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A METHOD OF MEASURING THE GINI RATIO OF INCOME INEQUALITY : THE KENYAN CASE

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Views expressed in this paper are those of the author. They should not be interpreted as reflecting the views of the Department of Economics, University of Nairobi.

ABSTRACT:

The purpose of this paper is to discuss a method of calculating the Gini Coefficient of Inequality, with particular reference to the Kenyan data. This method is simple, precise and straightforward, and is free of ambiguities that beset the other conventional method. Moreover, it can be readily applied to a series of data that cover a long period of time. As such, the method can be used to analyse readily the extent to which inequality is increasing or decreasing over time in the country or region.

A METHOD OF MEASURING THE GINI RATIO OF INCOME INEQUALITY: THE KENYAN CASE.

I: The Kenya's Policy Concerning Equality:

Since independence, the question of equality of income distribution in the country has occupied the attention of decision-makers. This preoccupation was natural. Inequality was one of the evils of colonialism in Kenya. The colonial society was divided into three layered racial groups: Europeans at the top, Asians in the middle, and Africans at the bottom. The fighters for independence pledged that the inequality of income distribution must be eradicated or reduced. Thus, soon after independence, the Government produced an official document, African Socialism and Its Application to Planning in Kenya, otherwise known as Sessional Paper No. 10 of 1965 (henceforth to be referred to as the Paper) in which the issue of equitable distribution of income was accorded a prominent attention. For example, the Paper says that "Kenya is already committed to (the objective of) high and growing per capita incomes, equitably distributed" (p.2) and to

> a wages and incomes policy that recognizes the need for differential incentives as well as an equitable distribution of income. (p.8).

All the subsequent Develop Plans, I, II and III, for the periods 1966 - 1970, 1970 - 1974, and 1974 - 1978, respectively, have paid attention to the subject of equitable distribution of income. But the greatest attention to the matter has been given by the ILO/UNDP visiting mission which devoted many pages to the question, especially chapter 5 and the Technical Appendix 4 of their Report: Employment, Incomes and Equality (Geneva : 1972). This Report highlighted the extent and degree of inequality in the country, and prescribed measures to deal with the problem. Thus, the matter of equality of income distribution has received much official attention during the post-independence period.

Yet there is a good measure of belief that inequality of income distribution, despite official attention, is indeed increasing both absolutely and relatively. The ILO/UNDP Report says (p.83) that "... unemployment and gross inequality continue, and in some respects may even have increased."

The idea that income inequality may have increased since independence suggests a need for a measure of inequality. This kind of measurement will not only assist the policy-makers in assessing the extent to which the policy for reduction of inequality has been achieved, but it will also help them to device new approaches to dealing with the problem. Without such accurate measurements, there would be no way of making precise judgements about the performance of the policy instruments deviced to deal with the problem.

II: The Problems of Measuring Inequality:

But any attempt to measure income inequality in the country is immediately beset with two problem: lack of data on family incomes and expenditure and a method of to use for measuring inequalty. Concerning the first problem, the issue is serious. Kenya does not have data necessary for the measurement. There are data on output and wages, but these data are not relevant for the problem at hand. The ILO/UNDP Report presents the matter in the following way (p. 73 ff.):

> A comprehensive analysis of income distribution in Kenya is unfortunately precluded by lack of data. There are parts of the population, especially wage earners in the formal sector, for whom the existing data yield a reasonably complete and accurate picture of income distribution, but for other parts only fragmentary data of limited reliability are available...

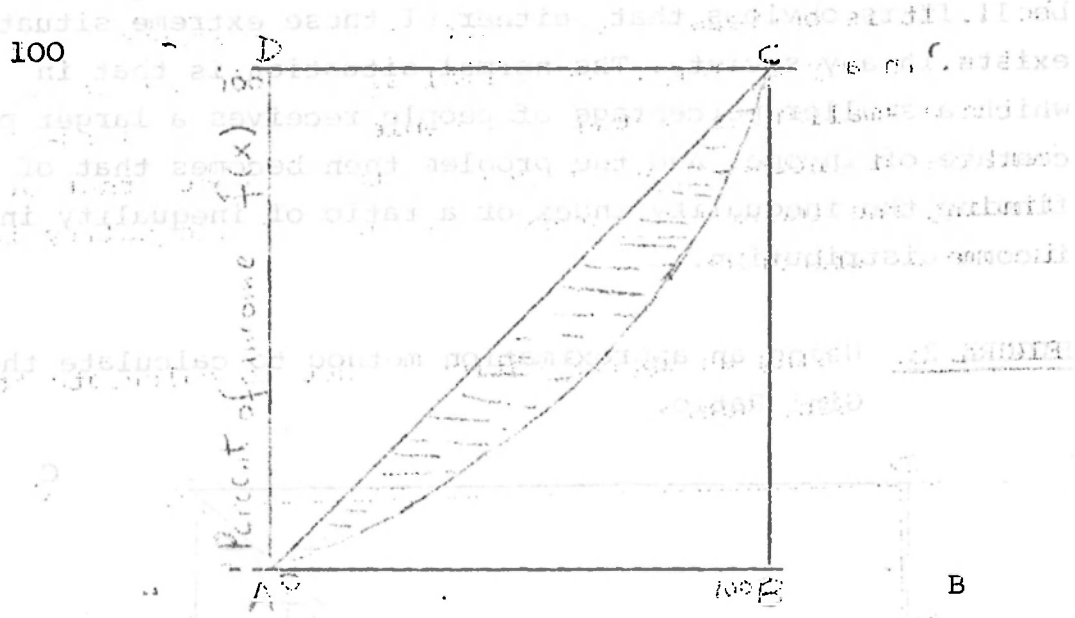
The second problem of measurement of income inequality concerns the technique to be used for the measurement. There are at least five commonly used alternative measures of inequality: the Gini Concentration Ratio, the Standard Deviation of Logs of Income, the Coefficient of Variation, the Shares of the Lowest Quintile, and Shares of the Highest Quintile, These techniques give different results when applied to a given set of data. Moreover, their results become

ambiguous when Lorenz curves cross. But it is the Gini Concentration Ratio that is of particular interest in this paper.

III. The Gini Coefficient Measure of Inequality:

The Gini Coefficient of inequality is usually obtained in the following manner. All income groups are ranked cumulatively from zero to one hundred percent. The corresponding incomes of the groups are also likewise ranked cumulatively from zero to one hundred percent. Then, using a graph paper, one can plot the cumulative percentile income receipts against the cumulative percentile income groups. Figure 1 illustrates this point.

Figure 1. Lorenz Curve of Income Distribution.



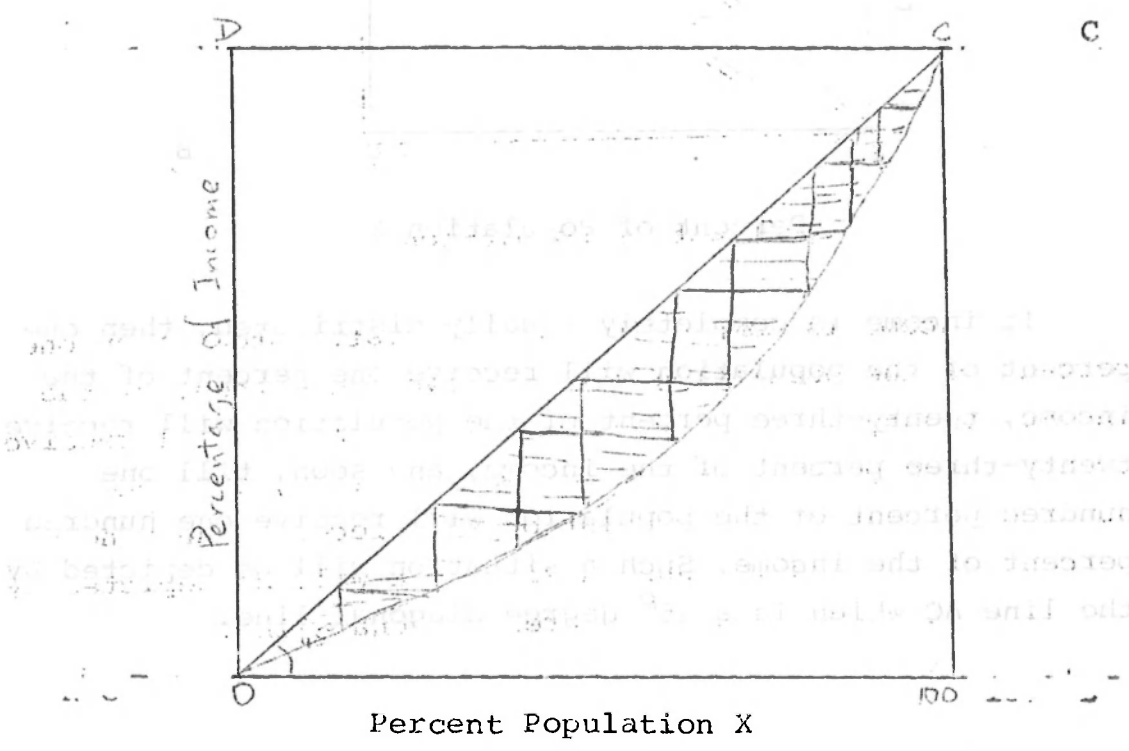
Percent of Population X

If income is completely equally distributed, then one percent of the population will receive one percent of the income, twenty-three percent of the population will receive twenty-three percent of the income, and soon, till one hundred percent of the population will receive one hundred percent of the income. Such a situation will be depicted by the line AC which is a 45^{o} degree diagonal line.

But that kind of situation does not exist. What exists is a situation in which a few people receive a disproportionately high income and the majority of the population receives a disproportionately smaller income. A line depicting that kind of situation can be depicted by the dotted curve below the line of complete equality. This latter curve is the Lorenz curve of inequality. It describes the extent to which there is a deviation of inequality from equality for all income groups.

This measure, however, is not specific. A single index of inequality is required. Hence the use of the Gini Ratio of Inequality. The Ratio expresses the shaded area in Figure 1 as a proportion of the total area of the triangle ABC. If there is a complete equality in income distribution, then the shaded area will vanish, and inequality will be zero. If there is a complete inequality in income distribution, it means that only one person owns everything, and the shaded area will embrace the entire triangle. The Ratio will be 1. It is obvious that neither of these extreme situations exists in any society. The normal situation is that in which a smaller percentage of people receives a larger percentage of income. And the problem then becomes that of finding the inequality index or a ratio of inequality in income distribution.

FIGURE 2. Using an approximation method to calculate the Gini Ratio.



The usual procedure of finding the ratio is to approximate the shaded area through the technique of sub-dividing the shaded area into triangles and rectangles and then add up all the so approximated area. The sum of all these are then expressed as a proportion of the triangle ABC. This is then the Ratio required. Figure 2 illustrates the point. The areas of all the small triangles and did. divided by the area of the triangle ABC whose area is ½ ABCD.

More generally, the Gini Ratio described above can be expressed mathematically as

$$C.R. = \frac{\int_0^{100} \left[\bar{X} - f(X) \right] dx}{\frac{1}{2}(100)^2}$$

where X is cumulative percent population and f(X) is cumulative percent income.

The method described above has several disadvantages. First, adding up all those triangles and rectacles is an arduous undertaking. It is time-consuming. Secondly, there are likely to be mistakes emanating from the approximations in the partitioning process. Thus, these errors may lead to subjective conclusions, since two people will not make the same partitions from the same data. And finally, the problem of Lorenz curve crossing is never dealt with. There is a need therefore for a technique that will take care of all these problems.

IV. The New Method of Measuring the Gini Coefficient of Inequality.

The new technique of measuring the Gini Ratio of Concentration, to be described below, has several advantages over the existing methods. In the first place, it is very simple, and is therefore non-time consuming. Secondly, it is definitely much more accurate and is thus much more objective than the others. And lastly, it does solve the problem of Lorenz curve crossing.

The new method begins to be applied where the Lorenz curve has been drawn. Instead of measuring the shaded area as a proportion of the triangle, as described above, the following procedure is followed.

(a) Draw a line parallel to the line of complete equality (the diagonal line which forms the 45^{o} with the horizontal line) but tangent to the Lorenz curve of inequality at F.

(b) The tangent point F at which the parallel line touches the Lorenz curve is the longest possible distance that exists between the 45^{o} line of complete equality and the Lorenz curve of inequality. This proposition should be verified by measuring these distances with a ruler, i.e. GF is the longest distance.

(c) Draw a line GE which joins the 45^{o} line with the horizontal axis, but passing through the tangent point F.

(d) Measure the distance GF as a proportion of GE. The ratio GF/GE gives the desired Gini Ratio of inequality.

V. Application of the Method to the Kenyan Data:

An attempt was made by the ILO/UNDP mission to find out the extent of income inequality in Kenya. Using Household Budget Survey 1968-69, the mission was able to tabulate income groups of various households in three big urban areas in Kenya: Nairobi, Mombasa and Kisumu. The result of their findings is reproduced in table 1 below:

Figure 3. A New Method of Calculating the Ratio.

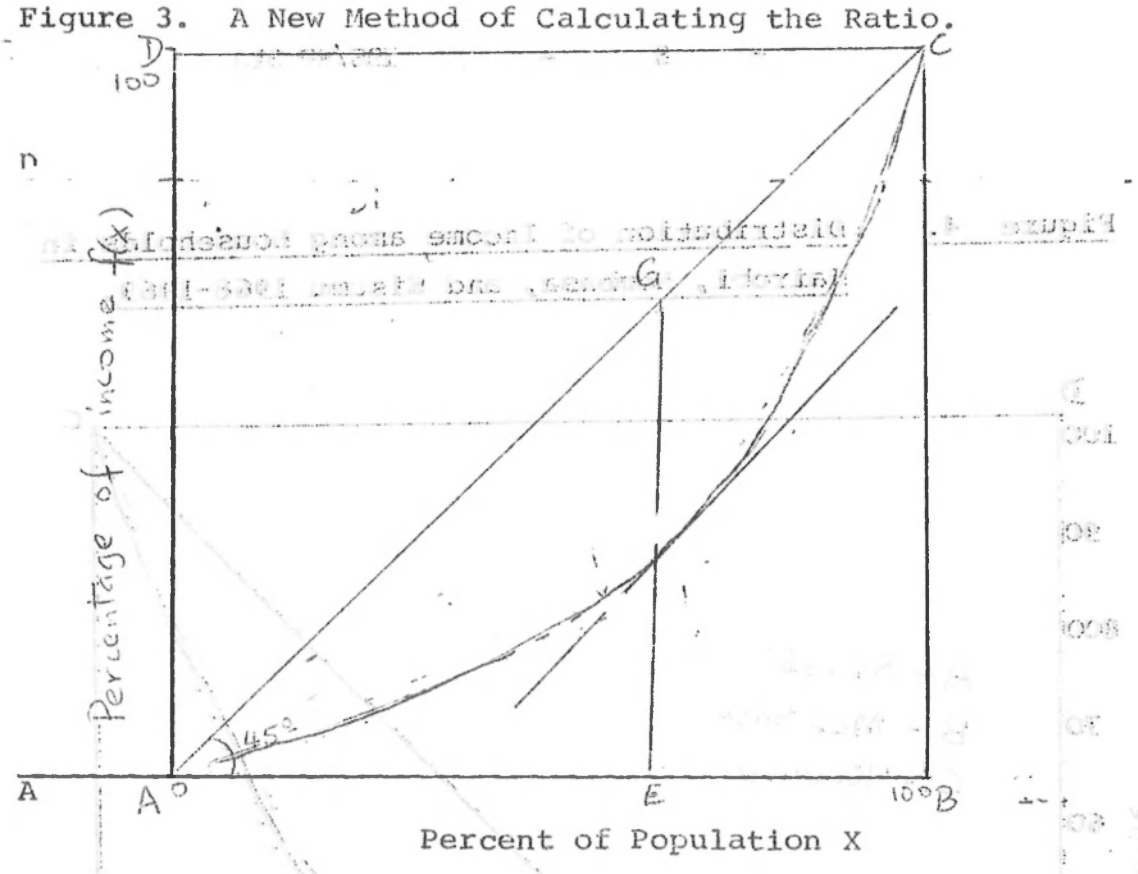
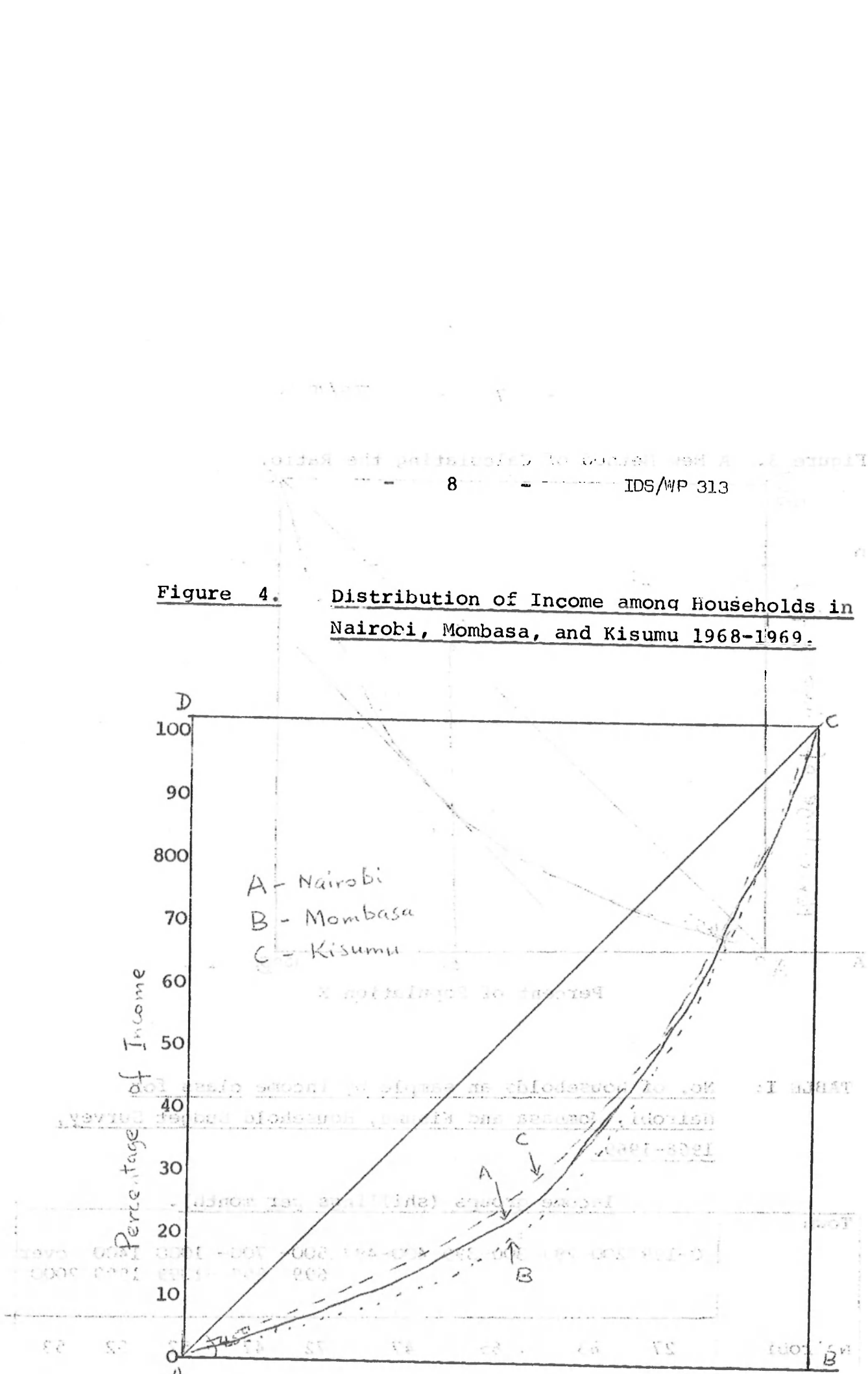


TABLE I: No. of households an sample by income class for Nairobi, Mombasa and Kisumu, Household Budget Survey, 1968-1969.

Town	Income groups (shillings per month).								
	0-199	200-299	300-399	400-499	500-699	700-999	1000-1399	1400-1999	over 2000
Nairobi	27	83	65	47	72	47	52	52	53
Mombasa	61	73	58	34	48	43	37	31	39
Kisumu	10	23	32	28	43	34	24	19	11
All three	98	179	155	109	163	124	113	102	103

Source: ILO/UNDP, Employment, Incomes and Equality, p. 347.

Figure 4. Distribution of Income among Households in Nairobi, Mombasa, and Kisumu 1968-1969.



Source: ILO/UNDP, Employment, Incomes and Equality, p.347.

These data were then transformed into cumulative percentage distribution by income groups and by income. A curve diagram depicting these distributions was then drawn, as in Figure

The results of calculated Gini Coefficients are as follows:

Table 2: The Gini Ratio's for Kisumu, Nairobi and Mombasa

Town	Gini Coefficient
Nairobi	0.5
Mombasa	0.6
Kisumu	0.4

From the results, it is clear that income is more, equitably distributed in Kisumu and Nairobi than it is in Mombasa, since the Gini Ratios are 0.4, 0.5 and 0.6, respectively.

Conclusion:

The purpose of this paper has been to discuss a method of income inequality measurement by the use of the Gini Coefficient of Concentration Ratio. The new method was found to be simpler, direct, and less time consuming. It is now possible then to undertake to calculate many Gini Ratio's for several years and to be able consequently to compare the extent to which inequality in income distribution is increasing or decreasing over time in either a region or in the country as a whole.