have operational relevance in understanding poverty conditions that will lead to the design of appropriate poverty eradication strategies. Research have shown that "generalized" poverty is typical of countries in a backward state of development where the bulk of the population live in conditions characterized by a degradation below the very essence of human dignity. This aptly represent the case of most sub-Saharan African countries as revealed by various estimates and of conjectures on the incidence of poverty in the region [14]. For instance, poverty is persistent in the rural areas as a result of unbalanced rural-urban development associated with the absence of basic physical, economic, social and financial institutional infrastructure and services which prevent the

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[14] Robert C. McNamara, "Africa's Development Crisis: Agricultural Stagnation, Population Explosion and Enviromental Degradation". Address to the African Leadership forum, OTA, Nigeria, June 21, 1990.

poor from taking initiatives towards non-farm income generating opportunities, and from gaining access to productive assets.

As conceptualized by Reardon and Vosti(1995), "welfare poverty" is a notion defined on the basis of income, consumption and nutrition, but these welfare criteria miss out the potentially large group of households in developing countries that are not 'absolutely poor' by the usual consumption-oriented definition, but are too poor to make key conservation or intensification investment necessary for land use practices that will not damage the resource base or encroach on fragile lands. The concept of 'investment poverty', in contrast, refers to the lack of ability of the poor to make minimum investments in resource improvements to sustain the quality and quantity of the resource base inorder to forestal or reverse resource degradation. Since by definition, the welfare-poor are usually investment-poor, the converse i.e. the investment poor being necessarily welfare poor, is not true, they contend that anthropometric and welfare poverty maps would not detect the kind or level of poverty that may be important to enviroment links[15]. This conceptualization, definition and measurement of 'investment poverty', therefore, are aptly relevant for agriculture-based economies in Africa where, an estimated 50 per cent of the poor in Africa live on marginal lands characterized by low productivity and high susceptibility to enviromental degradation[16], and poverty is a rural phenomenom and, the lack of access to productive assets is a crucial determinant and a major root cause of the pervasiveness and persistence of poverty.

As a crude definition, "mass" poverty in Africa can be seen as a process whereby the bulk of the population is surviving at the daily subsistence local dietary requirement; housed in squatter-type shelters; with the bare minimum of protective clothing; without the means to acquire productive assets; and with very low organizational capabilities and participatory role; as well as inadequate endowment of energy supplies for productive and other uses. In such an environment, the magnitude of ignorance and dependency and the prevalence of diseases, precludes the "Poor" from effectively responding to the demands of and participating in, the economic, social and political life of their societies.

IV. Measurement of Poverty

The measurement of poverty, [i.e. its magnitude (prevalence), intensity, severity, and persistence] must necessarily be the starting point of any concerted attempt at poverty

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[15] T. Reardon and S.A. Vosti, op.cit.

[16] UNDP, *Human Development Report* 1992. New York. Oxford University Press, 1992.

reduction and eradication. Although a number of poverty measures have been devised that are the basis of current analytical work, poverty measurement, as is its conceptualization and definition, is fraught with practical difficulties and complexities, which require a thorough investigation in a regional context. Theoretically, the measurement of poverty begins with the poverty line, which is a sharp divide between the poor and the non-poor. Conceptually, this term suggests that there is a clear line of demarcation that separates the poor from the non-poor. If an individual is below the poverty line, it means that his standard of living falls below a minimum acceptable level. But, the standard of living is a multi-dimensional concept that would require to first specify a poverty line at a minimum acceptable threshold along each of the different dimensions.

There is the problem of measuring absolute and relative poverty. Absolute poverty line signifies a level of living that is barely sufficient for physical survival, whereas relative poverty line is associated with and varies according to a living condition generally prevailing in a society. To justify this methodology, researchers argue that "measuring poverty in relative terms makes sense in the context of a poor society where scarcity of resources does not allow one to help everybody". This is the poverty alleviation perspective of the World Bank which underlies its poverty analysis and assessment in developing countries[17]. This approach engenders conceptual problem in the African context where, because of the generalized (or "mass") state of poverty, there may not be a sharp divide between poor and non-poor.

Empirically, the measurement of the absolute poverty line follows a pre-determined minimum acceptable satisfaction of a basket of basic needs either on the basis of nutritional standards or the level of income or expenditure as defined by a Basic Needs Budget. One estimation approach is to take the minimum cost at which a household can satisfy such needs and multiply it by the reciprocal of Engle's coefficient for food. Such a measure implies that the poverty-line may increase as the individual or the household's average income increases since, by Engle's law, expenditure on food decreases as income increases. Though empirically relevant in assessing poverty in developed countries, aided by sophisticated data and information capabilities, this measure cannot adequately reveal the state of generalized or mass poverty.

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[17] World Bank, "Tanzania: A Poverty Profile". Report of the Population and Human Resources Division, East Africa Department, Africa Region.

Another approach is to construct a linear function for each sub-population found at the lower end of the income distribution spectrum that allows for an intercept term. This measurement is appealing in the sense that the relatively poor are observed to have low monetary income but high level of auto-consumption, which may be common in subsistence economic systems. A linear function is specified as:

(1.) $C_i = b_i + a_i R_i$

where, C_i is the consumption of the income class i, R_i is disposable income of group i, and a_i and b_i are constant parameters measuring the marginal propensity to consume of group i and autonomous consumption or subsistence level of consumption by each group i, respectively. If this approach is pursued further, it may yield different levels of "poverty lines", by assuming there is a constant marginal propensity to consume for all groups taking the property of additive decomposability of poverty indices.

Estimation procedures are not without ambiguities. For instance, a large mass of people may be leading a normal life as accepted by the values of a poor society but may indeed be declared by empirical estimates to lie below an abitrary poverty line conjured up by researchers. Also, studies have shown that determining the poverty-line is irrelevant when the majority are considered poor as in sub-Saharan Africa where, in most countries, an average of 5 per cent of the population command over 90 per cent of the wealth and the rest live in abject poverty. For instance, in a case study on poverty in Uganda, Kayiso(1994) points out that, in terms of per capita income distribution, an average of 94 per cent of the rural population across the regions in the country have incomes of UGshs 240,000 or less annually[equivalent to about US$ 240 or less], while a negligible percentage of the entire population have average incomes of UGshs 960,000. This led to the conclusion that a very small segment of the population control most of the wealth to the detriment of the majority.

Our experience with African societies is that this observation can hold for all countries in the region, and that the poverty line as estimated in the literature may be of little analytical significance in the region. As an illustration, while the poverty line for developing countries given by the *World Development Report*, 1990 ($275-375) translates into "one dollar a day", a recent study in Zimbabwe shows that net incomes per head for rural households are around Z$127(US$14) per year or US3.8 cents per head per day. Zimbabwe is by far relatively industrialized by African standards but with 75 per

cent of its population in the rural areas, it is largely an agrarian society which exhibits an ill-defined agrarian structure that does not make the poor to realize their potential.[18]

In addition to the theoretical limitations of determining the poverty-line, there are a number of estimation problems. One is the paucity of the data in African countries. Nutrition surveys are rarely conducted and household income and expenditure surveys are fraught with incalculable errors right from the sampling and enumeration stages. There is also the equivalence problem, which appears across age factors, variations in nutritional requirements, household composition, etc. To circumvent these problems, various studies have suggested the use of more than one poverty-line to allow for possible measurement errors, and to carry out sensitivity analysis to scale down to the possible best of the poverty-lines.

In general, the controversy surrounding poverty measurement currently runs along two lines: the welfarist and non-welfarist approaches to the standard of living. The issue of ends and means lies at heart of this controversy, and its relevance is in the empirical manner in which poverty lines are estimated and interpreted as a basis for design of policies to address poverty[19]. For instance, expenditures on education, health and other services that improve the individual's well-being are regarded as ends by the capabilities approach but as means by the income-centered approach. The welfarist base their argument on consumer choice theory. This is the concept of utility with a twist towards the ordered preference field as developed by Pareto where utility functions form the building blocks of social welfare functions. Measures of inequality are derived on the basis of such welfare criterion. While analytically appealing, there are various caveats, especially the conceptual and definitional issues that need to be considered in the analysis of well-being in developing copuntries.

As Sen(1985) has argued, most social welfare functions turn out to be functions of individual households income which fail to give a complete picture of well-being. He is critical of the use of both "opulence" (income, wealth or commodity possession), and "utility" (whether interpreted as happiness, desire, fulfilment, or, simply, choice) as measures of well-being, arguing that they come to take the wrong space in which to make such assessments; and that the nutritional and non-nutritional-components are simply

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[18] South African Economist. Vol. 8. No.4, October-December 1995. SADC Press Trust.

[19] Paul Streeton:- Human Development: Means and Ends. American Economic Association(AEA)- Papers and Proceedings, May, 1994.

manifestations of a more fundamental requirement - the capacity to be able to participate in the social life of the community at a minimally acceptable canal.

Income alone and the basket of commodities it is supposed to entail do not, he argues, capture such a definition of well-being which has to do with being able to live long, well-nourished, literate and so on. Nor does the income of a household encompass other variables which form the overall capabilities for the well-being of that household, however deprived.The individual expenditure pattern may not fit well into the basic needs budget proposed by the welfarist approach because of the deviant behaviour of certain individuals within the same household. This is basically true of the poverty line which is commonly defined in terms of securing basic necessities for life.

Despite of the above empirical problems, poverty is generally measured and assessed in absolute terms and in relation to the monetary value of food consumption required to attain an acceptable level of calorie requirement. In essence, what is usually measured is 'food poverty' which is defined with reference to a calorie level necessary to maintain physical well-being. But, such a measurement is faulted on the grounds that individuals vary in their nutritional needs according to cultural and other locality-based factors. In Africa, there are traditional habits, spacing, apportionment within the households of farm families which are determined by culture. There is also adaptation of physiological needs to food availability in terms of small stature and lower levels of activity and energy use. The cash income criterion is also generally inappropriate for measuring poverty in developing countries where access to various services and assets are restricted, and where formal income maintenance systems are lacking.

V. Indices of Measurement

According to the current state of research on the measurement of poverty, the most widely used measures of poverty are said to have the following desirable properties: [20]

(a) Focus: The aggregate poverty index should be independent of the incomes of the rich;

(b) Anonymity: The aggregate poverty index should be unaffected if any two people exchange incomes, ceteris paribus;

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[20] John Rodgers and Joan Rodgers:-Measuring the Intensity of Poverty among Sub-populations: Application to the United States. *The Journal of Human Ressources*, Vol. 26, No.2, 1991. pp. 338-361.

(c) Symmetry: The aggregate poverty index should not change if two or more identical populations are pooled;

(c) Monotonicity (Type 1): The aggregate poverty index should decrease (increase) given an income increase (decrease) of poor person that does not move him or her across the poverty line, ceteris paribus;

(d) Monotonicity (type 2): The aggregate poverty index should decrease (increase) given an income increase (decrease) of a person that moves him or her across the poverty line, ceteris paribus;

(e) Transfer (type 1): The aggregate poverty index should decrease (increase) given a progressive (regressive) transfer of income between two people, both of whom are poor before and after the transfer, ceteris paribus;

(f) Transfer (type 2): The aggregate poverty index should decrease (increase) given a progressive (regressive) transfer of income between two people, which moves the donor (recipient) across the poverty line, ceteris paribus;

(g) Monotonicity Sensitivity: The decrease (increase) in a poverty index, caused by a given rise (fall) in the income of a person who is poor before and after the change in income, must be larger, the smaller is the income of that person;

(h) Transfer Sensitivity (type 1): The decrease (increase) in a poverty index, caused by a progressive regressive) transfer of income between the person and the (j+r) person, both of whom are poor before and after the transfer, must be larger, the lower is the income of the recipient (donor);

(i) Transfer Sensitivity (type 2): The decrease (increase) in the poverty index, caused by a progressive (regressive) transfer of income between two people, both of whom are poor before and after the transfer, but one of whom has D more income than the other, must be larger, the lower is income of the recipient (donor);

(j) Additive Decomposability: The poverty index for a population can be written as a weighted average of the poverty indices for a set of mutually exclusive and collectively exhaustive sub-populations.

As is well recognized in research circles, the choice of an appropriate poverty index depends on the specific objectives and the assumptions about the poverty phenomenon in a given society. For example, when interest is in the ability of a community to alleviate poverty rather than in the magnitude of poverty per se that requires eradication strategies, the focus axiom has to be abandoned. We may also have a paradoxical situation if a proposed poverty line is above the mean income of a society. In that event, an increase in the income of someone below the poverty line decreases poverty by the monotonocity axiom, but worsens the income inequality among the poor.

There is also the issue of the justification of the axiom of focus that is satisfied by nearly all measures of poverty. This axiom precludes the poverty indices from changing as a result of changes occurring in the income of the non-poor. This assumption may well go by for countries with an elaborate welfare system. But, in the African case, where no such systems exist, it is not difficult to find various cases where someone is made non-poor, or well off because somebody else has been made poor. Hagenaars (1987) has summarized the performance of poverty indices in meeting the above axiomatic requirements and concluded that the selection of a given poverty index has to compromise one property with another. These, and other caveats, are vital guides when using what has become standard measures of poverty indices. Currently, the Head-Count ratio, the Poverty Gap, and the Foster-Greer-Thorbecke measures of poverty are the most widely used and appraised in the poverty literature.

V.1. The Head Count Ratio

This is the simplest measure of the incidence of poverty. It is specified as a fraction of the income-receiving units which are below the poverty line in relation to the entire population.

(2.) $+(y)$; $f(y)$ where γ lies between $\underline{y}$ and $\bar{y}$

If z is defined as the poverty-line income level and

(3.) $\underline{\gamma}_2 \cdots \underline{\gamma}_q z \underline{\gamma}_{q+1} \cdots \underline{\gamma}_n$

as household incomes in ascending order, then there are q units below the poverty line. Denoting the ratio as H, we define,

H = q/n .....(1)

as the ratio of people with an income level below the poverty line, where, q is the total number of people earning an income level below z, and n is the total number of the population. In cases when the income distribution follows a continuous probability density function over the random variable income y, the Head count ratio H is defined as:

$$(4.) \qquad H = \int_0^q f(y)dy = F(Z), \ldots\ldots 1$$

where, H = F(z) is the distribution function up to income level z.

Though considered to be a crude measurement, the head count ratio is the most widely applied index to determine the incidence or prevalence of poverty in a society but does not say anything about the "depth" of poverty. In application, the head count ratio may be computed from a panel data on Household Income and Expenditure Surveys by segmenting the number of individuals living below a given poverty line (which is exogenously defined), and dividing it by the total number of individuals in the population. In the case of grouped data, the ratio can be read-off from a specific Lorenz curve.

While this measure of poverty is obviously simple to estimate and interpret, it has a serious draw-back in meeting a number of the desirable properties of a poverty index. It is just a measure of the number of people/households living below an arbitrary poverty line. It does not reveal if someone who is counted as poor has an income of nearly zero or close to the poverty line. For instance, by implying that all the poor experience equal intensity of poverty, makes it insensitive to the relative deprivation of one poor from another. Sen (1976) has argued that since the ratio is insensitive to the distribution of and invariant to the level of income of the poor, it violates the desirable properties of monotonocity(that a reduction in income of a person below the poverty line should be reflected in an increase in poverty) and transfer(that a transfer of income from a person below the poverty line to someone who is richer must lead to an increase in poverty). While the ratio may identify the number of the poor, it ignores how poor the poor really are, and therefore has the absurd property that it remains unchanged when a previously poor becomes poorer[21].

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[21]A.Sen:-Poverty: An Ordinal Approach to Measurment. *Econometrica*, Vol.44, No.2, 1976.pp220.

The head count ratio says nothing about the depth of poverty and, shows no increase in poverty even if the incomes of all poor house holds fall. Kakwani(1980) has shown that the measure is insensitive to decreases in the income of a household below the poverty line, i.e., to the deepening of poverty, and to the transfer of income among the poor, and from the poor to the non-poor. According to Ravallion (1992), the head count ratio measures only the prevalence of poverty and, a very crude estimate at best which usefulness cannot extend beyond a resource allocation tool in poverty alleviation assistance programmes.[22]

V.2 The Poverty Gap

The Poverty-Gap(or income short-fall or income-gap index), is the aggregate poverty deficit of the poor relative to the poverty line. The index is the sum of the gaps between the income of each poor person and the poverty line. It can give a good indication of the depth of poverty, but it is not sensitive to the severity of poverty. The sum of all the poverty gaps is interpreted as the minimun amount of transfers necessary to bring all households/individuals up to a poverty line if perfect targeting were possible.[i] The poverty gap ratio, therefore, is the sum of the difference of each income of the ith poor person from the poverty-line income z. It is defined as :

$$(5.) \qquad PG = \frac{1}{n}\sum_{i=1}^{q}\frac{(z - y_i)}{Z} \quad \ldots(2)$$

for the discrete case and, for a continuous case, it is:

$$(6.) \qquad PG = \int_0^z \frac{(z-y)}{z} f(y)dy = F(z)\frac{(z - \mu^*)}{z}, \quad \ldots\ldots(2)$$

where, u^* is the mean income of the poor.

Equation (2) can also be written as:

$$PG = I.H. \qquad \ldots..(3)$$

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[22] Martin Ravallion, 1992. Poverty Comparisons: A Guide to Concepts and Methods. Living Standard Measurement Study, Working Papar No. 88. The World Bank, Washington, D.C.

where I is the income-gap ratio, defined by:

$$I = (z-y_p)/z \qquad .....(4)$$

where y_p denotes the mean income of the poor below the poverty line.

We may note that if the income gap I is taken as a measure of poverty, it has the obvious deficiency of not measuring poverty in the event one poor is made non-poor. In this case, if y_p declines, then the income gap increases, which is meaningless. This may be avoided if I is multiplied by H, thus PG implying that the poverty gap changes with changes in the income inequality among the poor. The poverty-gap measurement has a clear implication for the costs of poverty reduction to society and the length of time it may take for the poor to cross-over the poverty-line threshold without redistribution. Using equations (3) and (4) above, it can be shown that the minimum cost to society of reducing poverty is given by:

$$(7.) \qquad \sum_{i=1}^{q} z - y_i$$

assuming that the policy-maker has the requisite complementary data and information. In the event when the policy maker does not know who the poor are and who is not, the maximum cost of reducing poverty is z.n. i.e. given the poverty line for everybody in the country.

One draw-back of the poverty gap measure is that it may not convincingly capture differences in the severity of poverty. To illustrate this point, Ravallion(1992) gives the example [ii] of two types of distributions for four persons with distribution A being (1, 2, 3, 4) and distribution B being (2, 2, 2, 4). For distribution A and B, H is 0.75 and PG is 0.25. But, the poorest in A earns half of the poorest of B. This implies that the poverty gap as defined in (3) is invariant to transfers from the poorest to the less poor i.e. it is insensitive to redistribution of income among the poor.

Though a large number of new indices have been introduced in recent years, empirical applications have utilized mainly the Head count ratio and the poverty-gap measures. The reasons lie partly in computational simplicity and in part, in the problem of interpretation of other indices. While Ravallion (1992) argues that the head count ratio H can be interpreted as a measure of the prevalence of poverty, the poverty gap does not

adequately reflect the intensity and severity of poverty. However, these measures have been estimated for many developing countries. In the context of the World Bank's Poverty Assessment and its impact on the country strategies program, the studies have used the head-count index based on the absolute poverty perspective.

V.3 The Foster-Greer-Thorbecke (FGT) Measure of Poverty

The quest for an aggregate poverty measure that reasonably reflect poverty among sub-groups of population has led to the widely applied Foster-Greer-Thorbecke(or FGT) measure of poverty[23]. The FGT poverty index is given by:

$$(8.) \qquad P_{\alpha}(y,z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^{\alpha} \qquad \ldots\ldots(16)$$

where n=total number of households in population; q=the number of of poor households; z=the poverty line for the household; y=household income; and _ is a 'poverty aversion parameter'[24]. The P_ index measures the severity of poverty for values of _ greater than 1, i.e. is sensitive to the distribution of income amongst the poor. The index is simply a head count ratio if _=0 or the product of a head count ratio and normalized poverty deficit if _=1 as given as follows: For _=0, P(y,z) reduces to the Head count ratio, and similarly for _=1, it reduces to the poverty gap maesure. However, for higher values of _, raising each household's normalized deficit to the power _ means that poor household are weighted more heavily in the calculation of the poverty index.[25]

The FGT measure of poverty is said to be: addictively decomposable with population-share weights; satisfies the Sen's(1976) monotonicity axiom for _=0, the transfer axiom for 1 and Kahwani's(1980) 'transfer sensitivity' axiom for _=2, and, is

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[23] Forster, J. E., J. Greer, and E. Thorbecke:- "A class of Decomposable Poverty Measures". *Econometrica*, Vol.52, No.3, 1984. pp.761-776.

[24] The value given by b determines the relative weight given to the very poor in the index. Thus, b reflects concern about the severity of poverty. As b increase a higher weight is given to the poorest of the poor in the poverty gap measure(i.e. when b=1). Usually, the index is not calculated for values of b greater than 2 because of the difficulty with interpretation.

[25] A normalized deficit is a poverty gap, z-y divided by the poverty line.

justified by a relative deprivation concept of poverty.[26] Phipps(1991) argues that, the FGT index fails to register an increase in poverty when the relative number of poor households increases because a non-poor household, A, transfer income to some othert husehold, B, so that the previously non-poor household, A, crossess the poverty line to become poor. The receipient household may be poor or non-poor, but does not cross the poverty threshold as a result of the receipt of the transfer. She concedes that the FGT index has an advantage in that it allows for the decomposition of sub-group population weights.[27]

Foster and Shorrocks (1991) proved rigorously the following two important propositions: (i). P is a continuous, subgroup consistent, relative poverty index[iii] if and only if there exists _, and F_R such that:

$$(9.) \qquad P_R(x,z) = F_R\left[\frac{1}{n(x)}\sum_{i=1}^{n(x)}\Gamma(x_i/z)\right]$$

where, n(x) corresponds to the size of population with income x, F_R continuous and increasing; G is continuous and non-increasing; and G(t)=0 for all t ≥1.

(ii). P is a continuous, sub-group consistent, absolute poverty index if and only if there exist d and F_A such that:

$$(10.) \qquad P_A(x;z) = F_A\left[\frac{1}{n(x)}\sum_{i=1}^{n(x)}\delta(z-x_i)\right]$$

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26 The transfer sensitivity axiom holds that when a transfer takes place from a poor household with income y to another poor household with income y+d(d_ 0), then the magnitude of the increase in poverty must be smaller for larger y. Transfer: a transfer of income from a person below the poverty line to someone who is richer must lead to an increase in poverty. Monotonicity: a reduction in income of a person below the poverty line should be reflected in an increase of poverty. Additive decomposability: The poverty index for a population can be wrtitten as a weighted average of the mutually exclusive and collectively exhaustive sub-group poverty index.

27 Shelly Phipps, Measuring Poverty among Canadian Households: Sensitivity to Choice and Scale. *Journal of Human Resources*, Vol. 28, No.1. 1991.

where, F_A is continuous and increasing; and d is continuous and non-decreasing.

Foster and Shorrocks(1991) have shown that a relative poverty index can be an absolute poverty index if and only if it is an increasing transformation of h; and in application this may not be of much empirical attraction. However, if the ranking of the income distributions implied by the absolute poverty index and the relative poverty index for any poverty line z is the same, then the two indices are said to be compatible. This can hold only if the relative poverty index is a continuous, increasing transformation of $P_\_$, $\_>0$, and the absolute poverty index is a continuous transformation of $z–P_\_$.[iv]. This requirement is satisfied by the Foster-Greer-Thorbecke class of poverty indices. In this class of sub-group consistency are the head count ratio, the povert gap, Chakravarty's index[v], and those of Clark, et. al. These indices are decomposable implying that they are sub-group consistent and constitute a compatible absolute poverty index which is sub-group consistent, and to a large extent satisfy other desirable properties of a poverty index.

Further, Foster and Shorrocks (1991) had argued that aggregate measures of poverty have to be sub-group consistent.[28] This property of a poverty index is closely associated with the notion of decomposability or adaptivity across sub-groups. If a poverty index is sub-group consistent, then it must be in the Foster, et.al. class or any of their increasing transformation. Rodgers and Rodgers (1990) have suggested a rather different measure of the intensity of poverty that could utilize all the known measures of poverty indices. They define an index of poverty intensity (PI) in sub-population k as: PI_k = the proportion of population size contributed by group k. PI_k is particularly much appealing to the class of poverty measures that are subgroup consistent or addictively decomposable. In such a case, $PI_k = p_k/p$, where p_k is of group k's poverty index value and p is poverty index calculated for the entire population.

Even though sub-group consistency is an appealing concept in poverty analysis, the assumption upon which the poverty indices satisfy this condition requires a closer inspection. First, sub-group consistency applies in situations where there is no population growth or migration among the sub-group population. This is a highly restrictive

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28 This sub-group consistency makes the index attractive in apllication since it allows the breakdown of poverty by region, socio-economic groups, or other categories, and to estimate the relative contribution of each group to total poverty.

assumption in cross-section analysis and absolutely non-operational in time-series analysis. Secondly, decomposability of a poverty index is defined as:

$$(11.) \qquad P\left(x^1,...,x^k\right) = \sum_{k=1}^{q} w_k P(x^k;z),.....$$

where x^k is income configuration of population belonging to sub-group k, $P(x^k;z)$ is the poverty index of a population in sub-group k, w_k is share of population sub-group k in total population; and the term on the Left Hand side is the aggregate poverty index, implying that, ceteris paribus, aggregate poverty changes by the difference between poverty index of sub-group i and j, as a result of a change in population share sub-group i and j, irrespective of the type of people who moved in or out. Thirdly, the poverty line that is used across all sub-groups is fixed and constant. Hagenaars (1987) has pointed out that no poverty index is capable of satisfying all axioms simultaneously if variable population size is assumed.

The estimation procedure for the aggregate poverty measures outlined above is closely related with the summary measure of income distribution known as the Lorenz curve. A closer look at all poverty indices indicates that they are functionally related with the poverty line, and rank income of the poor. Thus, if L(p) represents the percentage income of the poorest percentile in the population, H can be obtained using the relationship that x = _L'(p) which is the inverse function of the distribution function, p = F(x) and so L'(H) = z/m; where, z is income accruing to the percentile population, m is the total mean income accruing to the population and L'(p) is first-order derivative of the Lorenz function with respect to p[29]. As can be seen, this differential equation can be solved given the specific functional forms of the Lorenz curve. There are a variety of

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[29] See: N. Kakwani: *Income Inequality and Poverty: Methods of Estimation and Policy Applications.* Oxford University Press. 1980. The Lorenz curve is a graphic representation of inequality showing the cumulative share of total income according to each cumulative share of the population, when incomes are ordered from poorest to richest. However, if two income distributions are identical except that incomes in one are higher than the other, the two lorenz curves will be identical. Nevertheless, the size of the income in the two distributions is different. Another representation that assesses the absolute differentials between poor and rich incomes is the Generalized Lorenz curve. It incorporates both income and equality levels when comparing 'income' distributions and, by construction, it is the mean income times the Lorenz curve.

parameterized Lorenz functions to choose from for estimation, and it is usually suggested to fit more than one functional form.[30]

In the poverty measurement exercise, the interpretation of estimates of the aggregate indices stand prominent. The figures alone do not tell more than any statistical result. This has been the case specially with indices in the Foster-Greer-Thorbecke class with higher degree parameters. Even though some interpretations have been suggested for a = 0, a = 1, and a =2, it has remained ambiguous for a = 2. This is more so when interest is on the measurement of intensity of poverty. In spite of these drawbacks, the FGT poverty index is increasingly becoming an appealing technique in poverty analysis since it satisfies a large number of desirable properties of a poverty index as determined by the criteria built into the social-welfare functions approach to the measurement of income inequality.

Phipps(1991) gives the following numerical example to illustrate the differences among the Head count ratio; the poverty gap and the FGT poverty index. Suppose all households consist of single individual and that the poverty line is $10,000. Consider the following income distributions:

A: { 5000; 5000; 5000; 5000; 5000; 5000; 15000; 15000; 15000; 15000}

B: { 2000; 2000; 9000; 9000; 9000; 9000; 15000; 15000; 15000; 15000}

For both distributions A and B, the head count ratio is 0.60. The average poverty gap is 5000 for distribution A but only 3,333 for B. Thus, while the extent of poverty would be judged equal using the head count ratio, distribution A would be regarded as having more serious poverty problem using a poverty gap measure. The FGT index, assuming =2.5 is 0.106 for A and 0.116 for B. In this case, the index judges distribution B, with two seriously deprived households, to have the more severe poverty problem.She concluded that the FGT or other similar indices are seldom employed in applied studies of poverty but are attractive from a theorectical perspective particularly as a result of their attention to the distribution of income among poor households.

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[30] For Application, see: N. Kakwani-Poverty and Economic Growth with Application to Cote D'ivoire. LSMS Working Paper, No.63, 1990.

V.4. The Sen Poverty Index

In his seminal work on poverty measurement, Amartya Sen's [1976] objective was to derive an index that satisfies the properties of monotonocity and transfer and, other distribution sensitive properties. The derivation of a "distribution sensitive" measure of aggregate poverty captured significant explanatory properties overlooked by conventional indices and had spurred an extensive debate. In general, such an index satisfies the axioms of monotonocity; transfer; relative equity; ordinal rank weights; monotonic welfare; and, normalized poverty value.

The basic equation is as follows:

$$(12.) \qquad Q(x) = A(z,y) \sum_{i \varepsilon s(x)}^{q} g_i v_i(z,y) .....(3)$$

where, S(x) is the set of people with income no higher than x;
Q(x) is the aggregate income gap;
$v_i(z,y)$ is the non-negative weight to the income gap of the its person; and,
A(z,y) is a normalizing factor.

Note that y enters as a vector. P=max Q(x) implies that the aggregate poverty level is the maximum weighted income gap of the poor in a given community where the income shortfall of the ith person and the jth person must receive different weights[31].

For large numbers of the poor, the Sen index satisfies Axioms R, M, and N. It is given by: S= H[(I + 1-I)G].....(4) where, H is the head count ratio, I is the income-gap(average shortfall of the income of the poordivided by the poverty line), and G is the Gini coefficient of the income distribution of the poor.[32] However, S as defined in (4) is derived from the concept of the weighted income short-fall for the individuals below the poverty line. If we let the underlying procedure used to derive the absolute poverty measure to cover the whole income range then, the result evolves into a measure of

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[31] [which, if the poverty line income is z, becomes P=max Q(z)],

[32] The Gini Coefficient is an inequality index derived from the Lorenz curve. It is a summary measure of how uneven incomes are spread, i.e. it measures the area between a given lorenz curve and the lorenz curve for perfectly equal distribution(a 45 degree line). It is defined as the ratio of the area between the line of equal distribution and the curve to the total area under the equality line.

relative income inequality. Thus, the index S is essentially a translation of the Gini coefficient from the measurement of inequality to that of poverty[33].

The basic assumptions underlying Sen's index are: (a) that the weights on successive income short-fall are equal to the rank orders of the poor. If there are 100 poor persons below the poverty line, arranged in ascending order, the weight given to the 100th person is 100, to the 99th person 99, etc, and (b), that under the extreme case when all poor are at the same income level, $y^{*}<z$, then S= H.(I), which is certainly arbitrary. These assumptions and the axioms are the critical links between the Sen poverty index and that of relative inequality measures.

Sen concedes that the axioms relating to the ordinal rank weights and normalized poverty value are arbitrary and bear obvious shortcomings in terms of rigor. The equity axiom holds the broader view that welfare of individual i is less than welfare of individual j without a concern for magnitude. If a utilitarian social welfare function(SWF) is assumed and utilities can be fully compared interpersonally, the equity axiom can be explained in terms of the marginal utility of individual i and j. Axiom E can be embraced into Axiom R (Ordinal rank Weights). He points out the non-existence of any additive utility function which ranks income distributions in the same order as the Gini coefficient.These conclusions are better examined parallel to the class of additive social welfare functions(SWF) and the class of Foster-Greer-Thorbecke (FGT) poverty indices as well as the implication of the Gini coefficient in the Sen index.

Sen also introduced the monotonic welfare theorem: (Axiom M) which states that for any i, j, if $y_i>y_j$, then, $w_i(y)>w_j(y)$. Here, the problem with the head count ratio H is that it ignores the poverty short-fall per person. The Head count ratio and the income-gap index, I, give a complete information of the poor if all poor earn an income level $y*<z$. Note that, H and I, do not put any welfare weight on the poorest of the poor. Thus, the normalized poverty value, axiom N : If all the poor have the same income, then S= H.(I). According to Sen, these axioms are sufficient to derive a poverty measure that satisfy acceptable properties by a certain social evaluation criterion.

Kakwani (1980) argues that Sen's poverty index, while insightful conceptually, has a technical drawback that is essentially inherent in the Gini coefficient itself. This is the rank order weight given to each individual lying below the poverty line income which

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[33] A. Sen, Poverty: An ordinal Approach to Measurement. *Econometric*a, Vol.44, No.2. 1976.

implies that: a transfer of income among the poor is a matter of the size of the rank order between the donor and the recipient no matter their relative deprivation; and, that the corresponding Gini coefficient behaves in a similar manner for all levels of income. It is posited that the rank order can be rescaled by a positive scalar greater than 1. He argues that the transfer occurring at the lower end of the income of the distribution scale affects the poverty index more than if such a transfer occurred at the upper end. However, choosing a specific scalar independent of the underlying income distribution while retaining the desired transfer insensitive to the poverty index is shown to be impractical.

Kakwani (1980) formulated a poverty index by introducing the notion of the Gini coefficient. Given a random probability density function of income distribution, f(y), and a poverty line income z, the proportion of people earning income below z is given by: F(z)= q/n, where, q is the number of people earning an income level below z, and n is the total number of population. This is a continuous case for the head count ratio, H, as defined earlier. The poverty measure is defined as: $P= F(z) (z-u^*)/u$, where, u and u^*, respectively, are mean income of the total population, and mean income of the poor only. If G_p represents the Gini coefficient of the poor, then $P= F(z) (z-u^*)/u$, for $G_p =0$, This specification yields a general class of poverty measure which is written as: $P^*= F(z) [z-u^* g(G_p)]/u$, where $g(G_p)$ is any monotonic function of G_p. From this, it can be recognized that Sen's index is a generalization of such a specification of a poverty index i.e. $P< F(z) (z)/u$, for $dp/dG_p >0$, for all G_p.

Thon (1981) had shown that there is a basic flaw in this generalized equation which, he argues, violates the axioms of monotonciity and transfer by assuming u and F(z) to be constant when G_p changes as a result of a transfer from one poor to another, or from a poor to a non-poory. In an earlier work, Thon(1979) had argued that the poverty index developed by Sen and the various versions used in empirical studies have a weakness in terms of their implication for interpersonal transfers to alleviate poverty. He states that the poverty measures violate the following requirements- that *ceteris paribus*: (a) no transfer of income to anyone richer should decrease a poverty measure; (b) no transfer of income to a poor person from a rich person who stays rich should increase a poverty measure; and (c) no increase in a poor person's income should increase a poverty measure[34]. A poverty measure inconsistent with these requirements inevitably faces a

[34] D. Thon, On Measuring Poverty. *The Review of Income and Wealth*. Series 25. 1979.

problem of ambiguity. In these senses, the issue of poverty alleviation through redistribution takes the Paratoen and egalitarian dimensions.

Thon proposed a poverty measure given by:

$$(14.) \quad p_* = \frac{2}{n(n+1)z} \sum_{i=1}^{q} g_i(n+1-i) \ldots\ldots 5)$$

where, p∗ takes the weight suggested by Sen when everybody below the poverty line earns the same income. It is obvious that p∗is completely insensitive to the number of the poor.

V.5. Social Welfare Function (SWF)-Based Indices

Another strand of studies have attempted to use a class of Social Welfare Function(SWF) -based measures of absolute and relative inequality to derive poverty indices. Given a social welfare function that is continuous, S-concave and homothetic, one may define the representative income B as that income, if distributed equally, is ethically indifferent, as measured by the social evaluation function, to y, and is defined by:

$$(14.) \quad W(\beta_n) = W(y) \ldots\ldots 6)$$

where 1_n is the n-coordinated vectors of one. Solving (6) uniquely for B, we get: B= E(y).....(7), where E is a particular numerical representation of W, homogeneous of degree one. Letting b>0 be the mean distribution y, the Atkinson-Kolm-Sen[vi] inequality index is defined as:

$$(15.) \quad I(y) = 1 - \frac{E(y)}{\beta} \ldots\ldots 8)$$

Keeping in mind the above relations and the desirable properties that a poverty measure need to satisfy, various indices can be derived.

A poverty index P(y,z)-whether a relative or an absolute index [vii] -is required to satisfy the following properties apart from those already discussed: (a) P(y,z) is independent of the incomes of the rich; (b) P(y,z) is increasing in z; (c) P(y,z) is left

unchanged by a permutation of the incomes (impartiality); (d) P(y,z) is jointly continuous in y and z; and, (e) if the population is replicated several times, then the poverty index should be the same for the original income distribution obtained through replication (population symmetry axiom). Takayama (1979) has defined the censored income distribution y^* corresponding to y as follows:

$$(16.)\qquad \begin{aligned} y^* &= (y_1^*, \ldots\ldots y_n^*) \\ &= (y_1, \ldots, y_{n-q+1}, z, z, \ldots\ldots z) \end{aligned} \qquad \ldots\ldots\ldots (9)$$

He defined the Gini coefficient $I^*(Y)$ of poverty distribution y.

$$(17.)\qquad I^*(y) = \frac{1}{2n^2\beta^*}\sum_{i=1}\sum_{j=1}\left|y_i^* - y_j^*\right| \qquad \ldots\ldots\ldots (9),$$

$$\text{where, } \beta^* = \frac{1}{n}\sum_{i=1} y_i^*$$

It can be shown that the poverty index so defined violates the monotonocity axiom in that the Gini coefficient of the censored income distribution is invariant if all income are multiplied by a positive scalar.[35]

Blackorby and Donaldson (1980) came up with the notion of a completely strictly recursive property in the social welfare function, W(y), to derive a poverty index. This property ensures that the income of the poor is strictly independent from the income of the rich. If the representative income of the poor is given by β_p, we may write:

$$(18.)\qquad W(y) = W\left(\beta_p, \beta_p, \ldots, y_{n-q}, \ldots y_n\right) \qquad \ldots\ldots\ldots (10)$$

since W is completely strictly recursive, b_p is independent of

$(y_{n-q}),\ldots,y_n)$, and thus,

$$(19.)\qquad \beta_p = E^q(y_1, \ldots, y_{n-q}, \ldots, y_n) \qquad \ldots\ldots\ldots (11)$$

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[35] N. Takayama, 1979. "Poverty, Income Inequality and their Measures: Professor Sen's axiomatic approach reconsidered". *Econometrica*, Vol. 47. 747-759.

where b_p is homogeneous of degree one. They consider

(20.) $$B(y,z) = \frac{q\left(z - \beta_p\right)}{n(z)} \quad \ldots\ldots\ldots(10)$$

as a general relative measure of poverty index.[36]

Chakravarty (1983) has shown that B(y,z) violates continuity, and the strong transfer axiom. He proposed a new index denoted by:

(21.) $$Q(y,z) = \frac{z - \beta^*}{z} \quad \ldots\ldots\ldots(13)$$

where b^* stands for the representative income corresponding to the censored income distribution vector y^* ,so:

(22.) $$\begin{aligned} \beta^* &= E\left(y_1^*, \ldots . y_n^*\right) \\ &= E\left(y_1, \ldots . y_{n-q}, z, \ldots . z\right) \end{aligned}$$

The relative poverty index Q(z,y) satisfies all known properties of a poverty index. It can also be shown that given Q(z,y), there corresponds different relative poverty indices to every homothetic social evaluation function which is captured through b^*. Likewise, an absolute poverty index can be derived from a Social welfare function that is continuous, increasing, strictly s-concave, and translatable. W is translatable if it can be written as:

(23.) $$W(y) = \phi(w(y)) \quad \ldots\ldots\ldots(14)$$ where phi is increasing in its arguments and W is unit-translatable.

The overall representative income b can be written as :

b=F(y).....(15), where F is unit-translatable.

Following these, Chakravarty defined absolute poverty index as:

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[36] C. Blackbory, and D. Donaldson, 1980. "Ethical Indices for the Measurement of Poverty". *Econometrica*. Vol.48, No.4. 1053-1060.

$$(24.) \qquad T(y,z) = z - \beta * z$$
$$= z - F\left(y_1, \ldots . y_{n-q}, z \ldots ., z\right) \ldots \ldots \ldots (14)$$

T lies between zero and 1 and measures the per capita poverty. Total absolute poverty is arrived at if we multiply T(y,z) by n to yield:

$$(25.) \qquad T(y,z) = n(z - \beta^*) \ldots \ldots \ldots (16)$$

Both absolute poverty indices satisfy all the properties listed above[37].Note that they are the translations of absolute inequality index. In addition, for every social welfare function that is translatable, there exists a particular poverty index.

One very important feature of available poverty indices is that all can be deduced from the inequality measure introduced by Dalton (1920) and Atkinson (1970) in the context of social welfare. The former defined a measure of inequality as:

$$(26.) \qquad D = 1 - \frac{S(y)}{S(ym)}$$

where S(y) is a social welfare function according to a given income distribution, and $S(y^m)$ is the maximum social welfare to be attained given the available total national income.

The social welfare function of the Dalton tradition is defined over additively separable utilities of income, which is commonly known as a utilitarian social welfare function:

$$(27.) \qquad S(y) = \frac{1}{n} \sum_{i=1}^{q} U(y_i)$$

where $U(y_i)$ is the individual utility of income, and n is the total number of the population.

Atkinson transformed the Dalton measure of inequality into an income space by a transformation of $G(S(y))=U_{-1}(S(y))$. The specification of a poverty index is made using

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[37] S.R. Chakravarty, 1983. "A New Index of Poverty". *Mathematical Social Sciences*, Vol. 307-313.

the Dalton measure of inequality, which can be transformed into Atkinson's inequality measure. The move from an inequality measure to a poverty measure is made by truncating the income distribution for the entire population above the poverty threshold in the manner of Takayama (1979), Chakravarty (1983) and others as discussed earlier. Under this situation, the Dalton measure of inequality, D, reduces to a poverty measure if we define the social welfare function as:

$$(28.) \quad S(y^*) = \frac{1}{n}\sum_{k=1}^{n} \min[U(y_k), U(z)], \text{ where } S(y^*) = \frac{1}{n}\sum_{k=1}^{q} U(y_k)$$

The Dalton poverty index is defined as the relative gap between maximum attainable social welfare and actual social welfare of the truncated income distribution. If the poverty line, z, is less than the mean income of the population, y^-, then, Dalton's measure of poverty, D_p, can be written as:

$$(29.) \quad D_p = 1 - \frac{S(y^*)}{\max(S(y^*))}$$

It is obvious that the maximum welfare attainable by all people with income below z is to have their income equal to z; thus, max. $S(y^*) = U(z)$, which then implies $D_p = 1 - S(y^*)/U(z)$.

With an appropriate specification of U(y), we can derive poverty measures using the above relations. For example, the following variants represent respectively the Clark et. al. (1983), the Foster, et al, (1984), and the H poverty indices.

$$(30.) \quad \begin{aligned} &i.\ U(y) = \frac{1}{\beta} y^{\beta}, \\ &ii.\ U(y) = z^{a} - (z - y)^{\alpha} \\ &iii.\ U(y) = y \end{aligned}$$

Hagenaars (1987)[viii] has shown that if U(y) is continuous, strictly concave, and an increasing function, then, D_p satisfies all the desirable properties mentioned above except the population proportion axiom resulting from transfer of income from a rich person to a poor one.

Likewise, the Sen (1976), Kakwani (1980), Takayama (1979), and Thon (1979) measures of poverty are special cases of the D_p poverty index when the social welfare function is defined by the Gini type of the form:

$$(31.) \quad S(y) = \sum_{i=1}^{n} w_i y_i$$

where, all incomes y_i are ordered such that $y_i < y_{i+1}$ for all i. w_i is a weighting scheme we give to the relative position of individual i in terms of the welfare concept we have in mind. The corresponding D_p defined over the censored income distribution is given by:

$$(32.) \quad D_p^w = 1 - \frac{\sum w_i y_i^*}{z \sum w_i}$$

By using this same notion of social welfare function, Lewis and Ulph (1988)[ix] have suggested a framework that: determines the poverty line endogenously; separately measures poverty and income inequality; and offers a broader opportunity of incorporating kinds of deprivations that determine poverty in a given community. Their theoretical framework reinstates the Head count ratio(H) as a measure of poverty when an individual is subject to a single-type of deprivation and, move away from H when the issue is that of multiple deprivation.

A point of departure of the Lewis-Ulph analysis is the individual utility function which exhibits discontinuity as a result of the individual's inability to participate in a certain activity for lack of sufficient income. This creates a distinction between the indirect utility function of the poor and non-poor. In addition, as other measures do, the Lewis-Ulph index does not face the perverse situation when average income of the population falls below the poverty line. However, the Lewis-Ulph framework is conceptually attractive in that the participation attribute being specific to each community implies the level of deprivation and destitution prevalent in that particular community. A drawback is the problem of comparing poverty across different groups, communities, and countries, since the poverty index is specific to a community (essentially relative poverty) in the context of the participation parameter chosen. The framework is prone to problems of specification and estimation of demand systems in neoclassical choice theory. Also, recalibrating the poverty measures that are derived from welfare-based functions are questionable in terms of empirical relevance.

The approach suggested by Lewis and Ulph (1988) is to imbed into individual utility functions a social welfare criterion that is symmetric, Paretoen and quasi-concave in order to construct a framework that is welfare consistent. Within such a framework, there is nothing in the consumption behaviour of consumers nor in the construction of the individual or social welfare functions that gives one particular level of income the character and significance that this poverty line has in the present discourse on poverty analysis. The utility function is defined over two sets of commodities: a set of commodities that are normal, x, and assumed to be perfectly divisible and, a set of commodities that are basic for survival, z. The problem of the individual consumer is thus to maximize: U (x,z,a) subject to px + qz < or = y where, p and q represent price indices of commodity x and z, respectively. The special feature of this framework appears in the parameter 'a', which is supposed to represent participation activities of the consumer depending on the quantities of z and x he is able to buy. Such parameterization yields what Lewis and Ulph (1988) call conditional indirect utility functions. After an S-concave, symmetric social welfare function is embedded in the indirect utility function over all individuals, what finally results is a welfare change due to income inequality and poverty.

Quite interestingly, the poverty index that comes out of such a framework is the Head count ratio, which may lead one to believe that H is a welfare consistent measure of poverty. The income inequality index is the difference between welfare under what could be the most ideal situation (no equality and poverty) and that under a particular actual situation. Incidentally some studies [x] have already utilized similar reasoning to capture inequality changes when there were no sufficient time series data to estimate the dynamics of poverty. Empirical investigation to poverty and inequality issues may also proceed along the framework suggested by Lewis and Ulph by specifying a utility function and setting dummy variables for the parameter 'a' to solve the identification problem.

Conceptually, poverty may be cast side by side with income inequality if defined as a situation at the lower or upper end of an income distribution[xi]. However, when poverty is defined as a state of absolute destitution and deprivation, then the logical consistency between poverty and income inequality is severely compromised. In fact, the two concepts take distinct attributes. So far, attempts to resolve this apparent distinction have been done through the classification of poverty threshold into an absolute poverty line and a relative poverty line.

Hagenaars (1987) has noted that if the mean income of the population lies below the poverty threshold, then, the poverty measure implied by the Dalton-Atkinson approach reduces to an income inequality measure, which immediately violates the axiom of monotonocity and focus. It follows that the choice of a given poverty index depends very much on the kind of deprivation we may have in mind.

From the above analysis, it is clear that, firstly, all poverty indices developed so far are simple extensions of the income inequality concept formulated in the Dalton-Atkinson social welfare context that may either take utilitarian structure, or the weighting system of individual income in the sense of Gini (or Lorenz function)[xii]. Secondly, the axioms that a poverty index may have to meet are also drawn from axioms of income inequality measures. As Sen (1976) aptly commented, the basic equation he formulated [see Equation (3) under Sen's Index above] to capture the attributes of a poor person in terms of relative deprivation took him back to the natural home of income inequality measurement.

In general, the above indices have inherent inadequacies in that, first, they do not clearly show how poverty is related with inequality and its measurement; second, the interrelations between poverty and inequality and their contribution to overall social welfare is not made clear. Third, the poverty line is given exogenously, though at the conceptual and empirical level, there is an element of value judgement that enters in the definition. For if the factors giving rise to poverty, and hence the poverty line, were better reflected in the construction of individual welfare and utility, it may be easier both to distinguish poverty from inequality and also to display their interrelated and joint contribution to the overall level of welfare". [xiii]

V.6 The Rank Dominance Method

When the conceptual and empirical problems surrounding poverty line become acute, and the analysis based on aggregate measure of poverty is concerned with development strategies, one can use the rank dominance method of ranking Lorenz curves to compare poverty across countries, regions, subregions, groups of people, etc. Bishop, *et.al*.(1991) consider Rank Dominance as a criterion for comparing income distributions. It is bordered on the strong parts principle, but does not include the principle of transfers. This method has the advantage of dispensing with the controversial poverty line in ranking poverty in whatever sense we understand it. In fact, this approach is gaining a wider audience among researchers since it can also be used to

analyze poverty dynamics. The concept of rank dominance is derived from the analysis of inferences from Lorenz curves. It is well known that if one Lorenz curve dominates another one for an entire income range and the mean incomes are the same in both cases, then social welfare is higher in the first case than the latter[xiv]. This interesting feature of the Lorenz curve has been further applied to cases of unequal means using the dominance method.

Shorrocks (1983), and kakwani (1984) have shown that when ordinary Lorenz curves are scaled by the mean of the distribution, dominance comparisons can be made in the same fashion as with Lorenz curves. The dominance in terms of Generalized Lorenz curve has also been called the Second-degree Stochastic Dominance (SSD), while that for ordinary Lorenz curves is called the First-degree Stochastic Dominance (FSD). The former incorporates efficiency considerations along with equity, where as the FSD is concerned only with equity considerations.

Both FSD and SSD methods are carried out using the inference tests developed by Beach and Richmond (1985) by constructing confidence bands around a sample quintal (GL curve) which allow for three outcomes regarding dominance. One outcome is that if the distribution of each quintal overlaps, thus are equal; second, if the quintal functions (GL curves) are not equal but intersect, the quintal curves cross and are non-comparable. Third, if two quintal (GL curves) neither cross nor are equal, then a rank (GL) dominance relation exists.

The procedure to apply the dominance method to poverty is found in the relationship between the head-count ratio and rank dominance. It is an established proposition that if distribution A rank dominates distribution B, then head-count poverty in A is less than it is in B, regardless of the value of the poverty line. Thus truncating distributions A and B above any arbitrary poverty line, z, and testing for rank dominance on the truncated distribution, provides dominance ordering of head count poverty.

VI. A Framework for the Analysis of Chronic Poverty

The preceeding review and appraisal of poverty measures was undertaken to show their robustness and deficiencies as well as appropriteness as methods for poverty assessment in African countries. Our finding is that there are major empirical problems in trying to apply the existing methods and measures. Underlying these problems is the current state of the statistical data base in Africa which presents a formidable barrier to

the utilization of conventional indices. It is against this background that this section will outline a framework for analysis and assessment of chronic poverty in Africa.

There are numerous theoretical limitations of the various poverty measures in assessing poverty in Africa. Poverty in Africa is believed to be generalized, intense in depth, and persistent over time. The poverty measures are income centered in their construction, and there is no explicit justification why wealth or other types of assets which really reflect more profoundly a person's affluence or destitution in the African setting are not considered. The subsistence nature of African economies and the growing number of people living on unearned income and surviving on livelihood strategies(beggary, relief assistance, etc.,) make the African poverty distinct in nature. Existing poverty indices do not reflect the source of individual income as an important element influencing the poverty process.

Also, scales of diseconomies (or economies) following deterioration in the economic environment and, the consumption of public goods are not treated explicitly in the underlying social welfare functions that generate the poverty indices. Quite uniquely, Africa has the disadvantage of welfare loss at a community level as a result of poor sanitation, illiteracy, poor medical services irrespective of the level of income of the individual. Community level deprivations escape the poverty indices which are centered around the individual or, at best, the household. Also, the effort needed to earn a given level of income may be an important element to the poverty process, especially in African situation where an individual may find himself still in absolute poverty even after employing himself fully in a certain occupation. These and other factors need to underscore poverty measures for them to yield results that are capable of intuitive interpretations.

Apart from the option of using two or more poverty lines, and the sensitivity analysis that can be made to ensure better statistical results, there are methodological issues to be resolved to minimize the acute dependency on arbitrary measures. These include the use of conditional Indirect Utility Functions as proposed by Lewis and Ulph (1988), and the Rank Dominance method that has been extensively used in some of the most recent work on poverty. The first approach is anchored on poverty measures that are consistent to social welfare criterion. It also offers the opportunity to have an endogenous poverty line in the utility maximization process, so that it can be derived as functions of prices and income. The second approach makes an exclusive use of the Lorenz function to compare poverty incidence among different income distribution patterns, thereby providing a consistent ordering of the Head-Count ratio and poverty gap summary

indices, at the least. With information on expenditure or income distribution of various sub-groups, or across countries become available, it becomes possible to draw some inferences on the state of poverty.

In addition, aggregate summary measures need to be estimated for different regions, sub-groups and sub-classes to get a better profile of the poverty phenomenon. To this end, data is required on micro-level expenditure and on consumption patterns by either individuals or households belonging to a given region, sub-group or class. Estimation procedure consists of the fitting of various specifications of the Lorenz function. For instance, extrapolations can be made when time series data are not available to capture the dynamics of poverty, by making sensible assumptions as to the effect of economic growth on the state of income inequality. In Additionally, it is essential to have an estimate of the relation between poverty and other correlates, such as education, health, demographic processes, available resource and environmental factors, using appropriate indicators which, if carefully chosen and appropriately applied, can offer the essence of completeness to poverty analysis in the African context.

VI.1. Appropriate Measurement Approaches

The centrality of the proposed framework for poverty analysis and assessment in Africa is chronic and mass poverty. To circumvent the deficiences of existing approaches, the framework comprises of a multiplicity of indices and other social indicators that capture the interrelated factors that explain poverty in a comprehensive manner. Currently, poverty indices based on income, consumption and nutrition give only a static poverty profile at a given point in time thereby concealing the dynamism, persistence and multidimensionality of the poverty conditions in Africa. Whereas the poor, whether defined as the 'under class", and "underprivileged", are minorities belonging to a specific race, colour or ethnic group in the affluent developed and some developing counties elsewhere, in Africa, the poor experience life-time poverty that extends from one generation of a household to the next and it this prolonged destitution and deprivation across the the population which makes this condition different from poverty elsewhere.

To measure chronic poverty in Africa, the approach of Rodgers and Rodgers (1992) is the first initial step in a long chain of estimation procedures intended to capture the poverty conditions in a more comprehensive manner. It is an approach that is more appropriate for poverty assessment in African countries as compared to other methods in use. It captures important aspects of poverty not reflected in existing poverty indices and therefore are likely to be helpful in developing more realistic models of poverty causation

and persistence in developing countries. They argue that the measurement of chronic and transitory poverty is also important from a policy perspective. The approach places greater emphasis on programs that specifically target chronic poverty which is the kind of poverty in Africa.

Chronic poverty is defined as a function of permanent income of the ith individual in the ith period. It is argued that permanent income or lack of it is probably the principal influence on people's standard of living and style of life and, that longer income periods are better suited to understanding the nature of chronic poverty than shorter income periods. Conceptually, chronic poverty is the unattainability of such a level of income which can support a maximum consumption expenditure pattern of a given household with a due allowance to borrowing or saving factors. However, while income and, even broader measures of economic resources, may explain only a small percentage of destitution, factoring in the elements of savings and credit can improve our perception of the level of poverty in developing countries. Given the requisite longitudinal household survey data, chronic poverty can be estimated over an arbitrary time span that may vary from one country to another.

The measure decomposes the actual average poverty observed over T years into chronic poverty and transitory poverty. The index is defined thus:

$$(33.) \qquad A_p(T) = \sum_{t=1}^{T} w_t \, p_t$$

where, $A_p(T)$ is a weighted average of the corresponding T annual poverty index values,$p_1,...,p_T$ where, p is an appropriately chosen poverty index.[xv] The weights are required to sum up to unity following the decomposability condition. The w_i weights shall take the value of q_i/Q, where, q represents the number of the poor in period i, and Q is the total number of the poor in the entire period under consideration[xvi].

The estimation of the poverty threshold is to determine the food poverty line (or the hunger line) in a manner that reflects individual preferences, and the dietary habit of the African population[xvii]. Food expenditures are not very reliable indicators of whether a family's diet contains what experts regard as desirable nutrition. Nonetheless, with the assumptions embodied in the Engel curves, the overall poverty line is derived taking into account the provision of essential public goods like water and other services. Absolute

poverty can be measured by the Head Count Ratio(H) using alternative poverty thresholds. Since what is available is grouped data for most of the sub-Saharan African countries, this ratio can be derived from a fitted Lorenz curve. The task of fitting a Lorenz curve can be made through both elliptical Lorenz functions[xviii] and Kakwani's[xix] (1991) Lorenz function[38]. It needs to be pointed out that in the case of grouped data, all poverty indices introduced in the literature feature the parameters of the Lorenz function, and the poverty threshold. In cases where the number of income groups are large, an attempt can be made to estimate the Foster-Greer-Thorbecke class of poverty indices.

An innovation in this framework is how to deal with the problem of multiple incomes, including transfers and other receipts of the poor households especially in the rural areas of African countries. This is done by taking into account the crucial assumption underlying the FGT poverty index i.e. sub-group decomposability. The assumption of decomposability implies that the groups considered in the analysis are mutually exclusive. While this condition may hold in cases where poverty measurement is confined to sectors that are more or less separable with respect to the income they give rise to in different households, in African setting, for such a strict compartmentalization of the income earning processes to be mutually exclusive, is empirically difficult. In fact, it is very common to observe a given household being supported by income generated from various sources, including transfers and other in-kind receipts.[39]

To demonistrate how the FGT measure of poverty will be affected if there are more than one income sources:

Let $y= y_1 +y_2$ be the income of a household generated from two sectors . Let $g(y_1,y_2)=x(y_1/y_2)p(y_2)$, where, g is a bivariate density of y_1 given y_2, and p is the marginal density of y_2. Then the density of y can be shown to be:

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[38] In drawing the lorenz curve, the cumulative percentage of households for each income group is plotted against the cumulative percentage incomer share received by that income group. The 45 degree line represents a line of equal distribution. The further the curve is away from this line, the more uneven the income is distributed. If the curve is to coincide with this line, the household would have the same income.

[39] For useful discussions on multiple income sources and related issues, see: Johnson,M., A.D. Mcakay and J.I.Round, "Income and Expenditure In a System of Household Accounts: Concepts and Estimation". Social Dimensions of Adjustment In Sub-Saharan Africa, Working Paper No.10, 1990.

$$(34.) \qquad f(y) = \int x((y - y_2)/y_2)\,p(y_2)\,dy_2$$

The poverty index is thus:

$$(35.) \qquad \begin{aligned} PG_a &= \int_0^z \frac{(q-y)^a}{z^a} f(y)\,dy \\ &= \int_0^z \frac{(a-y)^a}{z^a} \left[\int_0^\infty x(y - y_2)/y_2 p(y_2)\,dy_2 \right] dy \\ &= \int_0^\infty \int_0^z \frac{(q-y)^a}{z^a} \\ &= \int_0^\infty P_{y_2,x} P(y_2)\,dy_2 \end{aligned}$$

where,

$$(36.) \qquad P_{y_2,a} = \int_0^z \frac{(z-y)^a}{z^a} x((y - y_2)/y_2)\,dy$$

is the poverty index for those whose source of income is y_2.[40]

For the sake of empirical comparison, a variety of poverty indices could be estimated along the line of the following utility structure:

$$(37.) \qquad U(y) = \ln(y)$$

which renders a poverty index of the form:

$$(38.) \qquad D_p = \frac{q(\ln(z) - \ln(y_p))}{\ln(z)}$$

where, y_p is the geometric mean income of the poor to be estimated from the grouped data. For greater accuracy, truncated income distribution above the poverty threshold

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[40]This specification is derived from insights of the comments on an earlier version of this study by Prof. S.C. Nana-sinkam, United Nations Food and Agricultural Organization.

shall be compared on the basis of the dominance method of ranking Lorenz curves[xx]. This method sufficiently ranks the poverty measure H unambiguously if the truncated Lorenz curves do not intersect irrespective of the value of the poverty line.

The measurement of the intensity of poverty follows the approach suggested by Rodgers and Rodgers (1990)[xxi]. However, the overall intensity of poverty experienced by a population cannot be captured by this approach. What one can measure using this method is the degree of poverty in a given sub-group as compared to the total population. The poverty gap index is a useful measure of the overall intensity of poverty since it is a good approximation of the relative deprivation of each poor[xxii].

In addition to the above series of measurements, a functional relationship can be established between certain types of basic macro-level gaps and aggregate poverty indices. These macro-gaps can be captured in food gap, foreign exchange gap, and in some cases the savings gap, which are important growth constraining factors in sub-Saharan African countries. Poverty analysis should examine the effects of the role of these factors on the incidence of poverty. The functional relation can be interpreted by taking estimated aggregate poverty indices in the sample and its corresponding macro-gap as explained by these variables. For an overall impression of the distribution factor, an estimate of a regional Lorenz function shall be attempted.

As discussed earlier, the measurement of "welfare poverty" is based on the criteria of income, consumption and nutrition. The measures are based on a bench-mark minimum calorie intake or to meet an anthropometric standard or to buy a diet just sufficient given a regional diet level and consumption. Reardon and Vosti(1995) argue that these measures may be appropriate for assessing humam misery, but may not be appropriate bench-mark for use in assessing poverty levels in the context of "investment poverty". To measure investment poverty, the cut-off point is 'the ability to make a minimum investment in resource improvement to maintain or enhance the quantity and quality of the resource base to forestall or reverse degradation. Such a measure is extremely relevant in Africa where the rural area constitute over 80 per cent of the poor and, therefore, its applicability is proposed as an integral part of this alternative approach to poverty assessment.

Again, to circumvent the narrow definition of poverty measurements that are centered around the individual income concept, one can juxtapose the deprivation of the individual with the deprivation of the community he belongs to using other indicators of

poverty. The poverty linkages with other factors such as level of education, state of health, the demographic structure, environment, etc. are crucial determinants of poverty conditions. One approach to incorporate these factors into poverty analysis is to set up a functional relationship between the poverty line, or any chosen index of poverty and these social and factors[xxiii] and, to define a representative variable which is measurable or quantifiable so that a functional relationship can be determined. Education is usually defined by adult literacy rate; health by life-expectancy, infant mortality rate; demographic factors by changes in gender composition, fertility rate, population growth, age structures, etc.; environmental factors by the degree of soil fertility of land, deforestation, soil erosion, etc.

Similarly, aggregate poverty indices will be simulated with these variables to see the extent of empirical relationship between the identified variables and the incidence of poverty bearing in mind all possible measurement and estimation errors. The construct of causation between poverty and these various correlates has an additional relevance to the current debate between the proponents of the income-centered and capabilities approaches to determine well-being and economic and social progress.

VI.2 Variables and Data Analysis

In estimating the aggregate poverty indices, the most important conventional variables are income, expenditure or consumption. In application, there are important distinctions among these highly correlated variables. Income data may be preferred to set up the Lorenz function, where as expenditure or consumption data is better in measuring the poverty line, and determining the consumption behaviour of the poor. In most household surveys in Africa, income tends to be understated, for it is easier for a household to remember expenditures in the immediate past than income earned and received from various sources.

The unit of analysis is usually the individual, the household or the family. The effect of composition of households on the poverty line and the income distribution has been noted to be significant. In Africa, individuals can, and usually do, belong to several overlapping networks of social units at the same time. Nuclear and extended families are two such units while the household is another. The characteristics of the African household as a unit for analysis differ extensively from the standard definitions applied in current studies. "Equivalence scales" are used to adjust for the biases introduced by household characteristics. Equivalence scales relate to the income needs of multi-persons households or households on special circumstances to those of the single individual.

These choices define a set of poverty lines for households of different types. Poverty estimates are sensitive to the equivalence scale implicit in such set of poverty lines[41]. Ruggles(1990) points out that the coice of equivalence scale can affect our understanding of the relative poverty experience of demographic groups with different average household sizes[42]. With these caveats, care would have to be taken in the choice and use of such scales in African countries. It is also worth noting that, it is the consistency in usage, instead of the usage per se, that matters most.

Poverty assessment in Africa is constrained by the inadequacy and low quality of data which is the binding factor in poverty monitoring. Typically, published tabulations of data are used to estimate the Head-Count ratio and the Income-Gap index. However, the degree of income equality among the poor is hard to estimate from these sources because such tabulations include too few income categories of the poor. The frequently used monetary estimate of the poverty line is shadowed by a large number of inconsistencies in its measurement, including errors in sampling, weights used to compare currency units of different countries, imputing non-tradeable items, etc.

Poverty monitoring requires regular collection and analysis of comparable data through household budget surveys, preferably on an annual basis. Data collection and processing in Africa, especially household budget surveys in rural areas for poverty analysis and assessment, is very much lacking. When carried out, the chosen sample sizes, the sampling technique utilized may result in a biased estimate of the sampling poverty index from the population (true) poverty index. Most household budget studies use the stratified random sampling technique which ensures equal probability for each random variable to be selected within each sub-group, and yet gives appropriate weights across sub-groups depending on some statistical or other considerations. This definitely minimizes the sampling error. In application, it is essential to ascertain the method of data collection before deciding to use the data.

To illustrate the above point further, a given data set on household consumption and income may be collected from a sample drawn from a specific locality where either the

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41 For some understanding of merits and demerits of equivalence scales in empirical application, see: Shelly A. Phipps, Measuring Poverty among Canadian Households: Sensitivity to choice of measures and scale. *The Journal of Human Resources*, Vol.28, No.1, 1991.

42 Patricia Ruggles, 1990. "Drawing the Line: Alternative Poverty Measurement and their Implications for Public Policy". Washington, D.C. The Urban Institute Press.

poor, or the middle class, or the rich are in high concentration. The resulting Lorenz function will be a poor fit and the poverty index will be so inaccurate as to render it unusable. In this regard, data collected for the World Bank's Living Standard Measurement Studies (LSMS) are the main reference points for few African countries. The data are in a form usable for the purpose of measuring poverty but whether they are designed according to the kind of sub-grouping one desires to work within the African context is not known. However, the issue of paucity of data can be circumvented to a large extent by using various indicators on which information is available in sufficient quantity to supplement conventional poverty measures.

Time series data of a reasonable quality is necessary to analyse the dynamics of poverty which is shown to be largely a rural phenomenom in African countries. Tabatabai and Fouad (1993) have argued that while multiple observations over time on the incidence of rural poverty may be available for many developing countries, time series data providing comparable observations over a reasonable long period of time are few, especially in sub-Saharan Africa. If available, such series are an essential requirement for the construction of "proxy indicators" to monitor changes in the incxidence of rural poverty as they generally include some measure of agricultural output, prices or wages. However, such proxy indicators do not permit the estimation of the level of poverty or its changes but, at best, only the likely direction of change, and, in only very rare instances, an estimate of its quantum. They are thus expedients that temporarily fill gaps left by infrequent surveys and not a substitute for them.[43]

VIII. Conclusion

Regional and global perspective and development studies have shown that sub-Saharan Africa is the "poorest of the poor" in the world. Yet, it is clear that the concept, theory and measurement issues of poverty have not so far been treated in the specific context of the Africa region with the gyration of its own unique social, economic and cultural characteristics which are crucial determinants of the dynamics of the poverty process. Apart from country poverty assessment studies undertaken in the context of the programming exercises of international Institutions, there is a serious gap in applied and theorectical research on poverty as the development problematique in sub-Saharan countries. This makes it imperative for research to confront and bring into sharper focus the poverty process that plagues the region on a massive scale. The need for reallocation

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of schorlarly efforts and the re-kindling of the policy agenda to this end is even more timely now as we move into the knowledge-based millineum.

In this study, a preliminary attempt has been made to propose a contextual framework of basic elements and alternative analytical apparatus for poverty assessment in Africa on the basis of an underlying premise that poverty is region-specific and, therefore, requires regional and country specifications inorder to profer workable modalities for its eradication. Another fundamental premise is that poverty eradication is complementary to and should be the over-riding goal of sustainable development and not conceived as a byproduct of the process.The central thesis of the framework is its identification and emphasis on 'chronic' and 'mass' poverty in sub-saharan Africa as distinct from other kinds of poverty, especially those obtaining in Affluent societies.

We have demonstrated that the analytical apparatus and policy directions for poverty eradication of chronic and mass poverty must, per force, be couched and grounded in the the context of the unique peculiarities and specificities of the African enviroment.If analytical research can unravell and bring about a complete knowledge of the prevalence and persistence of poverty in Africa through experimentation with this framework, and used as a basis for the design of appropriate strategies and policies to attack poverty, then this research would have served its purpose as a first logical step towards eradicating chronic and mass poverty and, therefore, sustainable development in Africa.

Footnotes and Bibliography

[i] Ravallion (1992:36).

[ii] Ravallion (1992).

[iii] relative index is scale invariant, and absolute index is translation invariant.

[iv] Foster,J.E., and Shorrocks, A.F., (1991), op cit, pp.705.

[v] Chakravarty, S.R., (1983), A New Index of Poverty, *Mathematical Social Sciences*,6, 307-313, quoted in Foster,J.E., and Shorrocks, A.F., (1991)

[vi] See Atkinson (1970), Kolm,S.C., (1969), The Optimal Production of Social justice, in j.Margolis and H. Guitton,eds, public Economics (London:Macmillan)

[vii] A poverty index is considered as absolute if it remains unchanged when all incomes and the poverty line itself are multiplied by the same positive scalar.

[viii] Hagenaars (1987), op cit, pp 601-603.

[ix] Lewis, G.W., and Ulph, D.T., (1988), Poverty,Inequality, and Welfare, *The Economic Journal*, Vol. 98, 117-131

[x] Kakwani (1990), Ravallion, et.al, (1991).

[xi] See Altmir, Oscar, (1982), The Extent of Poverty In Latin America, World Bank Staff Working Papers, Number 522.

[xii] see Kakwani, N., (1980), for the analytical explanation of the Gini's concept of income inequality.

[xiii] Lewis, G.W., and Ulph, D.T., Poverty, Inequality and Welfare, *The Economic Journal* 98, 1988, pp.118.

[xiv] See Atkinson (1970)

[xv] This relationship is assumed to be a sum of transitory and chronic poverty effects. There is no theoretical justification for it since the decomposition is not necessarily definition consistent. Therefore, if we know the two or the three, then the remaining is treated as a residual.

[xvi] Rodgers and Rodgers (1993) use total population as a weight.

[xvii] For details see Greer,J., and Thorbecke, E.A., (1986), A Methodology For Measuring Food Poverty Applied to Kenya, Journal of Development Economies, Vol 24, No 1, 59-74; Ravallion, M.,and Bidani, B., (1994), How Robust Is Poverty Profile, the *World Economic Review*, Jan., vol.8, no 1,75-102.

[xviii] see Villasenor, J and Arnold B.C.,(1989), Elliptical Lorenz Curves, *Journal of Econometrics*, 40, 327-338, for details of the properties of elliptical Lorenz functions.

[xix] Kakwani, N.,(1991), Poverty and Economic Growth: with applications to Côte d'Ivoire, LSM Study, Working Paper No. 63.

[xx]the method is explained in greater detail in Bishop,J., J.P., Formby, and P.D. Thistle (1991), Rank Dominance and International Comparison of Income Distribution, *European Economic Review*, 35,1399-1409

[xxi] Rodgers,J. and Rodger J. (1990), Measuring The Intensity Of Poverty among Sub-Population: application to US, *Journal Of Human Resources*, XXVI,2,338-358.

[xxii]Again we have to note that intensity of poverty varies with the particular welfare structure we are using. If we are using the utilitarian approach, it follows that PG is a good candidate; but if use the Gini type structure then we have to use either Sen's or Takayama's or Kakwani's index, or any of that variety (e.g., using Theil's weighting scheme in the social welfare function of the Gini type gives another alternative). But, so long as either methods are arbitrary, then the intensity measure remains also arbitrary. In regard to severity of poverty, even though we can use the interpretation of Ravallion (1992) for the Foster, et.al, index still it is subject to the same arbitrariness.

[xxiii] See for instance, Ravallion, et.al. (1991), and Anand and Ravallion (1993) for a specification of such functional forms for developing countries.