

Review

A survey of poverty and inequality indicators with an application to Southern African Customs Union (SACU)

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The article provides a brief survey of poverty and inequality indicators and proceeds to provide their analytical application for countries in the Southern African Customs Union (SACU). Poverty measures surveyed, included money-metric measures such as the Foster-Greer-Thorbecke (FGT) indicators, while the non-money metric measures included body mass index and human development index (HDI), among others. The inequality measures included, *inter alia* the entropy measures and the Gini index. The results reveal that SACU still has to go a long way in improving poverty and inequality levels as well as the general well-being of its member economies. Some positive observations emerge on the improvement of gender participation in economic and political activities in the union. Botswana performed better than the rest of the countries as far as the fight against poverty is concerned. However, all the countries need to continue to implement policies that not only reduce poverty but also narrow the pervasive inequality in the region.

Key words: Poverty, inequality indicators, South African Custom Union.

INTRODUCTION

Most developing regions in the world are characterised by poverty and widespread inequality. Using the head count index, Agenor (2004) found that the incidence of poverty is highest in South Asia and Sub-Saharan Africa. He further observed that poverty has in fact increased slightly in Sub-Saharan Africa. His observation is in line with the picture painted in Figure 1. Poverty is highest in Sub-Saharan Africa and its incidence has increased in 2001 from its 1981 level. Agenor (2004) further noted that in Latin America, poverty is evenly distributed between the rural and urban areas, while in Sub-Saharan Africa poverty is a rural phenomenon.

The use of the concept of \$1 a day as a measure of poverty fails to recognise that poverty is a multi-dimensional issue. The World Bank (2000) recognises that poverty goes beyond insufficiency of income to include other aspects such as lack of access to adequate health services and sanitation, high illiteracy rates, as well as deprivation of basic rights and security. Hence, it is important to use indicators that recognise most of the important aspects of the concept of poverty. This essay attempts to evaluate the different poverty and inequality indicators as well as offer their application to Southern

African Custom Union (SACU).

POVERTY INDICATORS

The discussion on poverty indicators requires that a benchmark of some sort is used to look at each indicator and decide which is superior and appropriate for certain circumstances. In order to put the discussion into perspective, Sen (1976) provided four axioms in this regard. First is the monotonicity axiom which indicates that the index must change as the income of a poor person changes. Fields (2000) postulated that a poverty measure must satisfy this axiom, for example, when a rise in some poor person's income occurs without doing anything to other people's incomes, poverty must necessarily reduce poverty. Hence, poverty must be responsive to the severity of the poverty of each individual. Second, transfer axiom which posits that the index must rise to reflect a transfer of income from a poor person to someone who is well-off relative to himself, whether poor or non-poor. Fields (2000) called this axiom the distributional sensitivity axiom because it recognises

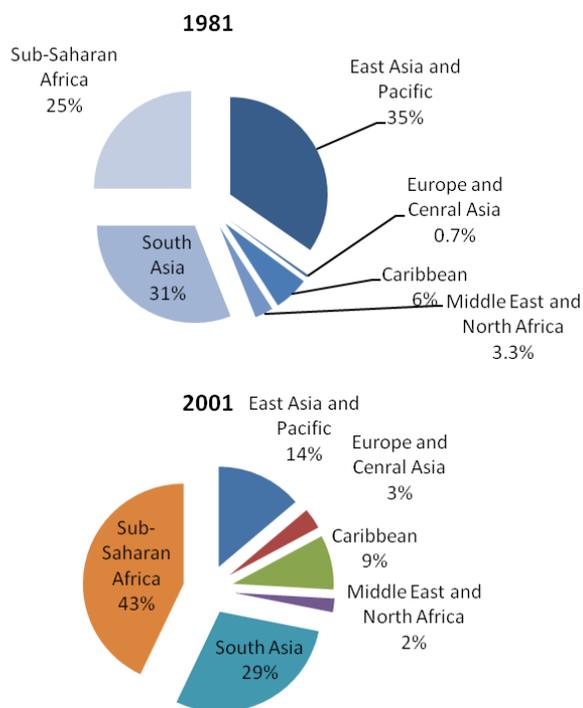


Figure 1. Population living below \$1 a day. Source: World Bank website.

the fact that a transfer of income from a poor person to any other richer individual relative to himself should worsen poverty. Third, if bringing of two populations together does not change the index, then it satisfies population symmetry axiom. Lastly, when the proportion of the population which is poor changes, the index must change as well to satisfy the proportion of poor axiom.

The literature on poverty measurement is replete with the measures of poverty. These measures can be grouped into two broad categories, namely money-metric and non-money-metric measures of poverty. Money-metric measures are quite common due to their simplicity. The term money metric denotes the nature of the measure in the sense that these are based on money – income or consumption. However, whether to use consumption or income is also a debatable issue. Fields (2000) stated that money metric measures characterise the poor in terms of insufficient income or expenditure to provide for the minimum standard of living.

Expenditure (or consumption) is preferred to income. This is because income can be plagued by errors of zero income as rich people do not want to declare their income. The poor may also understate their incomes if they suspect the data would be used as the basis for computing social grants. Although, there are many money-metric measures of poverty, the Foster-Greer-Thorbecke (FGT) Poverty Index is the most commonly used. This index comprises three indices, namely the headcount index, the poverty gap index, and the squared poverty gap index. These are decomposable poverty

measures because they constitute a weighted average of measures of poverty for the individuals in the group. The formula is expressed as follows:

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^q \left[\frac{z - y_i}{z} \right]^{\alpha} \quad (1)$$

where N is the total population, α is the poverty aversion parameter, y_i is consumption per capita, z is the poverty line and q is the number of the poor in the population. The headcount index ($\alpha = 0$), which was referred to at the outset of the essay, measures the poverty rate or incidence. This is the share of the population whose income falls below the poverty line for example 1\$ a day discussed previously. This measure suffers several limitations. For example, it assumes that all the poor are in a similar situation, and thus fails to differentiate their well-being, it is insensitive to any mobility under the poverty line, and does not take the intensity of poverty into account. This is a violation of the distributional sensitivity axiom.

The poverty gap index ($\alpha = 1$) takes care of the gaps between the poor people's living standards and the poverty line proportionate to the poverty line. It therefore measures the differential between the mean income of the poor and the poverty line. In other words, it measures the shortfall of the income of the poor relative to the poverty line. However, this measure does not consider the severity of poverty among the poor that is, the inequality among the poor. Hence, the squared poverty gap index ($\alpha = 2$) fills this gap by taking the square of the poverty gaps proportionate to the poverty line.

As pointed out in the introduction, poverty is multi-dimensional and goes beyond income. However, the money-metric measures obviously focus on income, as a sole measure of well-being. This approach has a number of limitations. Piachud (1987) argued that money metric measures do not take into account how the money is earned and how much leisure time is sacrificed to generate the money. Furthermore, Sahn and Stifel (2003) criticise money-metric measures along five axes: First, income and expenditure data is generally of poor quality especially in developing countries. Second, since the data are collected using recall surveys they are subject to measurement errors. Third, it is a complex task to deduce prices of goods, depreciation rates of durable and or semi-durable goods as well as nominal interest rates when measuring consumption aggregates. Fourth, seasonal price indices are subject to sporadic movements and are too variable. Lastly, even though purchasing power parity (PPP) numbers are widely used for cross-country comparisons, they represent rough estimations which are subject to considerable errors. Other non-monetary based indicators have been introduced as alternative tool of measuring poverty.

According to Glick and Sahn (2000), wellbeing is defined in terms of assets that individuals or the household possesses. This a non-money metric measure which

recognises that poverty goes beyond income to also include the capability of turning such income into activities that improve people's wellbeing. Filmer and Pritchett (2001) applied the asset index in India using a principal component analysis and found that the index was robust and comparable to the poverty rate data. Sahn and Stifel (2001) used the factor analysis to construct an asset index and reasons that the asset index has several advantages. First, household assets are fewer and easier to measure than income and so their validity and accuracy are better than that of income or expenditure. Second, this index avoids reporting biases because the assets can easily be observed by the interviewers.

The non-money metric measures of poverty such as the asset index do not go without defects as well. Moser (1998) highlighted that the asset index fails to capture absolute poverty but provides information that is useful to define relative poverty. In addition, the index is based on a generic list of commodities and fails to distinguish the better off who may have better quality or technologically advanced equipment from those who are less well-off. For example, no distinction is made between colour and black and white television sets. Furthermore, the index is a better measure of permanent income and poorly measures current income. However, this index does not capture the importance of a human body as an asset and thus fails to distinguish the able-bodied from the disabled.

The body mass index (BMI) attempts to fill this gap. Evans (1989) argue that poorer people depend on physical work to earn a living and suffer huge costs if they are disabled. Consequently, bodies are deemed as separate assets that the poor own. Since the poor are more exposed to illness that may arise from unsanitary and polluted conditions, their productivity is reduced. The poverty literature attempts to capture the value of the body through concepts such as labour power and availability as well as dependency ratios. More importantly, the capacity to work is captured by the BMI which is the weight in kilogram over height in metre squared. This is basically a measure of nutritional status of a person. The indices discussed in the foregoing focus on a single dimension of poverty, nevertheless there are measures that combine several dimensions of poverty in one measure. These are referred to as composite poverty measures.

The composite poverty indicators have been given credit because they are seen to cover the multidimensionality of poverty. A composite indicator combines information on several aspects of poverty in a single measure. One such measure is a composite measure called the human development index (HDI). The HDI is computed on the basis of three indicators, namely health measured by life expectancy, education measured by adult literacy rates and years of schooling and income measured by GDP per capita. Gatt (2005) state that:

"life expectancy is valued in itself and it is indicative of the

quality and delivery of healthcare. Literacy is essential if people are to be able to communicate, to appreciate their culture and to obtain and keep jobs. Income per capita relates to the ability of the population to meet its basic needs and generate resources to sustain advancement in all areas of development."

Hence, the HDI represents a single measure of well-being which takes into account economic and social aspects of human life, sometimes even suggesting the happiness status of people. For example, Wolfers and Leigh (2006) found that HDI is positively associated with happiness in Australia.

This composite indicator of poverty has also been criticised in various ways. For instance, Trabold-Nubler (1991) argued that the measure of education excludes traditional modes of acquiring education that is, indigenous knowledge. Furthermore, the measure of income per capita GDP does not recognise income distribution and cross-country income differentials (Noorbakhsh, 1998). Gatt (2005) pointed to the fact that the education measure also ignores to incorporate the quality of education. Hence, two countries with different school systems which differ enormously in terms of quality of education may be ranked the same according to the HDI. Moreover, the HDI has been criticised to exclude important aspects such as gender inequality and respect for human rights and political freedoms. However, the gender related development index (GDI) and the gender empowerment measure (GEM) were later developed to address these aspects.

The human poverty index (HPI) mimics the HDI by focusing on three dimensions of poverty namely; short life, lack of basic education and lack of access to public and private resources. It derived distinctly for a high income countries (HPI-2) and developing countries (HPI-1) (UNDP, 1997). Sen's index is another composite poverty measure which attempts to reflect the degree of inequality. It is calculated as the average of the head-count index and the poverty gap index weighted by the Gini coefficient. If the Gini coefficient is zero or one, Sen's index reduces to the poverty gap and the head-count index, respectively.

The concept of poverty depends on the distribution and level of consumption or income. However, the poverty measures discussed earlier focus specifically on the individuals or households at the bottom of the distribution. A concept that is defined over the entire population inequality is discussed subsequently.

Inequality indicators

The notion of income inequality is focused on relative poverty. The measures of inequality take the entire population into account and an increase in the population in either the lowest or highest income levels increases inequality (Contreras, 2003). Even for inequality indicators

Table 1. Axioms of measures of inequality.

Axiom	Definition
Pigou-Dalton transfer	An income transfer from the poorer person to a richer should never register a rise in inequality
Income scale independence	A change in everyone's income by the same proportion should leave inequality constant
Population	The inequality measure should be independent of income receivers
Anonymity	Only income, not any other characteristic should affect inequality
Decomposability	Overall inequality should consistently be related to the constituents parts of the distribution

Source: Litchfield (1999)

indicators, a benchmark is crucial to help in deciding which one is more appropriate for a particular situation. Litchfield (1999) discusses these axioms in detail and the summary is provided in Table 1.

There are several measures or indicators of inequality. First, the Gini index measures the area between the Lorenz curve and a 45° line which measure the cumulative share of income against the distribution of the population and perfect equality, respectively. It is mathematically defined as:

$$Gini = \frac{2Cov(Y,F)}{F} \quad (2)$$

Y is the income of an individual whose rank is F on the income distribution. The value of the Gini index varies between zero and one; these are extreme cases of perfect equality and inequality, respectively. In order to emphasise certain parts of the income distribution, a parameter β is introduced in Equation (2) to compute an extended Gini index. Hence (2) becomes:

$$Gini(\beta) = \frac{-Cov(Y,[1-F]^{\beta-1})}{F} \quad (3)$$

One disadvantage of a Gini index is that it is not additive across groups, in other words, the total Gini of a society is not the sum of the Gini indices of each sub-groups. The Theil index addresses this limitation because it can be decomposed into components if the data is stratified or divided into sub-groups. Fields (1980) stated that the Theil index is derived from the concept of entropy in information theory and is thus, a family of the entropy class. The general formula for the Generalised Entropy class of measures is given by:

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha} \left[\frac{1}{N} \sum_{i=1}^N \left(\frac{y_i}{y} \right)^\alpha - 1 \right] \quad (4)$$

Where N is the sample size, y is the income of individual I and α are population weights and assumes values 0, 1, and 2. Litchfield (1999:3) states that $\alpha = 0$ applies more weight to differences of incomes in the lower tail, $\alpha = 1$ applies same weight across the entire distribution and $\alpha = 2$ proportionately gives gaps in the top tail more weight. Theil-T and Theil-L are derived from this equation using L'Hopital's rule. The Theil-T is computed using weights

based on income shares of the subgroups and the Theil-L is calculated using weights based on population shares of the subgroups. They are expressed as follows:

$$Theil - L(y, N) = \frac{1}{N} \sum_{i=1}^n \log \left(\frac{y_i}{\mu} \right) \quad (5)$$

Another inequality measure is the Atkinson index named after its proponent. Levine (2006) interpreted it as a measure of the "the proportion of the present total income that would be required to achieve the same level of social welfare" assuming even income distribution. It is defined by the following equation:

$$A_\eta = 1 - \left[\frac{1}{N} \sum_{i=1}^N \left(\frac{y_i}{y} \right)^{1-\eta} \right]^{\frac{1}{1-\eta}} \quad (6)$$

η is defined as the inequality aversion parameter and ranges between zero and infinity, that is, the higher the value of η , the more concerned about inequality the society is. A_η ranges from 0 to 1, with zero representing no inequality.

The Gini index and the Theil index have a disadvantage of changing as the distribution changes, regardless of whether the change occurs at the top or bottom of the distribution. In order to overcome this "the share of income and consumption of the poorest x percent" is used as a measure of the share of income of the individuals at a specific portion of the distribution; top, middle or bottom (Levine, 1999). For example, this type of indicator is insensitive to changes in tax rates affecting income of the top 20% of the distribution which does not benefit the poor. "poverty and inequality in SACU" applies some selected measures of poverty and inequality to SACU. The selection is based purely on data availability of the measure and not necessarily on merit.

POVERTY AND INEQUALITY IN SACU

Background of SACU

SACU comprises South Africa, Lesotho, Namibia, Swaziland and Botswana. It is an old regional integration arrangement in Sub-Saharan Africa. Its evolution began in 1889 with the Customs Union Convention between Cape Colony and Orange Free State Republic which was

Table 2. Inequality in SACU using the Gini index and the share of income and consumption of the poorest x percent.

Country	Survey year	Gini	Lowest (10%)	Lowest (20%)	Second (20%)	Third (20%)	Fourth (20%)	Highest (20%)	Highest (10%)
Botswana	1993	63.0	0.7	2.2	4.9	8.2	14.4	70.3	56.6
Namibia	1995	70.7	0.5	1.4	3.0	5.4	11.5	78.7	64.5
Swaziland	1994	60.9	1.0	2.7	5.8	10	17.1	64.4	50.2
Lesotho	1993	63.2	0.5	1.5	4.3	8.9	18.8	66.5	48.3
South Africa	2000	57.8	1.4	3.5	6.3	10.0	18.0	62.2	44.7

Source: World Bank website

Table 3. Human development index.

Country	Rank	1995	2000	2005
Botswana	124	0.658	0.631	0.654
Namibia	125	0.698	0.657	0.65
Swaziland	141	0.641	0.592	0.547
Lesotho	138	0.616	0.581	0.549
South Africa	121	0.745	0.707	0.674

over time enlarged to include the Transvaal, Natal, Sothern Rhodesia, North-Western Rhodesia and the High Commission territories of Bechuanaland, Basotholand and Swaziland in 1906. The formation of the Union of South Africa in 1910 saw a new agreement between the Union of South Africa and the high Commission territories- the Southern African Customs Union Agreement (SACUA). In 1969, the agreement was renegotiated following the independence of the High Commission territories and became SACU (Tjirongo, 1995).

SACU provides duty-free flow of goods and services between member countries with a common external tariff and an arrangement of sharing the tariff revenue. This arrangement has benefited the small economies in terms of revenue especially because the revenue sharing formula has a significant development component to cater for the possible trade diversion. The disadvantage is the possibility of industrial polarisation since South Africa is more developed than the other member countries.

Application of some selected poverty and inequality indicators to SACU

The Gini for all the SACU countries is high ranging from 57.8 to 70.7% in South Africa and Namibia, respectively. This shows that inequality is high in all the SACU countries. Table 2 shows that the highest 20 and 10% of the population also tend to command a lion's share of the income in SACU with the lowest 10 and 20% receiving a bare minimum in relative terms. One message in line with this may be that due to the high unemployment rates in SACU, governments need to do more in terms of income redistribution. As Van der Berg et al. (2007) indicated,

South Africa is doing well in terms of implementing well a targeted social grant system to fight the plight of the poor; however there is a limit to this policy. Other SACU members have to emulate this initiative along with policies that target job creation.

Table 3 and Figure 2 portray a ten year picture of the HDI for the SACU countries spanning 1995 to 2005. None of the countries receive a rank in HDI below 100 in world rankings. South Africa tops the SACU ranking, followed by Namibia, while Swaziland ranks lowest. All the countries reflect a fall in the HDI from 0.75, 69.8, 0.66, 0.64 and 0.62 in 1995 to 0.67, 0.65, 0.65, 0.55 and 0.55 in 2005 for South Africa, Namibia, Botswana, Swaziland and Lesotho, respectively. This indicator shows that governments in SACU still have to go a long way in raising living standards, education levels, and improving longevity. According to DPRU (2001) SACU member countries such as Botswana (0.42), Lesotho (0.39) and South Africa (0.53) rank high in SADC on the gender empowerment measure which measures the inequality between women and men in areas of economic and political participation in decision-making in both the private and public sectors. The report attributes this to relatively high women participation in parliament, administrative and managerial jobs as well as professional and technical jobs in these countries.

According to the HPI, South Africa ranks 55 in world rankings and Swaziland ranks 73 (Figure 3). In SACU, Swaziland ranked highest on adult illiteracy rates of 20.4% of people aged 15 and above and Namibia ranked lowest on this measure. Swaziland topped the list as relates to children that are under weight at 10% while Namibia topped the list. The probability of not surviving beyond age 40 is highest in Swaziland and lowest in south

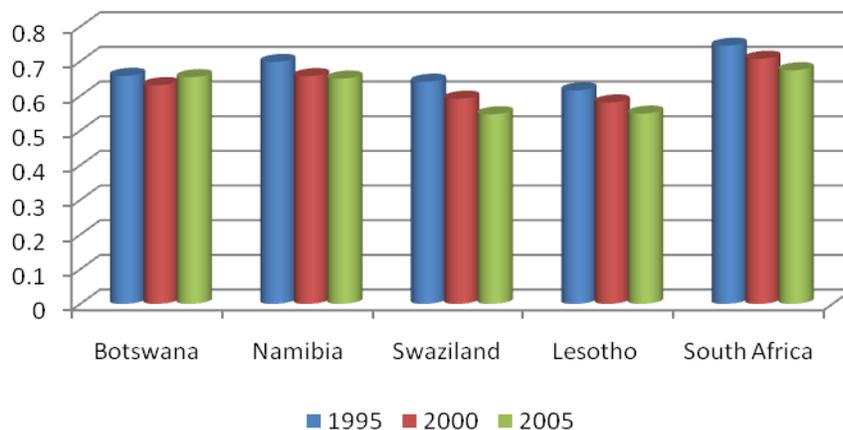


Figure 2. Human Development Index. Source: UNDP website.

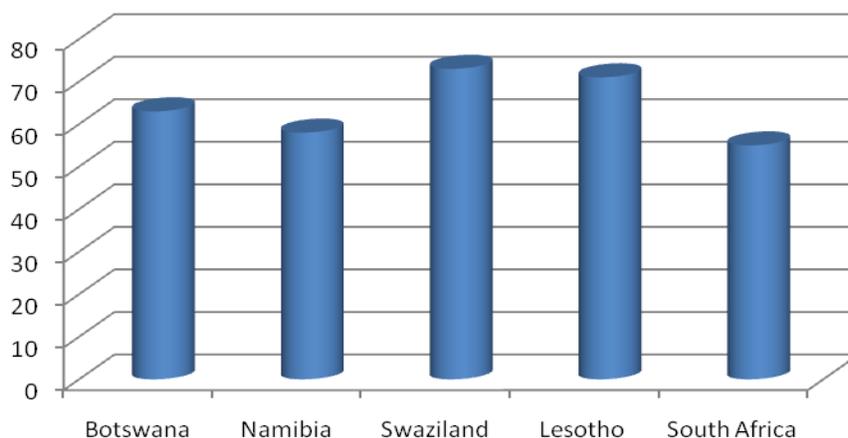


Figure 3. Human development index. Source: UNDP website.

Table 4. Human development index and its components.

Country	HPI	Adult illiteracy	Children under weight	Probability of not surviving pass age 40
Lesotho	34.5	17.8	20.0	47.8
South Africa	23.5	17.6	12.0	31.7
Namibia	26.5	15.0	24.0	44.4
Swaziland	35.4	20.4	10.0	48.0
Botswana	31.4	18.8	13.0	44.0

Source: UNDP human development report, 2007/2008.

South Africa (Table 4). The picture that emerges from the HPI index is in harmony with the message sent by the HDI discussed earlier that SACU governments still have to improve in education, health and provision of public and private goods and services.

Table 5 shows that poverty in the three SACU countries

is very high. The headcount index indicates that in South Africa, half of the population was poor in 1995 and has since slightly declined in 2004. Van der Berg et al. (2007) noted that the social grants have played a role in achieving this trend, but may have run their course. This means government must look for other options, such as

Table 5. Available FGT indicators.

Country	Survey year	P ₀	P ₁	P ₂
South Africa	1995	0.50	0.24	0.15
	2004	0.47	0.22	0.13
Swaziland	1995	0.70	0.48	N/A
	2001	0.63	0.29	N/A
Botswana	1993	0.32	0.12	0.07
	2003	0.30	0.12	0.07
Lesotho	1995	0.62	0.38	0.26
	2003	0.50	0.29	N/A
Namibia	1993	0.58	0.34	0.21
	2003	0.38	0.13	N/A

Source: Lesotho Bureau of Statistics (2007), UNDP and WDI; N/A means not available.

increased job creation. In Lesotho, about 62% of the population was poor in 1995 and in 2003 half the population was poor. In this case, it is not clear what accounted for this trend because old-age pensions were introduced during the period while at the same time, the population declined. Therefore, it is likely that the poor who are the most hard-hit by HIV/AIDS died during the period thereby improving poverty headcount, or the old-age pension had a positive effect, or both factors could have played a role. The incomes of the poor were 22 and 29% below the poverty line in South Africa and Lesotho, respectively according to the poverty gap index. Botswana reports the lowest poverty headcount in the SACU of 32 and 30% in 1993 and 2003, respectively.

Conclusion

The article set out to carry out a survey of poverty and inequality indicators. Poverty measures surveyed, included money-metric measures such as the FGT indicators, while the non-money metric measures included Body Mass Index and HDI, among others. The inequality measures included, *inter alia* the entropy measures and the Gini index. The survey was followed by a brief application of the indicators to the SACU economies. The results indicate that SACU still has to go a long way in improving poverty and inequality levels as well as the general well-being of its member economies. Some positive observations emerge on the improvement of gender participation in economic and political activities in the union. Although, Botswana has the lowest poverty in the region, all the countries still face the challenge that requires them to continue to implement policies that fight poverty and its effects as well as narrow the pervasive inequalities.

REFERENCES

Agenor P (2004). Macroeconomic adjustment and the poor: Analytical issues and cross-country evidence, *J. Econ. Surveys*, 18(3): 351-408.

Contreras D (2003). Poverty and inequality in a rapid growth economy: Chile 1990 -1996. *J. Dev. Stud.*, 39(3): 181-200.

Development Policy Research Unit (2001). Human Development Indicators in the SADC region, DPRU policy brief No. 01/P13, University of Cape Town, Cape Town, South Africa, pp.1-9.

Evans T (1989). The impact of permanent disability on rural households: River blindness in Guinea". *IDS Bulletin*, 20(2): 41-48.

Fields GS (1980). *Poverty, Inequality, and Development*, University of Cambridge Press, Cambridge, UK.

Fields GS (2000). The dynamics of poverty, Inequality, and Economic well-being: African economic growth in comparative perspective. *J. Afr. Econ.*, 9(supplement 1): 45-78

Filmer D, Pritchett L (2001). Estimating wealth effects without expenditure data or tears: An application of educational enrolment in India, *Demography*, 38(1): 115-132.

Gatt E (2005). The human development index and small states," *Bank of Valletta Review*, 32(Autumn): 21-33.

Glick P, Sahn D (2000). Schooling of girls and boys in a West African country: The effects of parental education, income and household, *Econ. Edu. Rev.*, 19: 63-87.

Lesotho Bureau of Statistics (2007). Household Budget Survey 2002/03, Maseru, Lesotho.

Levine S (1999). Measuring progress towards global poverty goals: Lessons from two "forgotten" datasets in Southern Africa, UNDP March 2006, Windhoek, Namibia, pp.1-25.

Levine S (2006). Measuring progress towards global poverty goals: Challenges and Lessons Southern Africa. *Afr. Statistical J.*, 3: 89-110.

Litchfield J (1999). *Inequality: Methods and tools*, World Bank Poverty Net: <http://www.worldbank.org/poverty>.

Moser C (1998). The asset vulnerability framework: Reassessing urban poverty reduction strategies. *World Development*, 26(1): 1-19.

Noorbakhsh F (1998). The human development index: Some technical issues and alternative indices. *J. Int. Dev.*, 10 (1998): 589-605

Piachuad D (1987). Problems in the definition and measurement of poverty. *J. Soc. Policy*, 16: 147-164

Sahn D, Stifel D (2003). Exploring alternative measures of welfare in the absence of expenditure data. *Rev. Income Wealth*, 49(4): 463-489.

Tjiirongo MT (1995). Short term stabilisation versus long term price stability: Evaluating Namibia's membership of the Common monetary

Area," CSAE Working paper No. 35
Trabold-Nubler H (1991). The human development index: A new development indicator?" *Intereconomics*, (Sep/Oct): 236-243.
UNDP (1997). The Human Poverty Index:
<http://hdr.undp.org/en/statistics/indices/hpi>www.worldbank.org

Wolfers J, Leigh A (2006). "Happiness and the human development index: Australia is not a paradox," *The Australian Econ. Rev.*, 39(2): 176-184.