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INEQUALITY IN THE SIZE DISTRIBUTION OF INCOMES IN SOUTH AFRICA

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"As will soon become evident, this is not to imply that the available data are adequate: if one is still obliged to make bricks without straw, mud bricks are better than no bricks."

Charles Elliot, "Income Distribution and Social Stratification: Some notes on Theory and Practice", The Journal of Development Studies, Vol 8, 1972, p 44.

1. INTRODUCTION

This paper begins with a review of estimates of income inequality which have been made for the South African economy, and then proceeds to a brief discussion of certain methodological issues concerning the measurement of inequality. An estimate of the size distribution of incomes in South Africa is then made for the year 1975, and inequality indexes are calculated from this estimated distribution. An appraisal of the accuracy and consistency of the available data is also made. Attention is also given to the existence of inequalities in African incomes in urban and rural areas.

2. ESTIMATES OF SOUTH AFRICAN INEQUALITY

Studies of income distribution are of fairly recent origin. The first attempt to provide reliable data on the distribution of income in Britain was made for the year 1904 by Sir G L Chiozza-Money,(1) although Pareto had rekindled an interest in measuring the size distribution of incomes eight years earlier.(2) It was not until 1955, however, that Kuznets pioneered systematic research on the distribution of incomes by size for countries at different levels of development.(3)

Time series data, which are strictly comparable in terms of its definition of income and coverage of recipient units, exists for a very small number of countries. Estimates of the distribution of income in particular years are available for a larger number of countries, and these data have been used in the cross-sectional studies of distribution and development. The most comprehensive tabulation of this sort of data is to be found in Jain's **Size Distribution of Income - A Tabulation of Data**, which contains data on the size distribution of income for eighty-one countries. These tabulations contain data for six "command" economies, and approximately two-thirds of the remainder are third world countries.(4)

The quality of the data which are contained in most inter-country studies of the distribution of income varies greatly, and Kuznets has questioned the degree of accuracy of the estimates of the distribution of income which have been made for some of the developing economies

which are contained amongst Jain's tabulations.[5] Both the Royal Commission and Kuznets have stressed the difficulties which may be encountered when making comparisons among income distributions which are based on different definitions of personal income, and on different concepts of the receiving unit.[6] Included in Jain's data is an estimate of the distribution of income in the South African economy in the year 1965,[7] and other writers, including Paukert, Adelman and Morris, Ahluwalia, and Chenery and Syrquin have used similar data for South Africa as the basis for inter-country comparisons of income inequality.[8]

Jain's publication is presented as a mere compilation of data, without claiming any responsibility for quality. Kuznets has asked whether, "a compilation excluding obviously deficient estimates would not have been more useful ...".[9] A clear case is to be found in the data Jain presents for South Africa, which is patently deficient to anyone who has the slightest knowledge of the demography and geography of the economy. Jain obtained this data by :

> "Using the UN Demographic Yearbook for population distribution and assuming all rural income to be distributed as in the Cape Peninsula, amalgamated from data in South Africa, Bureau of Statistics, "Survey of Family Expenditure, Ten Principal Urban Areas and the Urban Areas of the Vaal Triangle and the Orange Free State Gold Fields: Family Income," report no 11-06-03 (Pretoria, November 1966); G R Feldmann-Laschin, F E Radel, and C DeConing, "Income and Expenditure Patterns of Coloured Households, Cape Peninsula" (Pretoria: University of South Africa Bureau of Market Research, 1965); United Nations, Yearbook of National Accounts Statistics (various years); and United Nations, Demographic Yearbook (various years)." (10)

This estimate ignores the incomes of the whole African and Asian

populations. Coloureds living in the Cape Peninsula in 1960 accounted for approximately twenty-two percent of the total Coloured population of the Republic and cannot be assumed to provide a representative sample of the distribution of Coloured incomes. Indeed Chi-squared tests on the distribution of Coloured family incomes in Cape Town and the Republic, show that these incomes are not representative of the nation-wide distribution.(11) Further, the data on White incomes contained in the Survey of Family Expenditure cannot be assumed to be representative of the incomes of the White population, since it applies only to major urban areas, and ignores the smaller urban areas and the White farming community. Here Jain was luckier, for the distribution of family incomes of Whites in the Republic and in the urban areas do not appear to have been significantly different in 1960.(12) Jain's estimate combines family incomes of Whites with household incomes of Coloureds, without even a mention that different recipient units are being aggregated. The most serious omission however, is the distribution of incomes of the African population. The writer is indeed certain of only one detail concerning Jain's data for South Africa, and that is that they cannot represent the size distribution of income in the South African economy, or that if they do, this is purely by the operation of chance.

Estimates of the distribution of incomes in South Africa based on data which are more representative of the whole population have been made by Simkins and by the writer. Simkins used data on the distribution of individual incomes of White, Coloured and Asian recipients by industry drawn from the 1970 Population Census, and his data on Black incomes in urban areas are derived from the Bureau of Market Research.

However, he draws his data for the distribution of African rural incomes, without qualification, from the distribution of incomes in rural Botswana.(13) The latter data are presumably for households and is not therefore compatible with the urban data. This estimate of the distribution of incomes among income recipients cannot be compared with the family or household data most frequently tabulated for other countries. Simkins obtains Gini-coefficients of 0,71 and 0,65 for 1970 and 1976 and proclaims:

> "By international standards these values are extremely high - in the list of income distributions among households and persons for fifty-six countries presented by Paukert there is no Gini-coefficient as high as 0,71 (or 0,65, for that matter...)." (14)

Paukert's data refer to the distribution of incomes among a variety of concepts of recipient units, and Simkins' results cannot easily be compared with the results for the household or family distributions in Paukert's tables.(15)

The writer's own earlier estimates did not attempt to provide indexes of inequality, but attempted rather to measure the shares of income accruing to the top five percent, ten percent, twenty percent, and the bottom eighty percent of population, at the 1960 and 1970 Censuses, and to measure the proportions of the population above certain specified levels of income in 1950, 1960 and 1970. The personal income census was used for the data on the White, Coloured and Asian distributions, and data supplied by the Department of Inland Revenue were chosen to represent the distribution of African incomes.(16) The

defects of these estimates are that they refer to individual incomes, and that they combine two different concepts of income, since the definition of taxable income is different from the definition of personal income used in the Census. These estimates can be improved greatly by using the family income data which are available for Whites, Coloureds and Asians in the population Census, which can be combined with the data on African incomes collected by the Bureau of Market Research, and this procedure will be adopted for the estimates reported in this paper.

3. SOME ISSUES ARISING IN THE MEASUREMENT OF INEQUALITY

A host of complex methodological questions surround the measurement of income inequality, and some of these are reviewed here before presenting estimates for South Africa. In the measurement of inequality, a permutation of choices exists around the appropriate definitions of income and the recipient unit, the length of time over which accrued income should be measured, and of the statistical measure. Despite the complexity of the choices, some inter-country studies of income distribution have been very cavalier in contrasting distributions based on incomparable definitions of income and recipient units.(17)

The concept of income which is used ideally should embrace the value of all receipts which increase the command over resources. Studies of the size distribution of income have usually been concentrated on what Stark has called the "natural" standard of living, which corresponds to income before adjusting for the effects of taxation and government expenditures.(18) This distribution should, ideally, be compared with a distribution adjusted for the effects of all forms of taxation and the benefits of all government expenditures, although South African data are not detailed enough to allow this last step to be performed.

Some of the issues relating to the income receiving unit and the period of time over which income should be measured and the statistical measurement of inequality are discussed below.

3.1 The Income Receiving Unit

Income recipients, persons, families and households have all been used as receiving units in studies of the size distribution of income. Studies which use the individual or the earner as the income receiving unit must logically exclude children, whereas studies of household or family incomes will include the whole population.[19]

Morgan argues that a concern with economic welfare requires that the unit which is used must relate to needs;[20] and families or households must therefore be the most suitable. Kuznets adds weight to this argument by showing that the distribution of individual incomes is the least suitable, because it ignores the presence of children, because many earning and consumption decisions are determined inter-dependently within families or households and are only reflected in family or household income, and because some forms of income are difficult to assign to individuals, e.g. the income from jointly owned wealth, and the income from joint family enterprises. Kuznets does not state a preference for the family over the household as the ideal unit. He notes that in the developed economies the overwhelming majority of households are family households, whereas in developing economies, multiple family households are most common. There are financial ties between families (or households) which can affect incomes and economic decisions, but Kuznets feels that their impact is only a matter of conjecture.[21] Income distribution studies have never attempted to eliminate the double-counting of inter-household transfers. The importance of remittances from the migrant workers in South Africa in the incomes of households in the

Black States does warrant an effort being made to recognise the effects of these remittances on the distribution of income. This can be achieved by incorporating the amount of the remittances in the incomes of households in the Black States.(22)

The choice of unit also affects the extent of the inequality which is measured, since the distribution of the incomes of families (or households) shows less inequality than the distribution of individual incomes, since it combines within the receiving unit individuals with differing earnings capacities.(23)

Most writers would argue that comparisons between the incomes of families or households cannot be truly meaningful from a welfare viewpoint until the recipient unit has been standardised for size. Kuznets is forceful about this point stating:

> "It makes little sense to talk about inequality in the distribution of income among families or households by income per family or household when the underlying units differ so much in size." (24)

Standardisation can be achieved either by calculating the underlying distribution of the per capita incomes of units tabulated by size, or the underlying distribution can be converted into a per adult equivalent distribution by applying estimates of adult equivalence scales for families of different sizes and ages. Nicholson describes equivalence scales as being:

> "intended to measure the relative incomes which are needed to allow families of different sizes, or in different circumstances, to enjoy the same standard of living." (25)

Adult equivalence scales can take account of economies of scale in the purchasing and preparation of food, and in accommodation, etc. and should reflect differences in the age composition of families.[26]

Standardising the distribution of family or household income into per capita or for adult equivalent distribution will tend to shift the identity of the lower and the higher income classes. An example of this is provided by Danziger and Taussig in a table based on American current population survey data,[27] which is reproduced as Table 1 below. From this table it can be seen that the highest mean incomes are earned by six person families, and single individuals have the lowest average. Converting the incomes to per capita relative means places the average incomes of single individuals at the top of the distribution, and six person families rank towards the bottom end of the spectrum of per capita averages. Converting to standardised incomes per equivalent adult leads to the two person units ranking highest, and single individuals rank below six person units. Kuznets' research has revealed similar relationships between income and the size of the unit and he concludes:

> "The implication of this finding is obvious: the high income units in the conventional size distribution of families or households by income per family or household may, when reduced to a per person or per consumer basis, prove to be low income units. And all characteristics that we tend to associate with low or high family income may be displaced, unless some proper adjustment for the size differentials is made." (28)

TABLE 1

RELATIVE MEAN INCOME OF CENSUS UNITS BY SIZE OF UNITS IN AMERICA, 1976[1]

Unit Size	Definition of Income		
	Mean Census Unit Income (1)	Mean Per capita Income (2)	Mean Standardized Income (3)
1	1.00	1.00	1.00
2	1.97	0.98(2)	1.54
3	2.33	0.78	1.50
4	2.62	0.65	1.31
5	2.73	0.55	1.16
6	2.79	0.46	1.05
7	2.75	0.39	0.83
8+	2.46	0.28	0.76

Notes: (1) S Danziger and M K Taussig, "The Income Unit and the Anatomy of Income Distribution", The Review of Income and Wealth, Series 25, 1979, pp 366 - 368.

(2) A typographical error is corrected.

An alternative procedure which was used by Stark, calculated a separate statistic measuring the inequality of income for families of each possible size. By doing this he was able to retain the association between families and income inequality, which is lost when incomes are standardised into a per capita distribution or a per adult equivalent distribution, but an inequality index for the whole population cannot readily be obtained from these indexes of inequality for each family size.[29]

3.2 The Time Period

Ideally, data on the size distribution of incomes are required for both short and longer periods of time.

Annual data on incomes can be used to analyse the effects of the business cycle on the distribution of incomes. Schultz's evidence indicates that recessions increase income inequality and that they bear heavily on the least skilled and experienced, who suffer the biggest relative fluctuations in wage rates and employment. Falling rates of growth and rising rates of unemployment both increase inequality in the regression equations which he fitted.(30) Benus and Morgan's analysis of the incomes of several survey panels in America led to the conclusion that the most important determinant of income instability is occupation, followed by age and race. Farmers were found to have the highest level of income instability, while white collar and skilled occupations had the lowest, with the self-employed and unskilled workers in between.(31)

Long run trends in income inequality are best measured when fluctuations in income caused by the business cycle, have been eliminated. Morgan suggests that this can be achieved by averaging incomes over several years.(32) Kuznets lays down an even stricter theoretical ideal since he suggests averaging incomes over a decade, or even over twenty-five years. Further, he would seek to trace movements of recipients of income between ordinal groups in the population over this period, and to trace secular levels through at least two generations, although he does describe such requirements as

being "a statistical economist's pipe dream".(33) Dich also lays down stringent requirements when he argues that measures of inequality based on annual data may have very little relationship to the true level of inequality, which can be estimated only when the distribution of after-tax lifetime incomes has been discounted to present value.(34) Kuznets and Dich's requirements may be unnecessarily stringent, since Benus and Morgan's analysis of panel data has shown that inequality of incomes is initially reduced if the length of the accounting period is increased, but that a limit is approached after three periods of time have been incorporated. Their analysis showed that lengthening the accounting period has a relatively small effect on the distribution of income, ranging from no reduction in inequality of the household head's labour income, to a nine percent reduction for family income.(35) South African data do not allow any averaging of incomes to eliminate cyclical fluctuations.

Many writers have drawn attention to the variation of individual and household incomes over the life cycle, and have argued that age differences can exaggerate the "true" degree of inequality. Indeed, this provides one of the reasons for specifying permanent income rather than measured income as the ideal concept for comparing the size distribution of incomes.(36) In a growing economy, however, the expected lifetime incomes of new entrants will be substantially higher than the incomes of the groups which have already been in employment for long periods, and even if they are possible, comparisons of permanent income will not eliminate the differences in lifetime incomes of these different age groups. Paglin's solution is to

eliminate inequality arising from differences between age groups, and he attempts to do this by applying a factor to the American Gini-coefficient, which corrects for the effect of the age - earnings profile. His results show that the "true" degree of inequality is substantially less than had been imagined.(37) Many objections have, however, been raised against Paglin's procedures.(38)

3.3 Statistical Measures

The shares of income of South Africa's racial groups, or disparities in racial per capita incomes provide the crudest possible measure of inequality in South Africa, but they conceal inequalities which exist within racial groups. Measures of inequality in the size distribution of income can provide this information.

The earliest approaches viewed the measurement of inequality in the size distribution of incomes as an objective statistical exercise and the index which was used was selected for its statistical properties.(39) These would have included: measurement by a single coefficient capable of unambiguous interpretation, which would allow successive comparisons between different distributions; independence of the size of the population and the unit of currency in which incomes are measured; the index should have definite limits, preferably taking a value between zero and one; and should afford ease of compilation and interpretation.(40) However, Yntema showed that the measures which satisfied these criteria did not produce much uniformity in the ranking of distributions and his findings have been verified in many later studies.(41)

The inconsistency in the ranking has been shown to occur because of differences in the weightings which the various measures apply to lower, middle-ranked and higher incomes, and considerable efforts have been made to investigate the effects of the weightings used in the different measures.(42)

In this paper a distinction will be made between normative and positive (or objective) measures. This distinction lies in the fact that the positive measures are not deduced explicitly from a pre-postulated social welfare function; they attempt to quantify the extent of inequality in some objective sense, and at first sight do not appear to attribute an ethical value to the extent of inequality.

3.3.1 Positive Measures

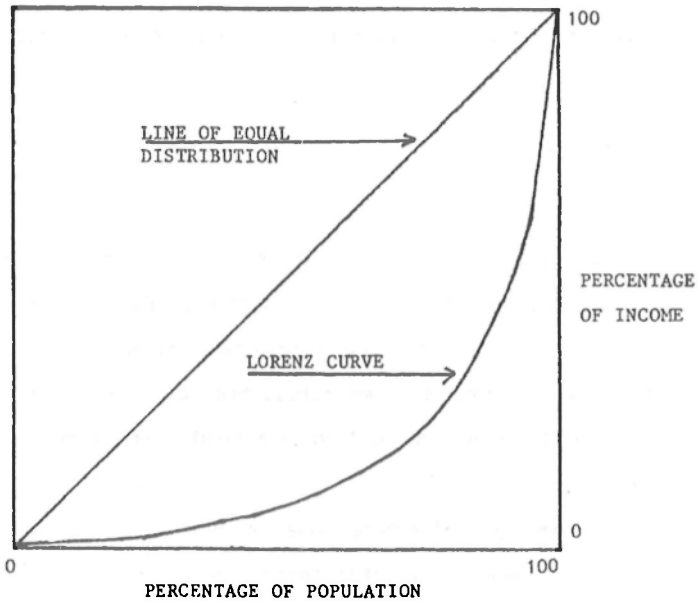
There are two broad types of positive measures. The first does not attempt to summarise the distribution into a single coefficient; these measures are best described as being non-decisive. The second group, which can be called decisive measures, provide summary information about the distribution in the form of a single coefficient.

The most commonly used non-decisive measures are percentile shares, which are the shares of total incomes which accrue to specified percentiles of the population.(43) Related to these percentile shares is the well-known Lorenz Curve, which graphs percentiles of income (plotted on the vertical axis) against percentiles of the population

(plotted on the horizontal axis). An example is shown in Figure 1 below.

If all incomes were equally distributed, the Lorenz Curve would lie along the diagonal of Figure 1, which is known as the line of absolute equality. The relative distance from this line of absolute equality provides an indication of the order of inequality when two non-intersecting Lorenz Curves are being compared.

FIGURE 1 LORENZ CURVE



The Lorenz Curve may be thought of as capturing certain important aspects of inequality, as it shows graphically the deviation of each relative share of income from perfect equality. The ordering of inequality by non-intersecting Lorenz Curves has powerful implications, for it has been shown to be the same as the ordering of the social welfare of the distributions, under the relatively weak conditions that the social welfare function is symmetric and concave.(44)

These non-decisive measures do not summarise information about the distribution into a single statistic and this may be regarded as one of their strengths, since they do not attribute any weighting to the ranges of the distribution, thereby placing the whole burden of observation on the observer.

By contrast, the decisive single coefficient measures summarise the whole distribution into a statistic, and although this is convenient for comparisons, it is also their greatest weakness, since different indexes may produce inconsistent rankings of different distributions. The decisive indexes which have often been used are:

the relative mean deviation,
the variance and the coefficient of variation,
the logarithmic variance,
the Gini-coefficient, and
Thiel's entropy index.(45)

Formulae for calculating these indexes are given in Table 2.

Index	Definition[1]	Minimum[1]	Maximum[1]	Rank Preserving Equalization	Scale Irrelevance[5]	Aggregativity[5]	Additive Decomposability[5]
Relative Mean Deviation (m)	$\frac{1}{n}\Sigma_i\lvert\frac{y_i}{\bar{y}} - 1\rvert$	0	$2(1 - \frac{1}{n})$	Not for incomes on the same side of $\bar{y}$ (2)	Yes	No	No
Logarithmic Variance (v)	$\frac{1}{n}\Sigma_i(\log(\frac{y_i}{\bar{y}}))^2$	0[3]	∞	Not for transfers between incomes above 2.718 times y* (4)	Yes	No	No
Gini-Coefficient (G)	$\frac{1}{n^2\bar{y}}\Sigma_i\Sigma_j\lvert y_i - y_j\rvert$	0	$\frac{n-1}{n}$	Yes	Yes	No	No
Theil Index (T)	$\Sigma_i\ s_i \log n s_i$	0	$\log n$	Yes	Yes	Yes	Yes
Atkinson's Index (A)	$1 - \frac{1}{\bar{y}}(\Sigma_i \frac{1}{n} y_i^{1-e})^{\frac{1}{1-e}}$	0	$1 - n^{\frac{-e}{1-e}}$	Yes.	Yes	Yes	No

TABLE 2

Notation: n = population size
y_i = income of unit i, i = 1, ..., n
Σ_i = sum over units i, i = 1, ..., n
$\bar{y} = \frac{1}{n}\Sigma_i y_i$ = arithmetic mean
$Y^* = \text{Exp}(\frac{1}{n}\Sigma_i \log y_i)$ = geometric mean.
$s_i = \frac{y_i}{n\bar{y}}$ = share of i th unit

Notes:
1 F Cowell, Measuring Inequality (1977), pp 150-154.
2 A Sen, On Economic Inequality (1972), pp 24-39.
3 Sen notes that the arithmetic mean is usually used in the income distribution literature, rather than the geometric mean, A Sen, ibid, p29.
4 Y Kondor, "Value Judgements Implied by the Use of Various Measures of Income Inequality", The Review of Income and Wealth, Series 21, 1975, p318.
5 F Bourguignon, "Decomposable Income Inequality Measures", Econometrica, Vol 47, 1979, p919.

A minimal requirement of any decisive index might be that it could meet the list of requirements laid down by Yntema, which were discussed above. Some of these requirements could be likened to axioms which should be satisfied before any index is used to measure inequality. Fields and Fei have proposed three axioms which are likely to be widely acceptable: the axioms of scale irrelevance, symmetry and rank preserving equalisation.(46) The axiom of scale irrelevance requires that the index should be independent of the level of income. This axiom takes account of the distinction between efficiency, as measured by the level of income, and equity, as represented by the measure of inequality, and allows both to be considered as separate components of economic welfare. Proportionate increases in all incomes will not change the value of measures which are scale independent. The variance is not independent of the mean and therefore fails to meet the requirement of this axiom.

The axiom of symmetry requires that all units being compared should be treated the same, i e if two frequency distributions of income are the same, but different units receive the income in the two cases, then each measure should be unaffected.(47) All the decisive indexes listed above satisfy this requirement.

The third axiom, rank preserving equalisation, is also known as the Pigou-Dalton condition, or the principle of transfers. It requires that a transfer from a richer to a poorer person that does not change the ranking of the people must reduce the inequality as measured. Dalton, who first applied this axiom to the measurement of inequality, stated it as follows :

> "..., if there are only two income-receivers, and a transfer of income takes place from the richer to the poorer, inequality is diminished. ... the transfer must not be so large as more than to reverse the relative positions of two income-receivers, and it will produce its maximum result, that is to say, create equality, when it is equal to half the difference between the two incomes."(48)

The logarithmic variance, the standard deviation of logarithms, and the relative mean deviation fail to satisfy this axiom.(49)

The Pigou-Dalton condition can be illustrated using Lorenz Curves, for if one Lorenz Curve, representing distribution x, lies wholly inside the other, representing distribution y (as shown in Figure 2(a)), then they will be related to each other through a series of Pigou-Dalton transfers. In these circumstances, Kakwani defines distribution x as being Lorenz superior to the distribution y. When Lorenz Curves intersect (Figure 2(b)), the Pigou-Dalton condition is not satisfied, and neither distribution can be considered Lorenz superior. In the case of Lorenz superiority (i e when the Lorenz Curve of one distribution is strictly inside that of another), then the one distribution is unambiguously more equal than the other, but when Lorenz Curves intersect, neither distribution can be said to be more equal.(50)

It has been shown that all the measures which conform to these three axioms will produce a consistent ranking of any number of distributions of income when the conditions of Lorenz superiority are met. This greatly simplifies the choice of measure if the goal is only one of obtaining an ordinal ranking of several distributions of this type. The proportionate changes recorded by the different measures,

FIGURE 2a NON-INTERSECTING LORENZ CURVES

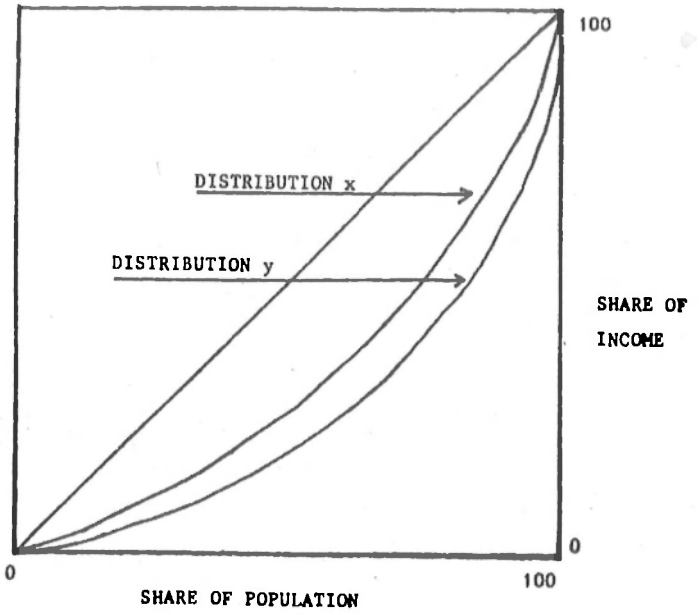
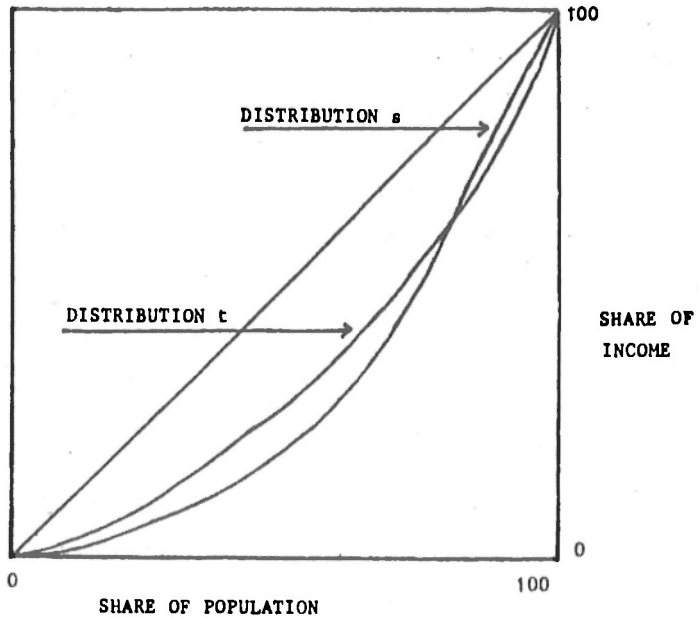


FIGURE 2b INTERSECTING LORENZ CURVES



when comparing the degree of inequality between the different distributions, will not be the same because of the different weightings of the measures.(51)

Positive measures of inequality which satisfy all three axioms are the coefficient of variation, the Gini-coefficient, and the Theil index. In addition, the normative Atkinson index, which will be discussed below, satisfies these axioms.

An axiom which might also be acceptable is that the index should be independent of the number of people. Income inequality, it might be argued, should be measured independently of the numbers of people in the population. The Theil measure does not satisfy this axiom, but it can be normalised to exclude the effects of population of different sizes.(52)

Distributions of income which cannot be derived by a series of Pigou-Dalton transfers, result in intersecting Lorenz Curves (see Figure 2(b)), and a consistent ranking will not be given by the measures which satisfy the axioms that have been stated above. Additional information is now required about the weightings given by the various measures in order to choose the one which corresponds best to the observer's values. Information of this sort is also required in all cases where cardinal comparisons of inequality measures are to be made.

The choice of indexes when Lorenz superiority does not exist, or when the cardinal properties of indexes are important, has been aided by

studies which have estimated by simulation the sensitivity of inequality measures to different forms of inequality. Other studies have also attempted to discover the form of the social welfare function which is implied when any particular measure is used as an index of welfare.

Champernowne's 1974 study is the most comprehensive of the attempts to estimate the sensitivity of the inequality measures to various types of inequality. He compared the performance of six measures of inequality estimated for forty-two simulated income distributions which differed in the extent to which they displayed inequality amongst low incomes, less extreme incomes, and very high incomes. The standard deviation of logarithms was found to be highly sensitive to inequality among relatively low incomes, whereas the coefficient of variation and Theil's index behaved most sensitively to inequality among high incomes. The Gini index was found to be best suited for measuring inequality associated with a wide spread of less extreme incomes.(53)

The interpretation of changes in single coefficient measures, or in their ranking of distributions, must therefore be undertaken with care, for the choice of measure can determine the final result. Champernowne stressed this when he concluded:

> "This suggests that the choice of index could quite frequently decide the answer to such questions as whether inequality had increased or decreased in a country over a decade. In making the choice, one should accordingly be very clear in what type of inequality one is primarily interested."(54)

Research into the properties of the social welfare functions implied by the various measures of inequality supports the results which Champernowne derived from his simulations. This research has emphasised the important fact that any measure of inequality involves judgements about social welfare.(55) Indeed, Blackorby and Donaldson have proved that for each family of indexes of inequality a family of social welfare functions can be found that imply the indexes, and that certain indexes have ethically perverse properties.(56)

Theil had shown the uses of decomposable measures in 1967,(57) and in the recent literature on measurement this issue has received considerable attention, for the analysis of inequality can be given a much less hazy focus if the index for the whole population can be expressed as the sum of appropriately weighted indexes of inequality "within" its sub-groups, and of inequality existing "between" them.(58) Indexes of inequality which have this property are said to be decomposable.

This property is extremely useful in societies which have clearly distinguishable sub-groups of the population, such as South Africa's racial groups, for it allows an analysis of the relative contribution which, within and between racial group inequalities make to the overall index of inequality, and can provide an answer to the question "How much inequality is due to racial variation in income?" The decomposable Theil index will be used in this paper to address this question.

3.3.2 Normative Measures

Explicitly normative approaches begin by specifying the form of the

social welfare function which is to be used, and a measure possessing the required properties is then deduced. The link between income and economic welfare is explicitly defined in the inequality measure since the measure is designed to provide an index of economic welfare. The measurement of inequality is totally dependent on the assumptions which are made about the form of the social welfare function, so that, unlike the decisive measures which were discussed above, it will provide a complete ranking of all alternative distributions.

Dalton was the first proponent of this approach to the measurement of inequality. He felt:

> "... the economist is primarily interested, not in the distribution of income as such, but in the effects of the distribution of income upon the distribution and the total amount of economic welfare which may be derived from income. ..., it is clear that, if we assume any precise functional relation between income and economic welfare, we can deduce a corresponding measure of inequality."(59)

Dalton's proposed measure was not independent of the unit of measurement, and it has been criticised for failing to separate the issue of shifts in the distribution of income from changes in its shape.(60)

Fifty years later, Atkinson returned to the approach pioneered by Dalton.(61) In common with Dalton, he assumed that social welfare was a function of individual welfare and that it was derived from the sum of levels of individual welfare. The marginal utility of income to the recipient is assumed to diminish as the level of income is increased. The index which Atkinson proposed is also consistent with the four axioms which were discussed in 3.3.1 above.(62)

Atkinson's measure is derived from the concept of an equally distributed equivalent level of income (y_e). If this was received by every individual, the resulting level of social welfare, under the assumptions which have been made about the social welfare function, would yield a level of social welfare as high as the actual distribution yields. Atkinson's index (A) is:

$$A = 1 - \frac{y_e}{\bar{y}}$$ (where $\bar{y}$ is the mean of the actual distribution).

As y_e can never be greater than $\bar{y}$, the index will take a value between zero and one.

The measure requires that a value for the parameter e must be chosen (see Table 2) and this will reflect the aversion attached by the society to inequality in the distribution of income. The parameter e is constant, indicating that society's aversion to income inequality does not change as the level of income rises.

The significance of e can be illustrated by the following "mental experiment" suggested by Atkinson:

> "Suppose that there are two people, one with twice the income of the other, and that we are considering taking £1.00 from the richer man and giving £x to the poorer (the remaining £1 - £x being lost in the process - eg. in administering the transfer). How far can £x fall below £1 before we cease to regard the redistribution as desirable? (Clearly if we are at all concerned with inequality, £x = £1 is considered desirable?) The answer to this question determines the value of e. For example, e = 1 corresponds to our regarding it as 'fair' to take £1.00 from the richer man and give £0.50 to the poorer; and e = 2 to it being regarded as 'fair' to take £1.00 and give £0.25p to the poorer man."(63)

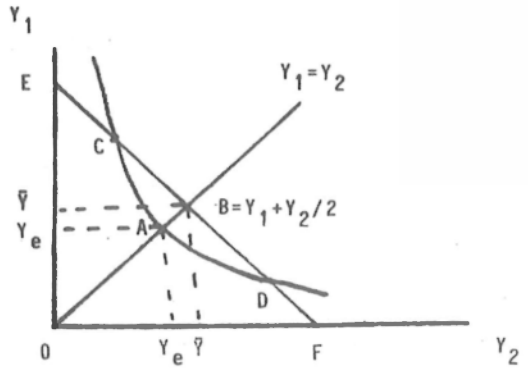
High values of e will be specified in societies which have a strong aversion to inequality, whereas a society which was quite indifferent to the issue of inequality would select a value for e of 0.

Once the value of e has been specified, A has an attractive intuitive interpretation. According to Atkinson:

> "Once e has been agreed, the measure has an intuitive interpretation as the proportion of the present total income that would be required to achieve the same level of social welfare as we have now, if all incomes were equally distributed. A value of 70 percent means that if incomes were equally distributed, we should need only 70 percent of the present national income to reach the same level of social welfare - or alternatively that the gain from redistribution to bring about equality is equivalent to raising national income by 30 percent."(64)

Muellbauer provides an innovative illustration of the significance of y_e.(65) In Figure 3, CAD represents a social indifference curve for a population of two people. The social welfare function is assumed to be strictly quasi-concave (i e the social indifference curve is strictly convex to the origin), and symmetry of the social welfare function requires symmetry of the social indifference curve about the line EF. Points C and D represent two distributions of income which are identical in magnitude. Point B represents the mean of the distribution (y) and strict quasi-concavity requires that B lie on a higher social indifference curve than CAD. Point B represents the maximum social welfare which can be attained at the level of income EF.

FIGURE 3 SOCIAL CHOICE AND THE EQUALLY DISTRIBUTED EQUIVALENT INCOME



Source: J Muellbauer, "Inequality Measures, Prices and Household Composition", The Review of Economic Studies, Volume 41, 1974, p 494.

Point A represents the amount of income (y_e) which, if given to each person, would yield the same level of welfare as the actual distribution at C (i.e. Point C represents the equally distributed equivalent of income). The parameter e determines the extent of convexity of the social indifference curve, for a high level of inequality aversion will result in highly convex social indifference curves, and an increase in the distance AB. The Atkinson measure is given by $1 - \frac{OA}{OB}$.

It is very doubtful whether the social welfare function which Atkinson has assumed could be universally acceptable. Sen has drawn attention to its "individualistic" nature, which excludes the possibility of relative deprivations depressing social welfare.(66) Muellbauer has shown that the satisfaction of a subsistence level of income cannot be

considered as a constraint in a homothetic function of the sort used in A.(67) Kakwani has drawn attention to the implication that social welfare is more sensitive to the mean income than to income inequality if A is less than one-half.(68) A substantial disadvantage of the Atkinson index is that it is not unambiguously decomposable.

The major advantage of the normative approach is that it explicitly requires a statement of the social welfare function, but this also constitutes its greatest weakness for the inequality index now ceases to have its normal descriptive content, as inequality becomes totally dependent of the social welfare function. It seems most unlikely that any democratic society will ever be able to attain a sufficiently general agreement on the form of the social welfare function to precisely specify a parameter such as e.

This discussion highlights the highly normative nature of any attempts to measure inequality, even when seemingly positive measures are being used. No single index is likely to provide an adequate measure of income inequality, and there is a need to use a combination of statistical measures.

The measures which will be used in this paper are the Gini-coefficient (which is the most commonly used positive index of inequality) and the normative Atkinson index. Comparisons of distributions will also be made using Lorenz Curves, and the Theil index will be used in a decomposition analysis of inequality in the distribution of incomes.

4. THE SOUTH AFRICAN SIZE DISTRIBUTION OF INCOMES

There is no single source of data covering the economy which is available for all racial groups for any given year. This compels the researcher to make the estimate from a number of different sources covering different years. The year 1975 was chosen for the estimate, because there are a number of sources of data for that year, and the surrounding years. The estimate which finally results from this data should be thought of as giving a crude indication of the magnitude of inequality, rather than a precise estimate; although it does pinpoint very clearly the areas where the data are deficient. In proceeding with this exercise, support can be derived from Elliot who was quoted at the beginning of this paper.(69)

Estimates of the distribution of incomes for Whites, Coloureds and Asians will be presented first, followed by an estimate of the distribution of African incomes, and then an estimate of the distribution of incomes in the economy taken as a whole.

4.1 The Distribution of Incomes in the White, Coloured and Asian Population Groups

4.1.1 Sources of Data

The most comprehensive source is the Census of 1970, which contains tabulations of the family incomes of the three groups. These data can be divided into the metropolitan areas, towns and rural areas, and could be transformed into a per adult equivalent (or a per capita

distribution), were it not for the way in which the published data has been tabulated.(70)

Data on the distribution of incomes of Coloured and Asian households are available for certain metropolitan regions in 1975, and in the same year White household incomes in the major metropolitan regions were covered by the Survey of Household Expenditure. The incomes and estimates of inequality which can be made from these sources can be used to provide a check on the accuracy of the estimate based on the Census.

4.1.2 The Family Income Census Data

Certain difficulties arise in using the Census of Family Incomes.

(1) The 1970 family census data are published in a number of income class intervals, which end at the relatively low incomes respectively of R10 000 for Whites and R2 500 for Coloureds and Asians. Errors will arise in estimating the means of any of the bounded income classes, and in estimating the mean of the last open class. The mean incomes were estimated by assuming that the mean income of the income classes up to the class containing the median income lay at the midpoint of each respective income class, and class means above the median class were estimated by using Pareto interpolations.(71)

(2) There are categories of unspecified and zero income recipients and there is some uncertainty about the accuracy of the coding of both these categories. Families recorded in both categories were therefore redistributed over the entire range of incomes on the

assumption that they represented incomes which had not been specified, but which actually occurred in the same proportions as the incomes which were reported in the Census.

(3) Census incomes are known to be understated. An estimate of the extent of underreporting of incomes made for the 1970 Census of individual incomes(72) was used to adjust the income classes and the estimated means, on the assumption that the extent of underreporting was independent of the level of family size, region or income. There are no data with which to test these assumptions, but they are most likely to result in an underestimation of the higher incomes of each race group, with a consequent underestimation of inequality within each race group.

(4) The distribution of family incomes excludes single individuals in receipt of an income who are not part of a family, and the incomes of this group are not tabulated in the Census (nor can they be identified from published census data). Table 3 shows the numbers of single individuals who were not in orphanages and who were not members of families in 1970.

In order to establish whether the distributions of family incomes derived in this way were consistent with average per capita incomes for 1975, an estimate of the total income of non-family members has to be made.(73) This was generated from income tax data relating to unmarried taxpayers. The definitions of recipient units are not strictly comparable between income-tax data and the Census, since single parent families are classed as unmarried taxpayers, while they are regarded as families in the Income Census. The definition of

income also differs between the tax data and the Census. Although the distribution of the incomes of non-family members which is obtained in this way will be an unsatisfactory surrogate, a better way of making the estimate does not seem to exist.

TABLE 3

SINGLE INDIVIDUALS AND UNMARRIED TAXPAYERS, 1970

	Whites	Coloureds	Asians
Single Individuals (1)	327 712	185 654	21 953
Unmarried Taxpayers (2)	433 086	63 233	23 553

Note: (1) Estimated from the Department of Statistics, Population Census 1970 Families, Report No 02-03-02, pp 1, 79, and 157; and Republic of South Africa, Annual Reports of the Department of Social Welfare and Pensions, Indian Affairs, and Coloured and Reheboth Affairs, RP's 96/1971, 32/1972 and 75/1971.

(2) Data for 1970 supplied by the Receiver of Revenue, Pretoria.

The 1970 distributions obtained for families and single individuals were used to estimate 1975 distributions on the strong assumptions that, for each racial group respectively, the incomes of all classes grew at the racial monetary average rate, and that the number of families and single people in every income group grew at the rate of growth of the population. The assumed growth rates are shown in Table 4.

The total incomes estimated from these distributions fell marginally short of the racial totals which have been estimated for 1975 and the distributions were adjusted to achieve consistency. The 1970 distributions of family incomes, and the adjustments which were made are shown in Appendix A. These estimated distributions for White, Coloured and Asian families have means which are compatible with the racial shares of income estimated for 1975, and they cannot differ too dramatically from the distributions which a census would have yielded at 1975.

TABLE 4

ESTIMATED GROWTH RATES OF THE POPULATION, AND OF INCOMES FOR THE PERIOD 1970 - 1975

	Percent per Annum		
	White	Coloured	Asian
Population	2,02	2,67	2,58(1)
Real Income	3,94	4,67	6,72(2)
Inflation	9,4	9,4	9,4(1)

Notes: (1) Calculated from: Department of Statistics, South African Statistics 1980, Pretoria, pp 1.4, 8.18.

(2) M D McGrath, "Historical Trends in the Distribution of Racial Incomes in South Africa", Perspectives in Economic History, Vol 1, 1982, p 18. The 1975 Incomes were estimated by Jill Nattrass, "The Narrowing of Wage Differentials in South Africa", South African Journal of Economics, Vol 45, 1977, p. 409.

Average family incomes and indexes of inequality for Whites, Coloureds and Asians for 1975 are shown in Table 5. These estimates indicate that White family incomes are respectively 5,15 and 3,50 times greater than the family incomes of Coloureds and Asians. These disparities are slightly smaller than the per capita disparities, which have been estimated for 1975 at 5,8 and 4,5 between Whites and Coloureds, and Whites and Asians respectively.(74) This smaller disparity is probably caused by income earning unmarried Coloured and Asian children who continue to live at home with their families for a longer time than do young income earning Whites,(75) and by the higher participation rates of Coloured women.

Average family incomes in the metropolitan regions, which are also shown in Table 5, are higher on average than family incomes in the non-metropolitan regions for all three race groups.

The indexes of inequality shown in Table 5 are based on compromise values derived from high and low estimates of their actual value.(76) The Gini-coefficient for White families in the metropolitan areas was the lowest of all, although the family incomes of all three groups were more equally distributed in metropolitan areas than in the non-metropolitan areas, or the whole economy. The White distribution is ranked as being the most equal by both the Gini-coefficient and Atkinson's index, and the result is borne out by the Lorenz Curves of these distributions which are plotted in Figure 4.

TABLE 5 INDEXES OF INEQUALITY AND AVERAGE INCOMES OF WHITE, COLOURED AND ASIAN FAMILIES IN 1975. (1)

	White Families			Coloured Families			Asian Families		
	Whole Economy	Metro-politan areas	Non-Metro-politan areas	Whole Economy	Metro-politan areas	Non-Metro-politan areas	Whole Economy	Metro-politan areas	Non-Metro-politan areas
Mean Incomes (Rand)	11 082	11 632	9 799	2 150	2 972	1 340	3 164	3 242	2 817
Gini-coefficient (2)	0,36	0,34	0,39	0,51	0,43	0,51	0,45	0,44	0,49
Atkinson's Index e = 0,5 (2)	0,11	0,10	0,14	0,23	0,16	0,26	0,17	0,16	0,21

Notes:

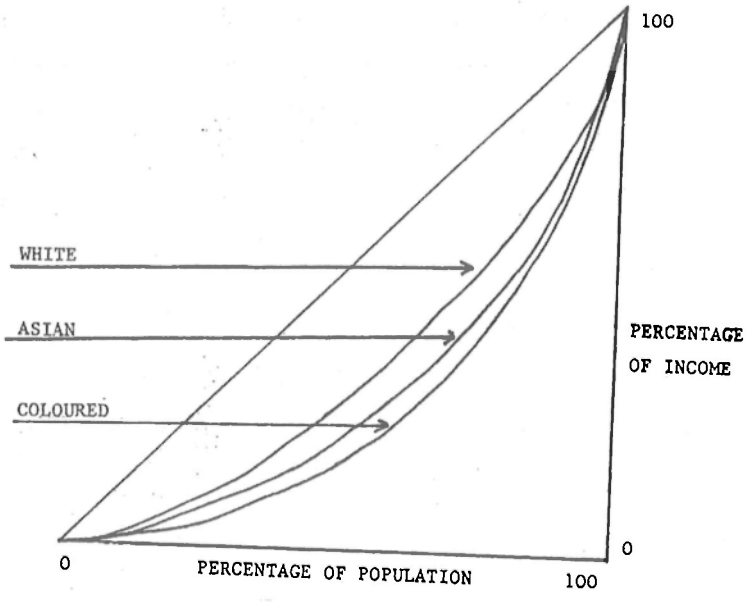
(1) Estimated from Tables A1, A2 and A3 of Appendix A.

(2) Compromise values derived from high and low estimates (See Footnote 76 of this paper)

4.1.3 The 1975 Survey of White Household Incomes

The survey of White Household Incomes can be used to provide a check on the credibility of the estimate of inequality which has been made from the Census. The definition of income used in the 1975 survey of White incomes is very close to the definition of Census Income. The 1975 survey, carried out in the major metropolitan areas of the economy, recorded data on the incomes of 4 677 households and 4 979 financial units. The definition of the family used in the Census corresponds closely to the Survey's concept of a financial unit containing two or more members, and the mean and the distribution of incomes of these financial units can be calculated from the published tabulations of the survey.(77)

FIGURE 4 LORENZ CURVES FOR THE DISTRIBUTION OF WHITE, COLOURED AND ASIAN FAMILY INCOMES IN SOUTH AFRICA, 1975



The mean incomes of the estimated family distribution, Gini-coefficients and Atkinson indexes for the 1975 Survey are shown in Table 6. The surveys of income are subject to sampling errors, and an estimate of the standard error of the Gini-coefficient is given in this table.(78) This survey data does not permit the estimation of maximum values of the inequality indexes, and for the sake of comparison the table shows the minimum values of the inequality indexes calculated from the 1975 census-based distribution.

The average income calculated from the 1975 Survey is shown in this Table to be below the 1975 mean which was obtained from the extrapolated family census data. However, at the 95 percent confidence level this difference is only marginally greater than one standard error of the sample mean, indicating that the variation in these averages may be entirely due to sampling errors. The survey data undoubtedly suffers from some understatement of income, and if it is adjusted by the proportion which was applied to the Census data (see Footnote (72)), the difference between the two means falls well within one standard deviation of the Survey mean. The consistency of these estimates of the mean provides considerable support for the distribution which was derived for White families.

The inequality indexes of these distributions are significantly different, and the higher inequality shown by the extrapolated census data may indicate that the means of the higher income ranges of the Census have been overestimated.

TABLE 6

AVERAGE INCOMES AND INDEXES OF INEQUALITY OF THE DISTRIBUTIONS OF INCOME OF WHITE MULTIPLE FINANCIAL UNITS AND FAMILIES IN METROPOLITAN AREAS IN 1975

	1975 Survey[1] of Financial Units	1975 Census Estimate of Families
Mean Income (Rand)	10 752	11 632
Gini-coefficient[3]	0,28	0,33
Standard Error of Gini	± 0,004	
Atkinson's Index e = 0,5[3]	0,07	0,10

Notes:

(1) Estimated from: Department of Statistics , Survey of Household Expenditure, 1975, Report 11-06-06.

(2) The standard error of the Survey mean was estimated to be - R830 at the 95 percent confidence level. The estimate was based on sampling error tables in: Department of Statistics, Population Census 6th May 1970 Sample Tabulation, Report No 02-01-06, p xi.

(3) Minimum values for the inequality indexes are shown here.

Nevertheless the Family Census estimate and the survey results are remarkably close considering the number of assumptions which had to be made to arrive at the 1975 estimate. It would therefore seem reasonable to conclude that the Census data can be used to give an estimate of inequality between White families in the metropolitan

areas, although this estimate may have a tendency to overestimate slightly the inequality of White family incomes in the metropolitan areas.

There are no surveys of White Family Income for the non-metropolitan areas, and for these regions the extrapolation of the Census is the only available data for 1975.

4.1.4 Surveys of Coloured and Asian Household Income

Household income and expenditure surveys undertaken by the Bureau of Market Research can also be used to provide a check on the plausibility of the incomes and indexes of inequality which were estimated from Census data for Coloured and Asian families.

Table 7 shows mean incomes and inequality indexes for Coloured and Asian households in certain metropolitan areas in the year 1975. The indexes of inequality of this Table are based on intermediate estimates.

The largest concentrations of the populations of Coloureds and Asians living in the metropolitan areas are covered by these studies. The definition of a household used by the Bureau of Market Research is broader than the definition of the family which is used in the Census, and it may even be more appropriate for measuring the distribution of Coloured and Asian incomes, for within these communities dwellings are frequently inhabited by more than one family unit.(79) The definitions of income of the Census and the Bureau of Market Research surveys are broadly comparable.

A comparison of the incomes and indexes of inequality shows that without exception the household incomes of Table 7 are higher than the Coloured or Asian family incomes in metropolitan areas, which were shown in Table 5. The indexes of inequality are, however, significantly lower according to the household data.

This result is not surprising. Multiple unit households normally have more income earning members than households comprising nuclear families, with the result that average household incomes should be higher than family incomes; but the presence of a larger number of income earners in households tends to reduce the extent of inequality in the distribution of household incomes. The large income differences between average household incomes in Johannesburg and the other regions shown in Table 7 may also account for some of the higher inequality, shown in the indexes of the distribution for families, when the distributions of income in all the metropolitan regions are aggregated.

It is not possible to provide a more rigorous reconciliation of the differences between these household incomes, and the family incomes of Table 5. The discussion above, however, shows that the differences in both the average incomes and the indexes of inequality can be given plausible explanations and this provides encouraging support for using the Asian and Coloured family income data in an estimate of inequality for the economy.

TABLE 7 MEAN INCOMES AND INDEXES OF INEQUALITY FOR COLOURED AND ASIAN HOUSEHOLDS IN CERTAIN METROPOLITAN AREAS 1975

	Coloured Households[1]				Asian Households[2]			
	Mean Income (Rand)	Gini-coëfficient	Standard Error of Gini	Atkinson's Index e = 0,5	Mean Income (Rand)	Gini-coëfficient	Standard Error of Gini	Atkinson's Index e = 0,5
Cape Peninsula	3 135	0,34	±0,011	0,09	-	-	-	-
Port Elizabeth	3 007	0,34	±0,013	0,08	-	-	-	-
Johannesburg	4 404	0,32	±0,018	0,09	5 132	0,21	±0,013	0,05
Durban	-	-	-	-	3 831	0,29	±0,013	0,07

Notes:

(1) Estimated from:Bureau of Market Research, Income and Expenditure Patterns of Urban Coloured Households, Cape, Port Elizabeth and Johannesburg, Research Report No's 50.5; 50.9; 50.8; Tables 8M.

(2) Estimated from:Bureau of Market Research, Income and Expenditure Patterns of Urban Indian Households in Durban, 1976, and Johannesburg, 1976, Research Report No's 50.7; 50.6; Tables 8M.

4.2 The Distribution of African Incomes

4.2.1 The Available Data

The data available for estimating the distribution of African incomes are without doubt the weakest link in the estimate of inequality for the economy. Nevertheless, this section will show that there are sufficient data available to make a reasonable estimate of the distribution of African incomes.

Data on African household incomes can be obtained from the BMR surveys of major urban areas for 1975, for two towns in 1975, two rural areas outside of the Black States in 1971 and surveys of Bophuthatswana and Venda for the year 1977, and Kangwane and the Transkei for the years 1978 and 1979 respectively. (80)

Many problems arise when using these data in a comparison of racial incomes. Firstly, the recipient unit concept differs from the Family Census unit. As mentioned in the discussion of Coloured and Asian inequality above, this may not be a limitation at all, for there is also a prevalence of multiple households, rather than nuclear families in dwellings in African areas. The second problem occurs because of differences in the definition of income and the dates of the BMR studies and the Census, but these problems are not fatal. The differences in data can be overcome by moving the Census and the BMR incomes to an estimated 1975 distribution. The income concepts of these two sources of data differ only slightly, mainly because the BMR includes lump sum payments received during the year prior to the

survey, while the Census excludes windfalls and non-recurring lump sum payments. The third problem area lies in sampling errors in the regions which are included in the BMR surveys. The errors arising from sampling in particular regions are not, however, likely to be as great as the errors which arise from making estimates about the distribution of incomes in the regions which have not been surveyed.

The extent of the coverage of the BMR surveys is shown in Table 8. The metropolitan White areas which account for an estimated 47,5 percent of African incomes are well covered in the BMR surveys, for these surveys represented 82 percent of the population of these regions. Smaller towns in White areas and White rural areas were most inadequately covered, both in terms of the number of surveys and the size of the samples.

Together they account for approximately 22 percent of the African population and 24 percent of African incomes. Four towns and two rural districts are covered by these BMR surveys, and they cannot be claimed to be at all representative; even the BMR hedges its report on the White rural areas. The BMR reports household incomes for the four towns, and does not publish a table of the distribution of incomes. Nevertheless, there are no other sources which can be used as substitutes, in the words of the BMR: "Very little is known about Bantu living in rural areas ...".(81) The relatively small weights which these areas carry in total personal incomes can to some extent offset the concern which might be felt over using data which is so limited in its coverage. Data exists for four Black States, covering an estimated 45 percent of the population of all the Black States, and

in addition, an estimate of the distribution of incomes can be made for the segments of the metropolitan areas which overlap the Black States. If these estimates are added, the proportion of the population of the Black States, covered by BMR surveys rises to 54 percent. The coverage of African incomes is therefore far from comprehensive, but it would be difficult to argue that the coverage of this income data is so wanting that a reasonable estimate of the distribution of African incomes cannot be made.

The assumptions made in order to fill the spaces left by the data were:

(1) The distribution of African household incomes in the towns was assumed to be the same as in the metropolitan regions, but the mean was obtained from the BMR estimate.(82) This assumption may give an upward bias to the final estimate of African income inequality if household income inequality is lower in the towns than in the metropolitan areas, because of the existence for Africans of a more restricted range of occupations and wage rates in towns.

(2) The population of towns in 1975 was estimated from Simkins' tabulations for 1970 and 1980, on the assumption that it grew at the constant compound rate of 2,4 percent per annum over the decade.(83) The number of households was obtained by dividing the total population of household members by the household size of 5,28 members, obtained from BMR data.(84)

TABLE 8 COVERAGE OF SURVEYS UNDERTAKEN BY THE BMR IN THE YEARS 1975 - 1979.

Region	Estimated Total Population	Size of Samples (4)		Estimated coverage of samples (%)	Share of African Personal Income in region (6)
		H/hold	Single		
White Metropolitan Areas (1)					
Cape Province	522521	903	790	89	-
Natal	406418	732	516	100	-
OFS	344926	293	202	26	-
Transvaal	2322524	946	634	84	-
Total White Metropolitan regions	3402672	2874	2142	82	47,5
White Towns (2)	1527322	262	-	neg.(5)	14,8
White rural areas (3)	587388	300	-	19	8,9
Black States (3)	3962300	2971	-	45	28,8

Notes: (1) Population estimated from : Bureau of Market Research, Regional Population Estimate for 1975, Research report No 51, and the reports referred to in Footnote 80 of this paper.

(2) Estimated from : C. Simkins, Four Essays on the Past, Present and Possible Future of the Distribution of the Black Population of South Africa (1983). pp 71 - 75.
This total excludes the population of the metropolitan regions overlapping with the Black States. It includes the 193 177 foreign migrants employed in Gold Mining.

(3) Estimated from : Bureau for Economic Research : Co-operation and Development, Statistical Survey of Black Development 1978, and the sources of (1) above.

(4) See the sources referred to in Footnote 80 of this paper.

(5) Only average incomes are reported.

(6) Estimated from regional shares of income given in : Bureau of Market Research, Income and Expenditure Patterns of White and Black Households living in Towns in the Republic of South Africa, Research Report No 65, p 1.
The incomes shares include the incomes earned by single migrants in the urban areas.

(3) The two studies of White rural areas were assumed to represent the distribution of incomes in all the White rural areas and the average household size of 6,65 recorded in these studies was assumed to be representative of all households in White rural areas.(85) The population was obtained by applying a compound growth rate of 1,3 percent per annum, estimated for the decade 1970 to 1980, to Simkins' estimate of the 1970 population.(86) Average household income was assumed to be the average of incomes of the studies and was inflated by the growth rate of the Gross Domestic Product to an estimated 1975 level.(87)

(4) The aggregate of the estimate of the four Homeland studies, weighted by the total population, is assumed to represent the distribution of incomes of the Black States.(88) These distributions were first adjusted to an estimate of the 1975 distribution on the assumption that the incomes of every income class grew at the money growth rate of the Gross National Income of the Black States between 1975 and the date of each survey.(89) The distribution of incomes of the single households, who resided in the areas of the metropolitan economic regions which extend into the Black States, was excluded from the estimate. In terms of the finally estimated distribution, approximately 10 percent of the total population of the Black States lived in urban areas in 1975, and this is indeed close to the average rate of urbanisation in the Black States recorded in the 1970 Census (90). The estimated distribution for the Black States yields an annual per capita income of R187, which compares very well with the annual per capita income of R192 which can be derived from

national accounting data for the year 1975 (91).

The Black States have in common their low incomes and their dependence on the White-controlled economic regions, but in terms of other economic characteristics they are remarkably heterogeneous. In 1975 per capita national incomes varied between a high level of R299 in Bophuthatswana, to a low level of R169 per capita in Kangwane. The average national income per capita was R247 (92). Personal incomes are lower than national incomes because national incomes include the total earnings of migrant workers, and expenditure studies show that the absent migrants themselves consume approximately 70 percent of these incomes and that only 30 percent is remitted to the families of the migrants. (93) Workers who live in the Black States which border on the fringes of the metropolitan areas, such as the Ciskei, KwaZulu and Bophuthatswana, are able to commute between their homes and their places of employment on a daily basis. These three states have the highest levels of income, due largely to the earnings of their frontier commuters. The contribution which labour migration makes to the national income of these states varies in a roughly inverse proportion with the relative level of the income earned by commuters, reaching 72 percent of the national income of Venda and falling to the low level of 30 and 28 percent of national income in Bophuthatswana and Kangwane (94). Nattrass also shows that there are considerable differences in output per head in agriculture and in land population ratios in these different areas (95).

The four states covered by the BMR surveys exhibit many of these different characteristics, and this is fortunate since they can be thought of as providing a cross section. The distribution of incomes which is estimated from this data is, nevertheless, a very crude surrogate. The Black States surveyed may provide a representative sample of all the Black States and the correspondence between the per capita incomes and urbanisation rates of the estimated distribution, and the actual averages do give some support for using this estimated distribution. However, the accuracy of this method of estimating the distribution will be unknown until income surveys have been undertaken in all the Black States.

(5) The coverage of the BMR sample surveys of African household incomes in the White metropolitan regions is very comprehensive, as is shown by Table 8. Estimates of the distribution of household incomes had to be made for Kimberley, Vereeniging/Vanderbijlpark, and the OFS Goldfields and Sasolburg. Since no income surveys existed for these areas, these distributions were generated from survey data collected for the other metropolitan areas.

The distribution of household incomes in Port Elizabeth was assumed to apply in Kimberley, and the population was divided into single and multiple households by applying the Port Elizabeth ratios, after subtracting the 13 200 workers employed in Diamond Mining from the total African poulation of Kimberley.(96) The population of Vereeniging and Vanderbijlpark

was divided into households and single individuals using the ratios of the Pretoria survey and these households were assumed to follow the East Rand distribution of incomes [97]. Households in the OFS Goldfields and Sasolburg were assumed to have the same composition and income distribution as emerged from the survey of Bloemfontein. The number of households was determined after subtracting an estimate of employment in gold mining [98].

(6) The tails of all the estimated distributions were extended using Pareto interpolations, based on the Pareto coefficients which are implied by the estimated means and the income classes tabulated by the BMR, and the data was regrouped into appropriate income intervals by using either linear or Pareto interpolations.[99] Table A4 of Appendix A shows the final estimated distributions of African household incomes.

4.2.2. Income Inequality amongst African Households

Indexes of inequality and average incomes for these estimated distributions of African households are shown in Table 9, and the underlying distributions are shown in Table A4 of Appendix A. The Gini-coefficients reveal that the metropolitan regions and towns have the most equal of the regional distributions, whilst the distribution in the Black States was the most unequal [100]. The shares of income in the regions which are shown in Table 9 differ from the shares derived from BMR's data, which are given in Table 8. The differences arise mainly in the income share of the White urban areas, for the estimates of Table 9 exclude the earnings of single individuals, most

of whom are migrants. When these earnings are added, the income share of the metropolitan regions rises to 49 percent of the total, which is very close to the BMR's estimate (101).

TABLE 9

AVERAGE MULTIPLE HOUSEHOLD INCOMES AND INDEXES OF INEQUALITY FOR AFRICAN MULTIPLE HOUSEHOLDS IN 1975 (1)

	Share of Total Population (percent)	Share of Income (percent)	Average Income (Rand)	Gini-coeffi-cient	Atkinson's Index e = 0,5
Metropolitan Regions (including the overlapping segments of the Black States)	19	34	2 017	0,33	0,10
Non-Metropolitan Regions	81	66	946	0,48	0,23
All African Households	100	100	1 152	0,47	0,21
Non-Metropolitan Regions :					
Towns in White Areas	8	12	1 709	0,32	0,10
White Rural Areas	19	11	670	0,36	0,11
Black States (excluding the overlapping segments of the Metropolitan Regions)	54	43	925	0,49	0,24

(1) See Appendix A, Table A4 for the estimated income distributions.

4.2.3 Urban Rural Inequalities

The average African household incomes shown in Table 9 give an indication of the very marked income inequality which exists between urban and rural areas, and when these household averages are expressed in per capita terms, the inequalities become even more noticeable.

Table 10 shows the per capita incomes which can be derived for different regions from the distributions which have been estimated. This table highlights the very marked income inequality between regions that has come to exist for the African population. Per capita incomes of African households in the metropolitan regions were 2,2 times as great as per capita household incomes in the Black States, and 3,7 times the per capita incomes of the African households in the White rural areas.

TABLE 10

AVERAGE MULTIPLE HOUSEHOLD INCOMES AND PER CAPITA INCOMES OF AFRICANS IN VARIOUS REGIONS IN 1975

	Average Household Income (Rand)	Average Household Size (2)	Per capita Income (Rand)
Metropolitan Regions (1)	2 017	5,5	367
White Rural Areas	670	6,7	100
Black States (1)	925	5,5	168

(1) As defined in Table 9.

(2) Derived from the estimated 1975 populations and numbers of households.

Remittances to the Black States by migrants account for approximately 35 percent of the income of the Black States, after excluding commuter incomes earned in the metropolitan regions [102]. At present, therefore,the migrant labour system is a major source of income for the rural areas of the Black States, and without it the income of these areas would be far lower. Paradoxically, however, the migrant labour system has been shown to have contributed historically to causing the low incomes of the Black States [103]. It is very clear that any reduction in the rate of labour migration would have disastrous consequences in the short term for households in the rural areas of the Black States, unless alternative sources of income were created at the same time.

5. INCOME INEQUALITY IN THE ECONOMY AS A WHOLE

5.1 A Contrast of Racial Distributions

The distributions for each racial group and for the whole economy are shown in Table 11. The data in this table provide a crude indicator of inequality within and between the respective groups. The median income for White families occurs at an income slightly greater than R8 000 per annum, and over 95 percent of the respective family or household populations of each of the other groups falls below this level. Twenty three percent of White families had incomes exceeding R12 000 per annum, while a mere 1,7 percent of Asian families, and a negligibly small proportion of Coloured families and African households, had incomes which exceeded R12 000 per annum.

Compromise indexes of inequality (which were described in Footnote 76) estimated for each racial group show that the distribution of White family incomes (with a Gini-coefficient of 0,36) is more equal than the distribution of incomes of the other groups, which have Gini-coefficients ranging between 0,45 in the case of Asian families to 0,51 for Coloured families. The Atkinson index (for e = 0,5) produces the same ordering of these distributions. The comparison of the Lorenz Curves of the Coloured and African distributions which is given in Figure 5 shows that the Lorenz Curve of the Coloured family distribution intersects the Lorenz Curve derived from the distribution of African household incomes, and this serves to indicate that the African distribution is not unambiguously more equal than the Coloured distribution, and a transitive ranking of these Coloured and African

TABLE 11 CUMULATIVE PERCENTAGE DISTRIBUTIONS OF FAMILY AND HOUSEHOLD ANNUAL INCOMES AND INDEXES OF INCOME INEQUALITY FOR SOUTH AFRICA 1975.

Less than Rand	White families	Coloured families	Asian families	African households	National Distribution
500	1,7	25,0	12,0	31,3	23,6
1 000	3,3	50,0	24,0	58,1	44,2
1 500	4,1	54,3	34,8	74,3	55,7
2 000	5,8	63,9	48,7	84,2	63,9
2 500	8,2	71,8	59,9	90,6	69,6
3 000	10,6	77,7	69,2	94,6	73,6
3 500	13.1	82,0	75,7	96,2	75,8
4 000	15,6	85,7	80,6	97,8	77,9
4 500	18,6	88,5	84,4	98,4	79,3
5 000	22,5	91,5	87,7	98,7	80,8
5 500	26,4	93,3	90,1	99,0	82,1
6 000	30,3	94,7	91,8	99,2	83,3
8 000	49,8	97,6	95,7	99,6	88,2
10 000	66,6	98,7	97,4	99,7	92,2
12 000	77,4	99,2	98,3	99,8	94,7
Mean Income (Rand)	11 082	2 150	3 164	1 152	3 503
Population	1 019 657	410 161	137 738	3 012 073	4 579 629
Gini-coefficient	0,36	0,51	0,45	0,47	0,68
Atkinson's Indexes					
e = 0,5	0,11	0,23	0,17	0,21	0,39
e = 1,5	-	-	-	-	0,86

distributions will not necessarily occur according to all the indexes of inequality which satisfy the principle of transfers. The White and Asian distributions are unquestionably more equal than the Coloured distribution, according to the principle of Lorenz superiority.

5.2 The Economy-Wide Distribution

The Gini-coefficients and Atkinson indexes which are estimated for the economy and shown in Table 11 are based on compromise estimates, derived from minimum and maximum values. The Gini-coefficient of 0,68 estimated in Table 11 confirms the intuitive feeling that South Africa must have one of the most unequal distributions of income in the world.

Indeed, Jain's data for economies with high income inequality shown in Table 12, do not record a Gini-coefficient for a national household or family distribution, which is greater than the 0,68 estimated here. The countries which approach the extent of income inequality experienced in South Africa are shown in Table 12. The comparison may, however, be wildly inaccurate for Jain's data for these other economies may well be as deficient as the data which she tabulated for South Africa.

The estimated distribution of African household incomes in the rural areas and the Black States is the most fallible link in the estimate for South Africa. The most unequal distributions for African households occurred in the White rural areas and in the Black States, and some readers may feel that a possible overestimation of inequality here may have led to an overestimation of income inequality in the economy as a whole.

TABLE 12

HIGH GINI-COEFFICIENTS REPORTED BY JAIN

Country	Gini-Coefficient
Brazil	0,61
Honduros	0,63
Mexico	0,61
Sierra Leone	0,61
Turkey	0,57
Venezuela	0,54
South Africa	0,58

Source: S Jain, Size Distribution of Income : a Compilation of Data (1975), pp 7, 46, 77, 113, 118.

In order to test the sensitivity of the results, the African distribution was reworked on the basis of the distributions which had been obtained for the metropolitan areas and towns in the White areas, and a hypothetical distribution of incomes for households in the Black States and White rural areas was created from Jain's tabulations of rural household incomes in Cyprus. This particular distribution was chosen because, according to Jain's tables, it exhibited the lowest level of inequality tabulated for any household distribution in rural areas, with a Gini-coefficient of 0,19 (104). Inequality within the distribution of African incomes does respond quite dramatically to this changed assumption, since the Gini-coefficient drops from 0,47 to

0,35, and the Atkinson index drops from 0,21 to 0,12. Inequality in the economy-wide distribution is hardly affected, for the national Gini-coefficient is lowered from 0,68 to 0,65, while Atkinson's index is reduced to 0,35. This result illustrates that the extent of income inequality in South Africa is relatively insensitive to a very extreme change in an assumption about the distribution of African incomes, and adds confidence to the results shown in Table 11.

The Lorenz Curve for the distribution of family and household incomes in South Africa in 1975 is shown in Figure 5, and the shares of income of selected percentiles of the population are given in Table 13. This table also shows the percentile distributions which were postulated by Jain, Adelman and Morris, and Paukert.

This comparison shows that these often quoted, but quite incorrectly-based, estimates understate inequality when compared with the estimate made here. This seems to occur largely because they underestimate the share of the top quintile of families, and overestimate the shares of the third and fourth quintiles, a result which is quite understandable since they omitted the poorest majority of the Republic. It is, however, difficult to understand why Jain's data on the top quintile differ so markedly from Adelman and Morris' and Paukert's estimates, for they all claim to have used similar sources.

An indication of the huge losses in purely static terms in economic welfare, which stem from income inequality in South Africa are shown by the Atkinson indexes of Table 11, if the explicit assumptions about the social welfare function embodied in this measure are accepted.

TABLE 13 PERCENTILE SHARES OF INCOME AND GINI-COEFFICIENTS FOR SOUTH AFRICA.

Source	Below 40%	Percentiles of Recipients			96-100%	Gini-coefficient
		41-60%	61-80%	81-100%		
1975 Estimate(1)	5,1	7,5	16,0	71,5	38,5	0,68
Jain (1965)(2)	6,7	10,2	21,1	62,0	23,1	0,5813
Adelman and Morris (1965)(3)	6,11	10,16	26,37	57,36	39,38	
Paukert (1965) (4)	6,1	10,2	26,4	57,4	39,4	0,58

Notes:

(1) Read from the Lorenz Curve showing minimum inequality.

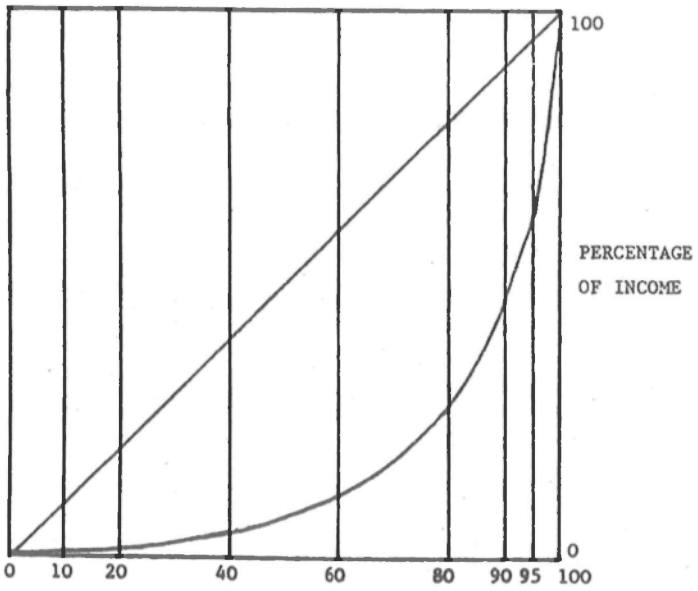
(2) S Jain, Size Distribution of Income: A Compilation of Data (1975), p 98.

(3) I Adelman and C T Morris, Income, Growth and Social Equity in Developing Countries (1973), p 152.

(4) F Paukert, "Income Distribution at Different Levels of Development: A Survey of Evidence", International Labour Review, Vol 108, 1973, p 114.

FIGURE 5

LORENZ CURVE FOR THE DISTRIBUTION OF FAMILY AND HOUSEHOLD INCOMES IN SOUTH AFRICA 1975



PERCENTAGE OF POPULATION

According to the Atkinson indexes, even if South Africans have a relatively weak aversion to inequality (e g e = 0,5) the same level of welfare could be attained with 61 percent of the national income; while more tenacious egalitarians (e g possibly e = 1,5) would see a mere 14 percent of the national income generating an equivalent level of economic welfare if incomes were equally distributed. Undoubtedly, tenaciously egalitarian South Africans do exist, and they might well be prepared to sacrifice 86 percent of the national income for equality, although at present most of this group is probably in exile.

5.3 A Decomposition Analysis

It was argued that the Theil index was highly suitable for a decomposition analysis of income inequality [105].

The purpose here of the decomposition analysis is to divide inequality of incomes of the population into a within group component (I_W) and a between group component (I_B).

Decomposition requires that:

$$I^n = I_W^m + I_B^m$$

where I^n is the index of inequality in the population (n) taken as a whole, and $I_W^m + I_B^m$ are the respective within and between group components of inequality in m sub-groups.

In the case of South Africa this enables us to examine the contributions which between-racial-group income inequalities (which

are dependent on racial shares of income), make to the overall level of inequality of incomes, relative to the contribution of income inequality within each race group.

The Theil index is used here to identify the relative racial contributions to income inequality in South Africa, and these factors are identified in the decomposition analysis which is shown in Table 14.

TABLE 14

A DECOMPOSITION ANALYSIS OF THE ESTIMATED RACIAL FAMILY AND HOUSEHOLD INCOME DISTRIBUTION IN SOUTH AFRICA, 1975

Group	Income Share (Percent)	Population Share (Percent)	Theil Index (value)	Relative Contribution (Percent)
				Within Group
White Families	67,0	22,2	0,23	53,6
Coloured Families	5,4	9,2	0,45	7,1
Asian Families	2,7	3,0	0,35	3,6
African Multiple	22,9	65,6	0,42	37,7
	100,0	100,0		100,0
Within Group Component			0,28	51,7
Between Group Component			0,21	42,9
Total Inequality			0,49	100,0

The absolute values of the Theil indexes for the race groups and for the economy-wide distribution are shown in the third column of Table 14, while the relative contributions of the race groups to within group inequality, and the relative magnitudes of the within and between group components of inequality in the size distribution of incomes are shown in the last column of this table.

The results of the table show that inequalities within racial groups account for 52 percent of the total inequality, and inequalities within the White group cause over one-half of this within-group component. This is due to the heavy weighting which White inequality receives because of the high share of Whites in total family and household incomes. A smaller component of inequality lies in the between-group contribution, where the large White share of income, relative to the share of Whites in the population, is the major influence at work.

Between 1945/46 and 1970 the White share of personal income never fell below 71 percent of personal income [106]. However, an analysis of the Sample Tabulations for the 1980 Census shows that by 1980 the White share had fallen to 65 percent of the personal incomes[107]. This decomposition analysis shows that the vast inequality between the shares of the race groups in income has a marked effect on the size-distribution of incomes.

Over the last decade a reduction has occurred in the White share of income and this should have worked towards reduced inequality in the size-distribution of incomes for the economy. However any increases in inequality in the within-group contribution attributable to increasing inequality in the African household distribution of incomes will have worked in the opposite direction.

6 CONCLUSION

In the discussion of methodology considerable emphasis was placed on showing the defects of comparisons of family (or household) incomes which have not been normalized to take account of differences in family sizes. The data which has been presented here cannot be arranged in per capita or per adult equivalent distributions, and thus while it "compares" with the unstandardised estimates usually used in cross-country comparisons, the earlier discussion should provide ample warnings about making such contrasts. In common with the American data shown in Table 1 above, South African data show that average family size rises with family income, at least until families are quite large. This is illustrated for White, Coloured and Asian families in Table 15, and African households follow a similar pattern.

TABLE 15

AVERAGE FAMILY SIZE BY 1970 INCOME CLASSES FOR WHITES, COLOUREDS AND ASIANS

Income Class	Family Size		Income Class	Family Size
	Coloured	Asian		White
0	4,16	4,16	0	3,34
299	4,85	4,53	399	3,37
300 - 599	5,18	5,00	400 - 799	3,00
600 - 799	5,26	5,00	800 - 1 199	3,10
800 - 999	5,42	5,05	1 200 - 1 999	3,40
1 000 - 1 199	5,43	5,12	2 000 - 2 999	3,76
1 200 - 1 599	5,41	5,09	3 000 - 3 999	3,86
1 600 - 1 999	5,46	5,22	4 000 - 5 999	3,83
2 000 - 2 499	5,55	5,25	6 000 - 9 000	3,83
2 500 +	5,54	5,29	10 000 +	3,96

Source: Estimated from : Department of Statistics, Population Census 1970 Families, Report No 02-03-02, Tables A3, B3, C3.

The effect which standardisation of the distributions would have cannot be easily determined a priori, and this places a major constraint on the use of these estimates in inter-country comparisons.

The data which are available calls for several comments. The family incomes of the 1970 Census were published in a very small number of income groups, and it is impossible in practice to convert these distributions into an adult equivalent form. The defects of the data severely constrained the scope and accuracy of this analysis, and at present it is prohibitively expensive for researchers to obtain more detailed tabulations of Census data from the Human Sciences Research Council. It is surely time that detailed Census data for these earlier years should be made available to bona-fide researchers without charge, or preferably that edited versions of all the available tapes of the Census should be distributed to Universities.

This study also highlights the areas where field research on incomes is essential in respect of the African group, namely: the White rural areas, small towns, squatter settlements on the peripheries of the metropolitan regions, the missing Black States, and the income flows between urban and rural households. A plea might also be made here to the BMR to allow researchers access to the computer tapes of their income surveys of the 1960's, 1970's and 1980's. This data has served its purpose for the BMR's subscribers, viz. predicting market potentials in particular regions. It is, however, the richest existing source of historical data on Black incomes in the post-1960 period. At an analytical level its potential is untapped, for the BMR has not produced any multivariate economic analysis of the

determinants of Black household incomes, and the published data does not lend itself to multivariate analysis.

The Census data could also be used in a multivariate analysis of the determinants of inequality if the Central Statistical Services could be persuaded to supply their tapes to the universities. Indeed the liberation of both the Census tapes and the BMR's data should be made a major goal of social scientists at South African univerities. Further the most valuable historical data on incomes lies in the archives of the Receiver of Revenue, and is as yet unpenetrated by researchers and the time has come for the Receiver to make available the data required for research on incomes.

In terms of economic welfare, a clear ordering between Whites and Blacks has been established by the findings of this paper. White per capita incomes are not only the highest of all the groups, but also White family incomes are the highest, and the distribution of White family incomes has been shown to be the most equal. In terms of these two crucial arguments of the social welfare function, the White community fares best. The Asian group takes an intermediate position in terms of economic welfare between Whites and the other Black groups, for its distribution is more equal than either the Coloured or African distributions, and its per capita and family income levels are also higher. In terms of economic welfare the latter two distributions produce an intransitive ordering, for although Coloured average incomes are higher than average African incomes, Coloured incomes are also less equally distributed. Within the African population, the metropolitan areas are superior in terms of economic

population, the metropolitan areas are superior in terms of economic welfare, because household and per capita incomes are highest in these areas, household incomes are most equally distributed, and the incidence of poverty is lowest.

These estimates show that South Africa has an extremely unequal distribution of incomes, and the Atkinson index was used to illustrate the static losses in welfare which are caused by this inequality. The implications of this analysis for social welfare have been based on a "static" form of the social welfare function, i e social welfare was assumed to be a function of the values of income and inequality at a moment of time. Even more important for perceptions of welfare by individuals and groups may be the perceived potential for income growth and their expectations of social and economic mobility. High levels of inequality may indeed be tolerable provided that the masses of the population hold expectations of expanding opportunities. In order to maintain aspirations of expanding opportunities both the level of employment and incomes will have to grow for the majority of the Black population.

The estimates of the paper have been based on a great number of assumptions, and the margins of error are considerable. The final results are, however, consistent with the estimated shares of income of the race group, and with the various sources of income data which are available, and in terms of their credibility they represent a great improvement over the estimates most often quoted for South Africa.

7. SUMMARY OF THE MAIN FINDINGS

7.1

The estimates of income inequality for South Africa frequently cited in international comparisons were shown to be based on completely incorrect assumptions.

7.2

Distributions of income for White, Coloured and Asian families were estimated for the year 1975 from 1970 Census data and the rates of growth of the income and population of each race group from 1970 to 1975. The estimated White family incomes for the economy were 5,15 and 3,5 times greater than the family incomes of Coloureds and Asians respectively; these disparities are smaller than the per capita disparities of 5,8 and 4,5 which have been estimated for these years. The average incomes of White, Coloured and Asian families in the metropolitan regions were higher than in the non-metropolitan regions, and were more equally distributed. The distributions estimated for White, Coloured and Asian families in the metropolitan regions for 1975 were found to compare favourably with income survey data which is also available for that year.

7.3

A distribution of African incomes was estimated from the data which is available from the BMR for years around 1975. The quantity of the data available for various regions varied considerably. The metropolitan areas are well covered by BMR surveys, and there are data for four Black States spanning years between 1977 and 1979. Data on

African incomes in the White rural areas and towns were the most inadequate.

In the distributions which were estimated, household incomes in the metropolitan regions were three times as great as incomes in the White rural areas, and 2,2 times as great as average household incomes in the Black States. The distribution of African household incomes in the metropolitan areas was most equal, while the Black States had the highest degree of inequality.

7.4

Comparisons of the estimated distribution of African household incomes for the economy showed that the distribution was less equal than either the distribution of White or Asian family incomes, while a comparison of the Lorenz Curve for the Coloured distribution with the Lorenz Curve for the African distribution yielded an inconclusive result. The vast inequality of income between race groups was vividly shown by comparing these distributions. The median income for White families occurred at an income slightly greater than R8 000 per annum, and over 95 percent of the family or household populations of each of the other groups falls below this level. Twenty three percent of White families had incomes exceeding R12 000 per annum, while a mere 1,7 percent of Asian families exceeded this income level, and a negligibly small proportion of Coloured families and Asian households.

7.5

The economy-wide distribution which is yielded from these sources showed a Gini-coefficient of 0,68 which is higher than any Gini-coefficient appearing in cross-country comparisons. A hypothetical estimate assuming much lower levels of African income inequality in the White rural areas and in the Black States did not lower the South African Gini-coefficient significantly.

7.6

A decomposition analysis using the Theil index showed that inequalities within the race groups accounted for 57 percent of the total, and that inequalities within the White group cause over one-half of this within-group component. The high White share of income relative to the proportion of Whites in the population was also a major contributor to the index of between-group inequality.

APPENDIX A

The Estimated Distribution of Family and Household Income

White Family Income Distribution

Table A1

Actual (1) 1970 Income Class (Rand)	Actual(1) 1970 Frequencies	Adjusted 1970 Frequencies	Estimated 1975 Frequencies	Estimated 1975 Income classes (Rand)	Estimated 1975 Income class means (Rand)
0	7138				
-400	16066	16346	18065	866	504
400-799	24483	24905	27524	1730	1512
800-1199	37508	38149	42161	2595	2519
1200-1999	78358	79702	88084	4327	4030
2000-2999	153236	155876	172268	6492	6299
3000-3999	185835	189038	208918	8656	8650
4000-5999	238004	242097	267557	12986	12075
6000-9999	130294	132544	146483	21644	18622
10 000+	43223	43973	48597	21645	39854+
?	8485				
		Total	1019657	Mean = R11082	

(1) Source: Department of Statistics, Population Census 1970 Families, Report No 02-03-02, Table A2.

Coloured Family Income Distribution

Table A2

Actual (1) 1970 Income Class (Rand)	Actual (1) 1970 Frequencies	Adjusted 1970 Frequencies	Estimated 1975 Frequencies	Estimated 1975 Income classes (Rand)	Estimated 1975 Income class means (Rand)
0	14134				
-300	86783	92277	105272	682	341
300-599	81791	86049	98167	1362	1022
600-799	34943	36762	41939	1817	1589
800-999	26210	27574	31457	2272	2044
1000-1199	21802	22937	26167	2727	2484
1200-1599	29187	30706	35030	3637	3130
1600-1999	20346	21405	24419	4546	4043
2000-2499	18216	19164	21863	5684	5036
2500+	21535	22656	25846	5685+	8945
?	4583				
		Total	410161	Mean =	R 2150

(1) Source: Department of Statistics, Population Census 1970 Families, Report No 02-03-02, Table B2.

Table A4 Cumulative Percentage Distribution of African Multiple Household Incomes, 1975

Less than (Rand)	Black States (1)	Rural Africans in White regions	Towns in White regions	Non-metropolitan regions	Metropolitan regions (2)	Total African Households
500	40,0	45,3	6,1	38,0	4,3	31,3
1000	69,6	82,6	24,0	68,1	16,8	58,1
1500	83,8	94,9	49,2	82,9	38,3	74,3
2000	90,8	97,2	70,8	90,3	58,9	84,2
2500	94,7	98,7	83,3	94,5	74,3	90,6
3000	97,5	99,6	90,0	97,2	83,7	94,6
3500	98,0	99,9	93,8	98,0	88,5	96,2
4000	98,4	99,7	96,3	98,5	94,7	97,8
4500	98,7	99,8	97,8	98,9	96,1	98,4
5000	98,9	99,9	98,7	99,1	97,0	98,7
5500	99,1	100,0	99,2	99,3	97,7	99,0
6000	99,3	100,0	99,5	99,5	98,1	99,2
8000	99,5	100,0	99,9	99,7	99,1	99,6
10000	99,7	100,0	100,0	99,8 (3)	99,5 (3)	99,7
12000	100,0	100,0	100,0	100,0	100,0	99,8
Mean Income	R925	R670	R1709	R1031	R2017	R1152
Population of Households	1602112	578987	252070	2433169	578904	3012073

Notes:

(1) Excluding the overlapping segments of the metropolitan regions.

(2) Including the overlapping segment of the metropolitan regions in the Black States.

(3) Rounded to 100,0, although a small number of households have incomes above R12 000.

Asian Family Income Distribution

Table A3

Actual (1) 1970 Income Class (Rand)	Actual (1) 1970 Frequencies	Adjusted 1970 Frequencies	Estimated 1975 Frequencies	Estimated 1975 Income classes (Rand)	Estimated 1975 Income class means (Rand)
0	4518				
-300	10158	10863	12339	651	358
300-599	22702	23767	26995	1300	1075
600-799	15672	16407	18636	1734	1673
800-999	12606	13198	14991	2168	2152
1000-1199	10023	10493	11918	2601	2600
1200-1599	15971	16720	18991	3469	3289
1600-1999	8826	9240	10495	4337	4257
2000-2499	7777	8142	9248	5422	5309
2500+	11879	12436	14125	5423+	10744
?	1174				
		Total	137738	Mean =	R3164

(1) Source: Department of Statistics, Population Census 1970 Families, Report No 02-03-02, Table C2.

Table A5 Hypothetical Cumulative Percentage Distribution of African Multiple Household Incomes and Hypothetical Distribution of all Household and Family Incomes 1975(1)

Less than (Rand)	African Multiple Households	All Families and Households
500	10,5	9,9
1000	54,4	41,8
1500	78,6	58,6
2000	89,7	67,5
2500	93,7	71,7
3000	96,0	74,7
3500	97,3	76,6
4000	98,7	78,6
4500	99,1	79,8
5000	99,3	81,2
5500	99,5	82,4
6000	99,6	83,5
8000	99,8	88,4
10000	99,9	92,3
12000	100,0 (2)	94,8
Mean Income	R1152	R3503
Population	3012073	4579629

Notes:

(1) Derived from the assumptions that African household incomes in the White rural areas and the Black States were distributed in the manner of rural household incomes in Cyprus.

(2) Rounded to 100,0 although a small number of households have incomes above R12 000.

FOOTNOTES AND REFERENCES

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7. S Jain, op. cit., pp 98-99.

8. F Pauket, op. cit., p 114; H Chenery and M Syrquin, Patterns of Development 1950 - 1970, Oxford University Press, 1975, p 60; M S Ahluwalia, "Income Inequality : Some Dimensions of the Problem", in H Chenery, et al., eds., Redistribution with Growth, Oxford University Press, 1974, p 35; and I Adelman and C T Morris, Income Growth and Social Equity in Developing Countries, Stanford University Press, 1973, p 152.

9. S Kuznets, "Demographic Aspects of the Size Distribution of Income : An Exploratory Essay", op. cit., p 4.

10. S Jain, op. cit., p 134.

11. The distribution of Coloured family incomes in South Africa in 1960 can be shown to be significantly different to the distribution of Coloured family incomes in Cape Town. A Chi-squared test on 1960 Census data on family incomes for the two distributions yields:

    $x^2 = 50{,}26$, with 10 degrees of freedom. These distributions are significantly different at the 99,5 percent confidence level. Ironically, although quite accidentally for Jain, the distribution of Asian family incomes in 1960 in South Africa was

not significantly different from the distribution of Coloured incomes in Cape Town, even at the highest level of confidence

(x^2 = 8,01, d.f. = 10). Data from : Department of Statistics, Population Census 1970, Families, Report No 02-03-02, Tables B2 and C2.

12. Chi-squared tests on the Republic-wide distribution of White family incomes and the distribution in urban areas yielded a

value of x^2 = 0,539 with ten degrees of freedom, which shows the distributions are not significantly different at the highest level of confidence. Data taken from : Department of Statistics, Population Census 1970, Families, ibid., Table A2.

13 C E W Simkins, "The Distribution of Personal Income among Income Recipients in South Africa, 1970 and 1976", Development Studies Group Working Paper No 9, 1979, pp3-6.

14. Ibid., p 9.

15 The variety of income concepts in the Paukert table can be pinpointed by comparing his results to Jain's tables. Jain's tables show that there were at least five countries which had Gini-coefficients for the distribution of income among recipients which approached Simkins Gini-Coefficients of 0,65. The countries were Rhodesia, Brazil, Columbia, Gabon and Kenya. S Jain,op. cit., pp15, 24, 40, 64 and 95.

16. M D McGrath, "Income and Material Inequality in South Africa", in L Schlemmer and E Webster, eds., Change, Reform and Economic Growth in South Africa, Ravan Press, 1977, pp 149-173.

17. Examples can be found in the Paukert, and Ahluwalia studies referred to in Footnote 8 above.

18. T Stark, op. cit., p 20.

19. S Kuznets, "Demographic Aspects of the Size Distribution of Income : An Exploratory Essay, op. cit., pp 84 - 87.

20. J Morgan, "The Anatomy of Income Distribution", The Review of Economics and Statistics, Vol 44, 1962, pp 279 - 280.

21. S Kuznets, "Demographic Aspects of the Size Distribution of Income : An Exploratory Essay," op. cit., pp 84 - 87.

22. In 1973/74 the remittances of migrants accounted for 55 percent of the national income of the Black States. Calculated from : Department of Statistics, National Accounts of the Bantu Homelands 1969-70 to 1973-74, Report No 09-17-01, p 1.

23. J Benus and J N Morgan, "Time Period, Unit of Analysis, and Income Concept in the Analysis of Income Distribution", in J D Smith, ed., The Personal Distribution of Income and Wealth, Columbia University Press, 1975, p 213.

24. S Kuznets, "Demographic Aspects of the Size Distribution of Income : An Exploratory Essay", op. cit., p. 87.

25. J L Nicholson, "Appraisal of Different Methods of Estimating Equivalence Scales and their Results", The Review of Income and Wealth, Series 22, 1976, p 1.

26. The estimation of the equivalence scales is discussed in J L Nicholson, ibid., pp 1-9; S J Prais and H Houthakker, The Analysis of Family Budgets, Cambridge University Press, 1971, pp 125-151; and E P Lazear and R T Michael, "Family Size and the Distribution of Real per capita Income", American Economic Review, Vol 70, 1980, pp 1-10.

27. S Danziger and M K Taussig, "The Income Unit and the Anatomy of Income Distribution", The Review of Income and Wealth, Vol 25, 1979, pp 366 - 368.

28. S Kuznets, "Demographic Aspects of the Size Distribution of Income : An Exploratory Essay", op. cit., p 39.

29. T Stark, op. cit., pp 39-51.

30. T Paul Schultz, "Secular Trends and Cyclical Behaviour of Income Distribution in the United States: 1944 - 1965", in L Soltow, ed., Six Papers on the Size Distribution of Income and Wealth, 1969, pp 86 -89.

31. J Benus and J N Morgan, op. cit., pp 218 - 224.

32. J Morgan, op. cit., p 272.

33. S Kuznets, "Economic Growth and Income Inequality", op. cit., pp 1 - 4.

34. J S Dich, "On the Possibility of Measuring the Distribution of Personal Income", The Review of Income and Wealth, Series 16, 1971, pp 265 - 272.

35. J Benus and J N Morgan, op. cit., pp 215 - 221. The length of the accounting period does not, however, appear critical, as quarterly and annual data yeild very similar results.

36. Examples are provided in J S Dich, ibid.; R Bentzel, "The Social Significance of Income Distribution Statistics", The Review of Income and Wealth, Series 16, 1971, pp 253 - 264; V Stoikov, "How Misleading are Income Distributions?", The Review of Income and Wealth, Series 21, 1976, pp 239 - 250.

37. M Paglin, "The Measurement and Trend of Inequality : A Basic Revision", The American Economic Review, Vol 65, 1975, pp 598-609.

38. E R Nelson, W R Johnson, S Danziger, J J Minarik, C John Kurien, " Comment on the Measurement and Trend of Inequality", American Economic Review, Vol 67, 1977, pp 497 - 519; and D Mookherjee and A Shorrocks, "A Decomposition Analysis of the Trend in United Kingdom Inequality", The Economic Journal, Vol 92, 1982, pp 886 - 902.

39. H Dalton, "The Measurement of the Inequality of Incomes", The Economic Journal, Vol 30, 1920, p 348.

40. Listings of criteria can be found in D Champernowne, "A Comparison of Measures of Inequality of Income Distribution", The Economic Journal, Vol 84, 1974, pp 789 - 790; and D Yntema, "Measures of the Inequality in the Personal Distribution of Wealth or Income", Journal of the American Statistical Association, Vol 28, 1933, pp 47 - 48.

41. R Weisskoff, "Income Distribution and Economic Growth in Puerto Rico, Argentine and Mexico", The Review of Income and Wealth, Series 16, 1970, pp 303-332; K R Ranadive, "The Equality of Incomes in India", Bulletin of the Oxford Institute of Statistics, Vol 10, 1965; A K Atkinson, "On the Measurement of Inequality, Journal of Economic Theory, Vol 2, 1970, reprinted in A B Atkinson, ed., Wealth, Income and Inequality, 1973, pp 23 - 43.

42. Reviews can be found in A Sen, On Economic Inequality, Oxford University Press, 1972; and N C Kakwani, Income Inequality and Poverty, Oxford University Press, 1980, pp 303 - 317.

43. Examples of the percentile shares which have been used are : Nicholson: share of top 1%, 2-5%, 6-10%, 11-40%, 41-70% and bottom 30%; Paukert: share of top 5%, 6-20%, 21-40%, 41-60% and bottom 20%; R J Nicholson, "The Distribution of Personal Income", Lloyds Bank Review, No 83, 1967, reprinted in A B Atkinson, Wealth Income and Inequality, op. cit., p 102; and F Paukert, "Income Distribution at Different Levels of Development: A Survey of Evidence," International Labour Review, Vol 108, 1973, p 114.

44. Dasgupta, A Sen and D Starrett, "Notes of the Measurement of Inequality", Journal of Economic Theory, Vol 6, 1983, pp 180 - 187; M Rothschild and J E Stiglitz, "Some Further Results on the Measurement of Inequality", Journal of Economic Theory, Vol 6, 1973, pp 188 - 204. Atkinson had earlier shown the same result under the more restrictive utilitarian assumptions of additive individual utilities. A B Atkinson, Wealth, Income and Inequality, op. cit., pp 24 - 27.

45. Other measures which have sometimes been used, which are related to the Gini-coefficient, are : the Total Disparity Measure (see S Kuznets, "Demographic Aspects of the Size Distribution of Income An Exploratory Essay", op. cit., pp 11 - 13), and Kakwani's L, (see N C Kakwani, op. cit., pp 83 - 85).

46. G S Fields and J C H Fei, "On Inequality Comparisons", Econometrica, Vol 46, 1978, pp 303 - 316.

47. G S Fields and J C H Fei, op. cit., pp 305 - 306.

48. H Dalton, op. cit., pp 351 - 352.

49. A B Atkinson, Wealth, Income and Inequality, op. cit., pp 30 - 33.

50. N C Kakwani, op. cit., pp 48 - 49.

51. G S Fields and J C H Fei, op. cit., pp 314 - 316.

52. D G Champernowne, op. cit., p 789. This axiom will ensure that the inequality measure will take a value if all the income accrues to a single income receiving unit, instead of log N for the unnormalised measure.

53. D G Champernowne, op. cit., pp 804 - 807.

54. Ibid., p 807.

55. A B Atkinson, Wealth, Income and Inequality, op. cit., pp 23 - 43; A Sen, op. cit., pp 31 - 43; D J Aigner and A J Heins, The Review of Income and Wealth, pp 12 - 25; and Y Kondor, "Value Judgements Implied by the Use of Various Measures of Income Inequality", The Review of Income and Wealth, Series 21, 1975, pp 309 - 322.

56. C Blackorby and D Donaldson, op. cit., pp 59 - 80. They confirm the earlier deductions that the social welfare function implied by the Gini-coefficient is not additively separable, and that the Gini-coefficient is not implied by any strictly quasi-concave social welfare function.

57. H Theil, Economics and Information Theory, North Holland, 1967, pp 91 - 134.

58. Some of the noteworthy articles are : F Bourguignon, "Decomposable Income Inequality Measures", Econometrica, Vol 47, 1979; A F Shorrocks, "The Class of Additively Decomposable Inequality Measures", Econometrica, Vol 48, 1980; F Coxwell and K Kuga, "Additivity and the Entropy Concept : An Axiomatic Approach to Inequality Measurement", Journal of Economic Theory, Vol 25, 1981.

59. H Dalton, op. cit., pp 348 - 349.

60. A B Atkinson, Wealth, Income and Inequality, op. cit., pp 23 - 24.

61. Sen notes that Champernowne had proposed the use of a measure akin to Atkinson's in 1952, for one of the measures he discussed was"the proportion of total income that is absorbed in compensating for the loss of aggregate satisfaction due to inequality". A Sen, op. cit., p 38.

62. A B Atkinson, Wealth, Income and Inequality, op. cit., p 34.

63. Ibid., pp 42.

64. A B Atkinson, "Poverty and Income Inequality in Britain", in D Wedderburd, ed., Poverty and Class Structure, Cambridge University Press, 1974, p. 51.

65. J Muellbauer, The Review of Economic Studies, Vol 41, 1974, pp 494 - 496.

66. A Sen, op. cit., pp 38 - 42.

67. J Muellbauer, "Household Composition, Engel Curves and Welfare Comparisons between Households", European Economic Review, Vol 5, 1974, pp 103 - 122.

68. N Kakwani, op. cit., pp 94 - 95.

69. C Elliot,"Income Distribution and Social Stratifications : Some Notes on Theory and Practice", Journal of Development Studies, Vol 8, 1971 - 1972.

70. Department of Statistics, Population Census 1970 Families, Geographical Distribution, Report No 02-03-01, pp2, 103 -205.

71. The Pareto function is of the form

$$N_j = \frac{A}{Y_j^{\alpha}} \quad \text{or} \quad \text{Log } N_j = \text{Log } A - \alpha \text{ Log } Y_j;$$

where N_j is the number of people earning an income Y_j or higher.

Extensive research has shown that the high income ranges of most income distribution follow this relationship.

The Pareto functions were fitted to the distributions of Family incomes by race group until the highest value for the coefficient

$(\bar{R}^2)$ was found, subject to the constraint that not more than the last three income intervals before the open class be omitted.

The Pareto interpolation for mean income of the open ended class is

$Yo = \frac{-Yn}{1-\alpha}$ where Yo is the income at which the open class begins, Yo is the mean income of the open ended class, and α is the coefficient of Y in the Pareto Regression.

For the Pareto line class means ($\bar{Y}_i$) can be estimated from the Pareto Interpolations :

$$\bar{Y}_i = \frac{\alpha}{\alpha+1} \cdot \frac{x^{\alpha+1} - x'^{\alpha+1}}{x^{\alpha} - x'^{\alpha}}$$

where x and x′ are the lower and upper limits of the class, and where $\alpha < -1$. α is estimated separately for each class. See T Stark, op cit., pp 134 - 136.

72. It was estimated that in the 1960 and 1970 Census in individual incomes, the incomes of Whites, Coloureds and Asians respectively were understated by 11,6; 26,5 and 4,8 percent.

73. See M D McGrath, "Historical Trends in the Distribution of Racial Incomes in South Africa", Perspectives in Economic History, Vol 1, 1982, p 18.

74. Ibid., p 18.

75. Morgan found that in the United States the incidence of relatives living together became less frequent as living standards improved. See J N Morgan, et. al., Income and Welfare in the United States, McGraw-Hill, 1962, pp 158 - 178.

76. Maximum and minimum values for the inequality measures were obtained using a technique suggested by Theil. The minimum value was obtained by assuming that all recipients obtained the estimated mean income of each income class. The maximum value was obtained by splitting the recipients between the extremes of the income class in such a way that the mean was preserved. Consider the income interval (a, b) with mean c such that : $a > c > b$. Minimum inequality will occur where all incomes in the class are assumed to coincide with c; whereas maximum inequality will occur where all incomes are equal to either a or b. H Theil, Economics and Information Theory, op. cit. pp 131 - 133. The upper limit of the open class was estimated by assuming that recipients were spread between its limits in the same proportion as occurred in the preceding closed interval. The compromise Gini is obtained from the ratios suggested by Coqwell (i.e. G = 2/3 Gu + 1/3 Gl). The compromise estimate of the Atkinson Index is a simple average of the lower and upper estimate. See F Cowell, Measuring Inequality, Phillip Allan, 1977, p 129.

Alternative ways of estimating bounds on inequality measures are presented in : F Mehran, "Bounds on the Gini Index based on observed points on the Lorenz Curve", Journal of the American Statistical Association, Vol 70, 1975, pp 64 - 66, pp 306 - 316; and N C Kakwani and N Podder, "On the Estimation of Lorenz Curves from Grouped Observations", International Economic Review, Vol 14, 1973, pp 278 - 292.

77. Department of Statistics, Survey of Household Expenditure, 1975, Detailed Expenditure According to Occupational Group, Household Size and Income Group, Report 11-06-06, Tables, 2, 4.4 and 2.4.01. It was assumed that the single and multiple households within each income group received the same mean income.

78. An approximate value for the standard error of the Gini coefficient can be derived from the formula :

$$S = G(C^2 + 0,5)/N \quad \text{where}$$

G = Gini-Coefficient C = Coefficient of Variation

S = Standard Error of G N = Population

See F Cowell, op. cit., p 131.

79. In contrast only 4.5 percent of White households in the 1975 survey comprised households of more than one financial unit. Survey of Household Expenditure, 1975, op. cit., p v.

80. Bureau of Market Research, Income and Expenditure Patterns of Black Households, Research Reports Nos 50.1, 50.2, 50.3, 50.4, 50.11, 50.12, 50.13, 50.15, 31, 64, 66, 82 and 90.

81. Bureau of Narket Research, Income and Expenditure Patterns of Multiple Bantu Households in White Rural Areas, Research Report No 31, 1971, p 3.

82. Bureau of Market Research, Income and Expenditure Patterns of White and Black Households Living in Towns in the Republic of South Africa 1975, Research Report No 65, 1978, p 15.

83. C Simkins, Four Essays on the Past, Present and Possible Future of the Distribution of the Black Population of South Africa, 1983, pp 73 - 74.

84. Bureau of Market Research, Research Report No 65, op. cit., p 16.

85. Bureau of Market Research, Research Report No 31, op. cit., Table A10.

86. C Simkins, op. cit., pp 55 - 56.

87. An inflator of 60 percent was applied. Estimated from: Central Statistical Serv ices, South African Statistics 1982, p 21,6.

88. Bureau of Market Research, Income and Expenditure Patterns of Black Households in Venda, Bophuthatswana, Kangwane and Transkei, Research Reports Nos 64, 65, 82 and 90. Populations of the Black States were obtained from the Bureau of Market Research, Regional Population Estimates for 1975, Research Report No 51, 1976, p 37.

89. Growth rates of Income in the Black States from 1975 to 1977 can be obtained from : Department of Statistics, Gross Domestic Product of the National States 1973 - 1977, Statistical News Release p 1, 1981. The growth rate of the economy's national income was assumed for the growth income in Kangwane in 1978 and 1979, and obtained from : South African Statistics 1982, op. cit., p 21, 4.

90. See South African Statistics 1982, ibid., p 1 - 21, and Bureau of Market Research, Research Report No 51, op. cit., p 37.

91. Incomes of migrants were reduced by 70 percent to take account of the consumption of the migrants themselves, and the remaining thirty percent was assumed to have been remitted to the Black States. Incomes were obtained from the Bureau for Economic Research Co-ordination and Development, Statistical Survey of Black Development 1978, p 30.

92. Ibid., p 30.

93. Evidence can be found in : Bureau of Market Research, Income and Expenditure Patterns of Urban Black Households, Research Report Series No 50, Table 915.

94. Calculated from Statistical Survey of Black Development, op. cit., Table 30.

95. J Nattrass, The South African Economy, Its Growth and Change, 1981, pp 190 - 202.

96. Employment in Diamond Mining estimated from South African Statistics 1982, op. cit., p 7.9; total population from Regional Population Estimates for 1975, op. cit., p 37; incomes from Bureau of Market Research, Income and Expenditure Patterns of Urban Black Households In Port Elizabeth 1975, Research Report No 50.9, 1976, Table 8m.

97. Total population obtained from Regional Population Estimates, op. cit., p 37. Income data and single and multiple population proportions estimated from Bureau of Market Research, Income and Expenditure Patterns of Urban Black Households in Pretoria, and East and West Rand, Research Reports Nos 50.2 and 50.15, 1976.

98. Total population obtained from Regional Population Estimates, op. cit., p 37. Income data from Bureau of Market Research Households in Bloemfontein, Research Report No 21.1, 1976, Table 8m. Employment in mining was derived from : the Chamber of Mines, Eighty-Sixth Annual Report 1975, p 70.

99. See Footnote 71 above.

100. A recent study by Julian May has found evidence of extreme inequality in the distribution of wealth in a rural area of the Transkei, and this gives some support to these findings. Some of the inequality in the distribution of incomes for the Black States is also caused by the wide income differences among them.

101. The total income of Black Households was estimated at R3 468 311 888 and the income of households in metropolitan areas was R1 167 649 368. Earnings of migrants in 1975 are given at R1 125 511 000. See Statistical Survey of Black Development, op. cit., Table 30.

102. Derived from data in : Statistical Survey of Black Development, op. cit., Table 30.

103. J Nattrass, "Migrant Labour and Underdevelopment : The Case of KwaZulu", Black/White Income Gap Research Report Project, Report No 2, 1977.

104. S Jain, op. cit., p 29.

105. The decomposition equation for the Theil index is

$$T_{ij} = \Sigma_i S_i T_i + \Sigma_i S_i \log \left(\frac{S_i}{\frac{n_i}{n}}\right)$$

$$T_i = \Sigma_j S_{ij} \log \left(\frac{S_{ij}}{\frac{n_{ij}}{n_i}}\right)$$

The first term on the right hand side of the equation of T_{ij} measures the within group contribution - it is a weighted average of the within group Theil Indexes T_i, the weights being equal to income shares Si. The second term measures between group inequality and is derived from group income shares S_i and group population shares n_i/n. The ratio of the between group component to the total Theil Index T_{ij} measures the between group contribution.

106. See M D McGrath, "Historical Trends in the Distribution of Racial Incomes in South Africa", op. cit., p 16.

107. Estimated from : Central Statistical Services, Population Census 80, Sample Tabulation, Economic Characteristics. Report 02-08-03, using the methods discussed in Footnote 71 above.