

**THE CONCEPT AND MEASUREMENT OF
GROUP INEQUALITY**

Achin Chakraborty

Working Paper No. 315

May 2001

**THE CONCEPT AND MEASUREMENT
OF GROUP INEQUALITY**

Achin Chakraborty

Centre for Development Studies
Thiruvananthapuram

May 2001

An earlier version of the paper was presented at CDS Faculty Seminar.
I thank Chandan Mukherjee, N. Krishnaji, John Kurien and K.P. Kannan
for comments.

ABSTRACT

The economist's conceptualisation of inequality in terms of interpersonal distribution of income or wealth, and the tradition of measurement of inequality that follows from this conceptualisation have not paid adequate attention to the need for reckoning inequality across social groups. In this paper we show that certain simple statistical tools to analyse categorical data can be shown to have properties that conform to our normative judgement on group inequality. We then analyse the grouped data available from such sources as the NSSO to illuminate our understanding of group inequality in India. A broader goal of this paper is to combine the insights from the literature on axiomatic method of measuring inequality with the idea of inequality that is commonly shared by other social science disciplines like sociology and political science.

JEL Classification: I31

Key Words: Inequality, measurement, social groups, odds ratio, India.

1. Introduction

The core of the economist's approach to measurement of inequality consists of a formal structure that is founded on a set of axioms and mathematical propositions. This forms a natural extension to the literature on social choice and welfare economics in which the prevailing practice is to derive conclusions by strict logical deduction from first principles. The formal structure has close connections with those dealing with some other related issues in economics as well, such as, the issues in index number construction, the measurement of risk, and so on.

The research agenda on the axiomatic foundation of inequality measures can be seen as a clear departure from the way classical political economy approached the issue of inequality. In classical political economy of Marx or Ricardo the emphasis was on setting the analysis of economic injustice within a particular social or institutional framework. The focus of research in more recent times, however, has been on the 'foundational issues' which are considered to be invariant across social and institutional settings. Nearly all of the theoretical propositions and indexes put forward in this literature have been founded on a small set of core assumptions, such as scale independence (or translation independence), the principle of transfer, and the population principle. Until a few years ago, all that was said about these axioms was that they were 'reasonable'. In recent years, inequality research has taken an

interesting turn. A substantial literature based on the ‘experimental evidence’ has come up which examines whether the standard axiomatic structure coincides with public *perceptions* of inequality. (Amiel and Cowell, 1999).

Sociologists, for good reason, have not had much sympathy for the economist’s preoccupation with foundational principles and axioms. They have long recognised that perceptions of inequality are related to how an individual is socially situated. They chose to focus instead on the *process* of inequality – how inequality persists over time - much in the tradition of the classical political economy. One might even argue that the entire history of sociological thought could be written in terms of attempts to answer questions like ‘why is there inequality in societies?’ The ‘theories of inequality’ that seek to address these questions, however, have generally remained separate from the technical issues in measurement. A theorist of inequality rarely makes an attempt to develop a measure of inequality and examine its theoretical properties. Even when she is compelled to use some inequality measure to analyse data, she makes her choice as a matter of habit or convenience, and makes no effort to examine the axiomatic foundation of her chosen index¹.

From what we have just said it would be wrong to conclude that there is a complete division of labour between the two groups so that sociology is the only discipline that has supplied all theories of inequality and all indexes of inequality are economists’ contributions. Explaining

1 Very recently, the editors of the Journal of the Indian School of Political Economy have done a remarkable job in bringing out a special issue of the journal on the Scheduled Castes (JISPE, July – December, 2000). Since the articles are written almost exclusively from the sociologist’s perspective (and the Guest Editor is Professor Andre Beteille, a renowned sociologist), there is no discussion on the measurement issues, even though the reader must be amazed by the painstaking work that has gone into the impressive statistical supplement.

(apart from measuring) the persistence or change in inequality is as much the economist's research problem as the sociologist's. As a matter of fact, this is an area where more frequently one sees cross-fertilization of ideas. This is evident from the recent theoretical work by economists that aims at analysing group inequality (Loury, 1981; Akerlof, 1997). But interestingly, even though sociology and other disciplines like political science and geography have their own share in the methodological literature in inequality measurement, there is no strong evidence of cross-disciplinary interaction of ideas on measurement. Very few sociologists have so far chosen to intervene in the axiomatic literature on measurement of income inequality. Even though there has been a growing interest among a small group of economists in measures of segregation or stratification, which had originally been introduced by sociologists, an overwhelming majority of economists are largely preoccupied with interpersonal distribution of income². Even when it is argued that income is not the right kind of 'space' in which the question of distributive justice should be dealt with, the reference unit in economists' thinking continues to be the *individual*. This is clearly evident from some of the recent attempts to measure inequality in the space of what Amartya Sen calls 'human functionings'³.

To add a further dimension to what we have already said, political scientists too have noted the connection between the rise of modern democracy and the conceptualisation of the social world based on individual selves as the fundamental units for the calculation of social welfare. The collective identity in the modern democracy is supposed to

2 One of the most authoritative collections of articles on poverty and inequality in India is Krishnaswamy (1990) which contains no reference to inequality among groups.

3 See Hicks (1997) for an important attempt in this direction.

form around common interests. And therefore condensation of individuals into groups is never permanent in a modern democracy. In India, however, perception of disadvantage often tends to be more collective than individual, and collectivity is seen as solidarities that are not interest-based. “Disadvantage is seen more as unjust treatment of whole communities, like lower castes, minority religious groups and tribal communities, which are thus seen as potential political actors for social equality....Certainly, people who are part of democratic mobilisations are predominantly poor, but the principle of their self-identifying action is not poverty but discrimination” (Kaviraj, 1996).

The point that we want to emphasise here is that, even though economists have been somewhat influenced by other disciplines while approaching the conceptualisation of well-being and explaining its distribution among people, on the question of measurement they have remained more or less insulated from others. In applied research, calculating the Gini index of interpersonal distribution of income continues to be the economist’s favourite⁴. Would our understanding of inequality measurement be enriched if we could draw liberally on disciplinary approaches other than economics? This paper is motivated by the belief that it would⁵. The main objective of this paper is to critically reflect on the economist’s conceptualisation of inequality and the tradition of measurement of inequality that follows from this conceptualisation.

4 It would be wrong if we said economists completely ignored group inequality. The literature on ‘inequality decomposition’ addresses the question by decomposing the overall inequality index into the intergroup and intragroup components. See Anand (1983) for an excellent application of this method.

5 Some attempts were indeed made in the past toward this objective. Beteille (1983) did an excellent job in bringing together a group of five scholars in various disciplines with the aim of ‘the cross-fertilization of scholarly discourse’.

The other important objective is to illuminate the issue of group inequality in the Indian context using appropriate technical tools.

In the next section we discuss the methodological implications of the habit of thinking exclusively in terms of interpersonal distribution of income. In section three, we discuss various ways of measuring group inequality and why we choose to apply some simple statistical tools to illustrate certain aspects of group inequality. In section four we discuss our results. We conclude in section five.

2. Interpersonal and intergroup inequality

Beteille (1983) made a useful distinction between two aspects of inequality – the *relational* and the *distributional* aspects. The sociologist is mostly concerned with the first kind, whereas the economist is with the second. In the first case, inequalities are seen as built into the social structure in the form of relations of superordination and subordination, i.e. the patterns of rights and obligations. The economist, on the other hand, sees inequality in the distribution of wealth or income, or, following Sen, in the distribution of certain ‘outcome indicator’ like health or educational status. Why has the economist been rather less concerned about inequality across racial, ethnic or caste groups? The answer probably lies in the methodological preference of the economist for a depersonalised agent as the unit of analysis. The agent acts independently to choose the best course of action given the opportunities. This way of thinking has definitely been fruitful in illuminating a variety of problems. It cannot, however, fully capture the ways intergroup inequality persists over time. There is no point in denying that one’s location within the network of social affiliations substantially affects one’s access to resources.

At some point in the past, even some sociologists – mainly of the Parsonian persuasion – assumed that inequalities of race, gender and

even class background were all forms of ascription that would go away with the development of impersonal market forces. They shared the same belief in the rationalising logic of modernity as the development economists of the earlier generation, even though they differed significantly on whether the market or the central planner would be the agent of modernity. The subsequent rise of neo-Marxian scholarship restored class analysis to a central position. It was then assumed that class-based loyalties were in the end fundamental. In recent decades, however, the discipline of sociology has turned full circle. The class-centred approach has been giving way to new multidimensional accounts of identity that include caste, religion and gender categories.

One would naturally expect that this development would influence the way the economist measures inequality. While attempts have been made by UNDP's team of experts to develop group-inequality-adjusted indices such as the Gender-related Development Index, reckoning inequality among social groups has not drawn as much attention.

In recent years, UNDP has succeeded in persuading a large number of national and sub-national governments to produce their own Human Development Reports. Two Indian states, Madhya Pradesh and Karnataka, have already done it, and others are expected to follow suit. With this a small craft industry has developed in computing the human development index at sub national levels. The objective ostensibly is to capture disparities in the levels of achievement within the country and the sub-national units. In India, the obvious sub-national units are the states. And a case for ranking the states according to their levels of human development can surely be made on the ground of planning and evaluation. But can one apply the same logic while computing human development index for districts and ranking them according to their index values? I shall argue that there are reasons to be skeptical about the real

worth of this exercise, and the state human development reports could do a better job if they highlighted some aspects of intergroup inequality⁶.

There are at least two different kinds of motivation behind most of our attempts to compile data on various indicators of development at the national and sub-national levels, and the two have distinct methodological and empirical consequences. International institutions such as UNDP or the World Bank routinely publish compilations of a variety of indicators, the most important purpose of which is clearly planning and evaluation. Governments, international agencies and foundations have a constant need for estimating various aspects of the development process to inform resource allocation decisions and formulate appropriate development programmes. On the other hand, the task for development research is to develop theories and methods to illuminate our understanding of social phenomena. Even though both from planning and evaluation point of view as well as from social research and analysis point of view we need to identify a variety of quantifiable aspects of the phenomenon called 'development', a common set of indicators and indices may not be suitable for both the purposes. This seemingly banal observation is often overlooked in practice.

When we make an attempt to measure the status of human development at the district level, what we are up to is capturing variation or inequality within the state. As we have argued, at the conceptual level inequality refers to achievement variation among people or between groups of people. The geographical or administrative units such as the districts is brought into the analysis of inequality on the assumption that groups of people are delimited in such a way that people will be able to

6 Neither *The Madhya Pradesh Human Development Report 1998* nor *Human Development in Karnataka 1999* has any discussion on inequality across social groups.

identify themselves as belonging to this or that district. This does not seem to be a very reasonable assumption. While it is true that the locality one belongs to may form one of the dimensions in one's identity, it is not clear whether the district is the relevant unit. It would perhaps be more reasonable to treat inequality as the variation among socio-demographic groups rather than over the administrative units. In this context, the two different purposes that we distinguished above may be recalled. Even though from planning or resource allocation point of view, focus on districts can be justified, it serves very little purpose when it comes to social research. To tie the description of inequality or variation in achievements to a recognised social structure will make the description more pertinent to the political discussion. Rural-urban disparity, gender disparity, or disparity between scheduled castes (SC), scheduled tribes (ST) and non SC/STs are examples of more meaningful groupings from analytical point of view. The need for inter-district analysis, however, cannot be ignored either. Such analysis is necessary to address the issue of spatial variation in development outcomes, which in turn is a valuable input to resource allocation decisions by the government. What we are questioning is the tendency to give overwhelming importance to planning or administrative purposes while dealing with social data.

Unlike income, HDI is not measured at an individual level. This has been considered by many (predominantly economists) as a serious limitation, since it is generally believed that one is basically interested to know how the benefits of human development achievement are distributed among *individuals*. To discuss the implications of this kind of belief it would be helpful if we made a distinction between two kinds of indicators. Some aspects of development refer to some property of a human collectivity, other than those simply derived from information on the conditions of individuals constituting the collectivity. Such an aspect, which may be called a 'system' aspect, is typically formed both

by individuals and the social relations linking them together. Obvious cases of system aspects are those concerning the nature and operation of the political system of the collectivity. Some aspects, on the other hand, concern those features that can be documented by summing data about its individual members. We can call them 'aggregable' aspects⁷. Many aggregable dimensions are simple totals or averages or rates.

In the light of this distinction it can be argued that an indicator need not always be definable at an individual level. And we further add that taking care of distributional concerns does not necessarily require individual level and aggregable variables. Furthermore, the study of inequality in non-distributable conditions – such as health or knowledge and skills, of which it is not possible to transfer units between persons - becomes more meaningful when we study inequality between groups rather than between individuals. To study the distribution of physical disabilities, for example, over the population at large has very little importance. From social scientific point of view, it would be more meaningful if we could show that physical disability on average and net of age differences varies between social classes.

3. Measures of group inequality

In this section we make an attempt to measure the disparity among the three groups – the Scheduled Tribes, the Scheduled Castes, and others – in terms of the incidence of poverty. The extent of poverty in a group has been loosely measured here as the percentage of people belonging to the group whose monthly per capita consumption expenditure does not exceed Rs. 190. The choice of Rs 190 may be justified by the fact that it is the 30th percentile of the all-India rural MPCE distribution.

Table 1 gives such percentages for 17 major states in India on the basis of the data from the 5th quinquennial survey of consumption expenditure (NSS 50th Round, 1993-94) conducted by the National Sample Survey Organisation (NSSO) and reported in NSSO (1997).

Table 1. Percentage of persons with MPCE less than Rs 190 for different social groups

STATES	ST	SC	Others	All
Andhra Pradesh	40.5	42.3	23.1	28.4
Assam	12.8	18.0	22.2	20.5
Bihar	60.3	60.3	41.2	47.0
Gujarat	25.9	27.6	13.2	17.8
Haryana	41.5	23.1	7.4	12.4
Himachal Pradesh	28.6	18.0	8.9	11.9
Jammu & Kashmir	40.3	6.2	6.4	7.0
Karnataka	39.5	48.8	25.4	31.5
Kerala	24.2	17.6	9.5	10.5
Madhya Pradesh	55.3	44.2	28.8	39.3
Maharashtra	47.9	49.7	30.8	36.1
Orissa	69.6	46.7	38.1	47.6
Punjab	22.0	7.9	1.7	4.4
Rajasthan	30.8	25.5	10.3	16.5
Tamil Nadu	41.7	41.1	25.2	29.6
Uttar Pradesh	30.8	48.8	27.6	32.7
West Bengal	37.5	28.1	21.6	25.0
All-India	44.1	40.3	24.7	30.2

From the four columns of Table 1 one can certainly make a few straightforward observations on particular states. But if one wishes to throw more light on the overall pattern of group inequality and the relative position of each state in that respect, one has to go beyond Table 1.

One of the most popular measures of group inequality that many applied researchers have used takes the following simple form:

If there are two identifiable groups of people, A and B, and if X_A and X_B , respectively, are the average levels of certain indicator for the two groups, then the group inequality index (GI):

$$GI = \frac{X_A}{X_B} \quad (1)$$

Kishor (1993), instead, used

$$GI = \log X_A - \log X_B \quad (2)$$

An altogether different alternative could be

$$GI = X_B - X_A \quad (3)$$

Or,

$$GI = \frac{X_B - X_A}{X_A} \quad (4)$$

The basic difference between (3) and the first two is that, while (1) and (2) are invariant with respect to equiproportionate changes in X_A and X_B , (3) remains unchanged if a constant is added to X_A and X_B . These two properties are similar to the well-known axioms of scale independence and translation independence in the inequality literature. The value judgement implicit in the axiom of scale independence is that inequality should be invariant to equiproportional changes in incomes

of all individuals. The value judgement in the axiom of translation independence is that inequality should not be affected by equal additions to incomes of all individuals. In our case we have two groups rather than n individuals. If we ignore intragroup inequality then the arguments are similar. Since the measures based on scale independence produce index values which are, in a sense, more 'conservative' than those based on translation independence, the former type of measures are called 'rightist' and the latter 'leftist' (Kolm, 1976). The choice between the two is clearly a matter of value judgement. We formally state the two axioms with slight changes so as to make them meaningful in the context of group inequality.

Let X_i be an indicator of achievement by the i th group, $i = A, B$, and x be the pair (X_A, X_B) . Let S be the set of all possible pairs x . By an inequality comparison we mean a binary relation on the members of S . Given any $x, x' \in S$, $x \approx x'$ means the degree of inequality between the groups is the same in x and x' .

Scale Independence: For any $x \in S$, and any positive scalar λ such that $\lambda x \in S$, $\lambda x \approx x$.

Translation Independence: For any $x \in S$ and any scalar α such that $x + \alpha I \in S$ (I denotes a vector of ones), $x + \alpha I \approx x$.

Notice that (1), (2) and (4) satisfy scale independence, and (3) satisfies translation independence.

Many of the studies done by the National Council of Applied Economic Research (NCAER) on Human Development across states have applied (1) as the 'disparity index'. In a recent study, applying (1) on the data from past four censuses, two NCAER researchers have concluded that the overall disparity in the rates of literacy between SCs and others has declined over the past decades (Chakrabarty and Ghosh,

2000). It is not difficult to see that the conclusion becomes a great deal weaker if one uses (3) rather than (1).

The Human Development Report 1995 took a more sophisticated approach to reckon inequality between gender groups. The Gender-related Development Index (GDI) is an adjusted version of the Human Development Index (HDI), and the adjusted formula has been based on the idea of the 'equally distributed equivalent achievement' in line with the approach Atkinson (1970) put forward in his classic paper. This falls in the group of indices of inequality that are based on the concept of the 'social welfare function'. The social welfare function that GDI assumes is the same as the one Atkinson introduced⁸. If one is interested in ranking the Indian states according to a combined index of aggregate achievement and inequality in achievement across various groups, the GDI methodology can be useful⁹.

We do not attempt to develop an alternative index based on the social welfare function approach. After all a social welfare function is no less arbitrary than any so-called 'ad-hoc'¹⁰ index formula. We examine instead the adequacy of the statistical measures such as the odds ratio, which are well-known to an applied researcher in social sciences, in the light of the axioms that are known only to the researcher in the axiomatic measures of inequality. We find that the odds ratio does possess the properties that might be considered 'desirable' from the vantage point of the axiomatic method.

8 For the derivation of the index formula and the assumptions behind it, see Anand and Sen (1995).

9 There have been several other attempts to develop indexes of group inequality in recent years. See, for example, Jayaraj and Subramanian (1999).

10 It is generally the practice within the axiomatic literature that if an index formula is not founded on axiomatic basis it is called 'ad-hoc'.

What does an odds ratio measure? The standard statistical procedure for categorical data essentially addresses two distinct aspects: homogeneity and association. Homogeneity refers to the hypothesis that the probability of ‘being poor’ is the same in the two groups being compared. The odds ratio is used to capture the relative degree of departure from homogeneity. If p_1 is the probability that a person belonging to the Scheduled Caste is poor and p_2 the probability that a non-SC person is poor then the odds ratio ‘in favour of’ poverty with respect to SC or others is given by

$$O_{SC / others, poor} = \frac{\frac{p_1}{1 - p_1}}{\frac{p_2}{1 - p_2}}$$

One of the interesting things about the odds ratio is that if p_1 and p_2 increase by the same proportion the odds ratio increases. Let us explain in terms of an example what it means. Consider two states S and T. In S, 20 percent of the people belonging to SC and 10 percent of ‘others’ are poor, whereas in T the percentages are 40 and 20 respectively. If our inequality measure satisfied the scale independence axiom, the intergroup inequality in S and T would be the same. But can we hope to reach an agreement on the desirability of scale independence in this context (that is, in the context of *intergroup inequality*)? One would rather like to judge that intergroup disparity is more in T than in S. The odds ratio captures this intuition.

What would be our judgement if the percentages in T were 50 and 40 instead of 40 and 20, whereas the percentages in S were the same as above (i.e. 20 and 10)? Notice that the difference between the two percentages in T is the same as in S. One would probably perceive less intergroup inequality in T than in S for the simple reason that in T the

overall incidence of poverty is much higher. If we accept this intuitive idea as well, then the odds ratio passes the test (see Appendix for proof). Notice that while (3) too has this second property, scale independence makes it unattractive. We can now summarise our discussion as Table 2.

Table 2.

	Equiproportionate change	Equal addition
X_A/X_B	No change (ND)	Decreases (D)
$\text{Log } X_A - \text{log } X_B$	No change (ND)	Decreases (D)
$X_B - X_A$	Increases (D)	No change (ND)
$(X_B - X_A)/X_A$	No change (ND)	Decreases (D)
Odds Ratio	Increases (D)	Decreases (D)

D: Desirable

ND: Not desirable

It needs to be mentioned that the odds ratio as an index of group inequality is not strictly comparable with the first three. While p_1 and p_2 are expressed only as percentages, X_A and X_B can be indicators like the life expectancy at birth which are expressed in certain units. However, for practical purposes this may not be a serious problem since an indicator like the ‘percentage of people who are likely to die before reaching age forty’ may be used to reckon inequality in the dimension of longevity.

One reason for our preference for the statistical measures is that even before we get to measure inequality between the social groups we need to examine if poverty frequency and social group identity are related. This is addressed by the measures of association. As we have mentioned, the study is entirely based on the classified data published in NSSO (1997). First, we regrouped the per capita monthly expenditure classes into two – one containing all MPCE levels less than Rs 190 and the

other exceeding Rs. 190. The first group can loosely be called the 'poor' and the second 'non-poor'. Thus, for each state, we get a 3x2 contingency table (3 rows for the categories of ST, SC and others, and 2 columns for 'poor' and 'non-poor') with the cell frequencies calculated from the 'per thousand' figures and the estimated population totals.

From the definition of independence, existence of association between poverty and social group identity means that the probabilities of the joint events in the cells can be written in terms of the marginal probabilities. An appropriate test statistic for this will be the contingency chi-square statistic with $(3-1)(2-1)$ degrees of freedom. From the same data set, we have constructed another contingency table with five rows and two columns, where rows are for five categories of occupational groups in rural areas: self-employed in non-agriculture, agricultural labour, other labour, self-employed in agriculture, and other households. The idea here is to see whether the possibility of interest-based grouping is stronger than the community-based grouping. If there is a strong association between the economic status and the caste identity the perception of relative disadvantage is likely to be reinforced by the economic deprivation. This is just to mention one dimension of many-sided implications of differing degrees of association.

To see the relative strength of the two kinds of association we have used Cramer's V measure which seems to be the most useful for comparing several tables of different dimensions¹¹. Unlike the odds ratios, however, this measure of association cannot be given any substantive meaning. We have used it as an index number to compare the degrees of association between poverty and social group identity on one side and between poverty and occupational groups on the other.

11 See Mukherjee, White and Wuyts (1998) for a lucid discussion on this.

We feel that the simple statistical tools for analysing categorical data can thus serve the twin purpose of highlighting the relative positions of different states in terms of intergroup differences in relative disadvantage, as well as the degree of association between the levels of living and alternative groupings (in terms of occupations, in our case).

4. Discussion of results

In Table 3 the two columns of Cramer's V - one indicating the degree of association between poverty and social groups and the other

Table 3

STATES	Cramer's V Pov&Soc.Gr.	Cramer's V Pov&Occ.Gr.	Difference
(1)	(2)	(3)	(3) – (2)
Andhra Pradesh	0.187	0.200	0.013
Assam	0.083	0.315	0.232
Bihar	0.175	0.317	0.142
Gujarat	0.166	0.231	0.065
Haryana	0.251	0.398	0.147
Himachal Pradesh	0.162	0.181	0.019
Jammu & Kashmir	0.188	0.167	-0.021
Karnataka	0.207	0.282	0.075
Kerala	0.096	0.200	0.104
Madhya Pradesh	0.241	0.270	0.029
Maharashtra	0.172	0.291	0.119
Orissa	0.263	0.276	0.013
Punjab	0.185	0.226	0.041
Rajasthan	0.231	0.238	0.007
Tamil Nadu	0.156	0.285	0.129
Uttar Pradesh	0.193	0.229	0.036
West Bengal	0.110	0.333	0.223

Table 4

STATES	MPCE<190 All	Odds ratio ST/Others	Odds ratio SC/Others	Rank ST/Others	Rank SC/Others	Overall GI rank
Andhra Pradesh	28.4	2.266	2.440	8	11	12
Assam	20.5	0.515	0.769	1	1	1
Bihar	47.0	2.168	2.168	6	8	5
Gujarat	17.8	2.298	2.506	9	12	13
Haryana	12.4	8.879	3.760	15	16	16
Himachal Pradesh	11.9	4.100	2.247	14	10	14
Jammu & Kashmir	7.0	9.869	0.966	16	2	11
Karnataka	31.5	1.917	2.799	3	13	7
Kerala	10.5	3.041	2.034	10	6	7
Madhya Pradesh	39.3	3.058	1.958	11	5	7
Maharashtra	36.1	2.066	2.220	4	9	4
Orissa	47.6	3.720	1.424	12	4	7
Punjab	4.4	16.300	4.958	17	17	17
Rajasthan	16.5	3.877	2.982	13	14	15
Tamil Nadu	29.6	2.123	2.071	5	7	3
Uttar Pradesh	32.7	1.168	2.500	2	12	5
West Bengal	25.0	2.178	1.419	7	3	2

between poverty and occupational groups - reveal an important fact about the nature of association in the Indian context.

The values of the contingency chi-square statistic have not been reported since all of them are far above the critical values. The degree of association between poverty and occupational groups is definitely stronger than the other kind of association in all the states except Jammu and Kashmir. The difference between the two, however, varies across the states. The degree of association between poverty and social group identity is relatively weak in Kerala, West Bengal and Assam. And Tamil Nadu comes next. The association is high in Orissa, Haryana, Madhya Pradesh and Rajasthan.

The second and third columns of odds ratios in Table 4 have more direct interpretation. The relative disadvantage that the two groups - SC and ST – experience vis-à-vis others again varies quite a bit across the states. Even within a state the difference between SC and ST can be large. This is clear from the fourth and fifth columns in Table 4 which give the ranking of states according to the index of group inequality between SC and others and between ST and others, respectively. For example, whereas in Uttar Pradesh and Karnataka the scheduled tribe populations are much less disadvantaged compared to the scheduled castes, in Jammu & Kashmir and Orissa a reverse scenario is apparent. Assam has the distinction of having the lowest degree of inequality and Punjab has the highest on both counts. We are, however, not sure how much importance should be given to our finding on the scheduled tribe population in Punjab and Haryana. Although in general it is not a major problem that the numbers of SC and ST in different states estimated from NSS differ to some extent from the Census (1991) figures, for Punjab and Haryana the problem is different. According to the Census, ‘no population has been scheduled as tribe’ in Punjab and Haryana, but

if one goes by NSSO (1997) one does 'find' scheduled tribe population in these states. To avoid confusion we present in Table 5 the percentages of SC and ST population across states according to both Census, 1991, and NSS 50th Round, 1993-94.

In Punjab the odds ratio 'in favour of poverty' with respect to the scheduled tribe population vis-à-vis others is roughly sixteen, and that with respect to the scheduled caste population vis-à-vis others is around

Table 5

STATES	%ST	%ST	%SC	%SC
	NSS	Census	NSS	Census
Andhra Pradesh	7.57	6.31	16.51	15.93
Assam	13.20	12.83	9.13	7.40
Bihar	8.03	7.66	20.72	14.56
Gujarat	16.62	14.92	11.78	7.41
Haryana	1.86	0.00	24.37	19.75
Himachal Pradesh	4.13	4.22	23.38	25.34
Jammu & Kashmir	1.90	NA	27.40	NA
Karnataka	7.50	4.26	18.05	16.38
Kerala	1.29	1.10	9.02	9.92
Madhya Pradesh	24.14	23.27	17.56	14.54
Maharashtra	11.66	9.27	18.54	11.10
Orissa	23.45	22.21	17.83	16.20
Punjab	1.46	0.00	33.17	28.31
Rajasthan	13.23	12.44	17.74	17.29
Tamil Nadu	1.80	1.03	21.61	19.18
Uttar Pradesh	0.89	0.21	21.98	21.04
West Bengal	6.70	5.60	28.54	23.62

five – both are rather high. How should we reconcile this with the fact that the overall incidence of poverty in Punjab is the lowest among all Indian states? In general it seems to be the case that in states with low overall incidence of poverty the gap between the SC-ST population and others is relatively more pronounced. This is clearly evident if we take a look at the odds ratios together with the first column of Table 4. The three states, Punjab, Haryana and Jammu and Kashmir, which have the lowest percentage of people below MPCE Rs.190, have the highest degree of disparity between social groups (as revealed by the odds ratios).

5. Conclusion

In this paper we have presented a way of looking at the issue of measuring inequality across social groups. We have illustrated that the simple statistical tools to analyse categorical data can be applied to grouped data available from such sources as the NSSO reports to illuminate our understanding of inequality between the social groups in India. A greater portion of the paper has been devoted to conceptual clarification of the notion of group inequality, drawing lessons from other social science disciplines besides economics. We have argued that the economist's preoccupation with interpersonal distribution of income has been responsible for the lack of development in measures of group inequality.

Appendix

It is easy to show that

I. For all $0 < \lambda > 1$ and $p_1 > p_2$

$$\frac{\lambda p_1(1 - \lambda p_2)}{\lambda p_2(1 - \lambda p_1)} > \frac{p_1(1 - p_2)}{p_1(1 - p_1)}$$

Proof:

$$\text{Assume } \frac{\lambda p_1(1 - \lambda p_2)}{\lambda p_2(1 - \lambda p_1)} < \frac{p_1(1 - p_2)}{p_2(1 - p_1)}$$

$$\Leftrightarrow \frac{1 - \lambda p_2}{1 - \lambda p_1} < \frac{1 - p_2}{1 - p_1} \quad [\text{since } \lambda, p_1, p_2 > 0]$$

$$\Leftrightarrow 1 - \lambda p_2 - p_1 + \lambda p_1 p_2 < 1 - \lambda p_1 - p_2 + \lambda p_1 p_2$$

$$\Leftrightarrow \lambda(p_1 - p_2) < (p_1 - p_2)$$

$\Leftrightarrow \lambda < 1$ if $p_1 > p_2$ which contradicts our initial assumption.

In other words, disparity increases if both p_1 and p_2 increase equiproportionately.

II.

For all $d, 0 < d < 1 - p_1 - p_2$ and $\frac{p_1(1 - p_2)}{p_2(1 - p_1)} > 1$

$$\frac{(p_1 + d)(1 - p_2 - d)}{(p_2 + d)(1 - p_1 - d)} < \frac{p_1(1 - p_2)}{p_2(1 - p_1)}$$

Proof:

$$\text{Assume } \frac{(p_1 + d)(1-p_2-d)}{(p_2 + d)(1-p_1-d)} > \frac{p_1(1-p_2)}{p_2(1-p_1)}$$

$$\Leftrightarrow \frac{p_1(1-p_2) + d(1-p_1-p_2-d)}{p_2(1-p_1) + d(1-p_1-p_1-d)} > \frac{p_1(1-p_2)}{p_2(1-p_1)}$$

$$\Leftrightarrow \frac{d(1-p_1-p_2-d)}{p_1(1-p_2)} > \frac{d(1-p_1-p_2-d)}{p_2(1-p_1)}$$

$$\Leftrightarrow \frac{p_1(1-p_2)}{p_2(1-p_1)} < 1 \text{ assuming } 0 < d < 1-p_1-p_2$$

This contradicts our initial assumption.

In other words, disparity decreases if p_1 and p_2 increase by adding a constant.

References

- Akerlof, George (1997) 'Social Distance and Social Decisions', *Econometrica* 65(5)
- Anand, S. (1983) *Inequality and Poverty in Malaysia: Measurement and Decomposition*, New York: Oxford University Press published for World Bank.
- Anand, S. and Sen, A. (1995) 'Gender Inequality in Human Development: Theories and Measurement', Background Paper for the Human Development Report 1995, UNDP.
- Atkinson, A. B. (1970) 'On the Measurement of Inequality', *Journal of Economic Theory*, 2.
- Beteille, A. (ed.) (1983) *Equality and Inequality: Theory and Practice*, New Delhi: Oxford University Press.
- Chakrabarty, G. and Ghosh, P.K. (2000) 'Growth of Literacy Among SCs and STs Across States', Discussion Paper No. 8, National Council of Applied Economic Research.
- Cowell, A. and Amiel, Y. (1999) *Thinking about Inequality*, Cambridge: Cambridge University Press.
- Hicks, D.A. (1997) 'The Inequality-Adjusted Human Development Index: A Constructive Proposal', *World Development*, 25(8), 1283-1298.
- Jayaraj, D. and Subramanian, S. (1999) 'Poverty and Discrimination: Measurement, and Evidence from Rural India', in Harris-White, B. and Subramanian, S. (eds.) *Illfare in India: Essays on India's Social Sector in Honour of S. Guhan*, New Delhi: Sage.
- Kaviraj, S. (1996) 'India: Dilemmas of Democratic Development', in A. Leftwich (ed.) *Democracy and Development*, Cambridge: Polity Press.

- Kishor, S. (1993) "'May God Give Sons to All': Gender and Child Mortality in India', *American Sociological Review*, 58(2).
- Kohm, S-C. (1976) 'Unequal Inequalities I', *Journal of Economic Theory* 12.
- Krishnaswami, K. S. (1990) *Poverty and Income Distribution*, Delhi: Oxford University Press, published for Sameeksha Trust.
- Loury, G. C. (1981) 'Intergenerational Transfers and the Distribution of Earnings', *Econometrica* 49(4).
- Miles, I. (1985) *Social Indicators for Human Development*, London: Frances Pinter.
- Mukherjee, C., White, H. and Wuyts, M. (1998) *Econometrics and Data Analysis for Developing Countries*, London: Routledge.
- NSSO (1997) *Differences in Level of Consumption Among Socio-Economic Groups*, Report No. 422.

CENTRE FOR DEVELOPMENT STUDIES
LIST OF WORKING PAPERS

(From 1991 onwards)

- MRIDUL EAPEN** Hantex: An Economic Appraisal.
 September, 1991, W.P.242
- SUNIL MANI** Government Intervention in Commercial Crop Development:
 A Case of Flue Cured Virginia Tobacco.
 November, 1991, W.P.243
- K. PUSHANGADAN** Wage Determination in a Casual Labour Market: The
 Case Study of Paddy Field Labour in Kerala.
 January, 1992, W.P.244
- K.N. NAIR & S.P. PADHI** Dynamics of Land Distribution: An Alternative
 Approach and Analysis with Reference to Kerala.
 January, 1992, W.P.245
- THOMAS ISAAC** Estimates of External Trade Flows of Kerala - 1975-76 and
 1980-81.
 March, 1992, W.P.246
- THOMAS ISAAC, RAM MANOHAR REDDY, NATA DUVVURRY** Re-
 gional Terms of Trade for the State of Kerala.
 March, 1992, W.P.247
- P. MOHANAN PILLAI** Constraints on the Diffusion of Innovations in Kerala:
 A Case Study of Smokeless Chulas.
 March, 1992, W.P.248
- R. ANANDRAJ** Cyclicity in Industrial Growth in India: An Exploratory
 Analysis.
 April, 1992, W.P.249
- T.M. THOMAS ISAAC, RAM MANOHAR REDDY, NATA DUVVURY**
 Balance of Trade, Remittance and Net Capital Flows: An Analysis of
 Economic Development in Kerala since independence.
 October, 1992, W.P.250
- M. KABIR, T.N. KRISHNAN** Social Intermediation and Health Transition:
 Lessons from Kerala,
 October, 1992, W.P.251

- SUNIL MANI, P. NANDAKUMAR** Aggregate Net Financial Flows to India: The Relative Importance of Private Loan vis-a-vis Foreign Direct Investments.
August, 1993, W.P.252
- PULAPRE BALAKRISHNAN** Rationale and the Result of the Current Stabilisation Programme.
November, 1993, W.P.253
- K.K. SUBRAHMANIAN, P. MOHANAN PILLAI** Modern Small Industry in Kerala: A Review of Structural Change and Growth Performance.
January, 1994, W.P.254
- DILIP M.MENON** Becoming Hindu and Muslim : Identity and Conflict in Malabar 1900-1936.
January, 1994, W.P.255
- D. NARAYANA** Government Intervention in Commodity Trade: An Analysis of the Coffee Trade in India.
January, 1994, W.P.256
- K.J. JOSEPH, P. NANDAKUMAR** On the Determinants of Current Account Deficits: A Comparative Analysis of India, China and South Korea.
January, 1994, W.P.257
- K.K. SUBRAHMANIAN, K.J. JOSEPH** Foreign Control and Export Intensity of Firms in Indian Industry.
February, 1994, W.P.258
- PULAPRE BALAKRISHNAN, K. PUSHANGADAN** Total Factor Productivity Growth in Indian Manufacturing - A Fresh Look.
April 1994, W.P.259
- D. NARAYANA, K.N. NAIR** Role of the Leading Input in Shaping Institutions: Tendency in the Context of Irrigation Uncertainty.
May, 1994, W.P.260
- G. MURUGAN, K. PUSHANGADAN** Pricing of Drinking Water: An Application of Coase Two-part Tariff.
December, 1994 W.P.261
- MOHANAN PILLAI** On the Mexican Crisis.
December, 1995, W.P.262
- SUNIL MANI** Financing Domestic Technology Development through the Venture Capital Route.
December, 1995, W.P.263

- T.T. SREEKUMAR** Peasants and Formal Credit in Thiruvithamcore: The State Institutions and Social Structure 1914-1940.
December, 1995 W.P.264
- AMITABH** Estimation of the Affordability of Land for Housing Purposes in Lucknow City, Uttar Pradesh (India): 1970-1990.
March, 1996. W.P.265
- K. PUSHANGADAN, G. MURUGAN, K. NAVANEETHAM** Travel Time, User Rate & Cost of Supply: Drinking Water in Kerala, India:
June 1996. W.P.266
- K.J. JOSEPH** Structural Adjustment in India: A Survey of Recent Studies & Issues for Further Research,
June 1996 W.P.267
- D. NARAYANA** Asian Fertility Transition: Is Gender Equity in Formal Occupations an Explanatory Factor?
October, 1996 W.P.268
- D. NARAYANA, SAIKAT SINHAROY** Import and Domestic Production of Capital Goods from Substitution to Complementarity,
October 1996. W.P.269

NEW SERIES

- W.P. 270** **ACHIN CHAKRABORTY** *On the Possibility of a Weighting System for Functionings* December 1996
- W.P. 271** **SRIJIT MISHRA** *Production and Grain Drain in two inland Regions of Orissa* December 1996
- W.P. 272** **SUNIL MANI** *Divestment and Public Sector Enterprise Reforms, Indian Experience Since 1991* February 1997
- W.P. 273** **ROBERT E. EVENSON, K.J. JOSEPH** *Foreign Technology Licensing in Indian Industry : An econometric analysis of the choice of partners, terms of contract and the effect on licensees' performance* March 1997
- W.P. 274** **K. PUSHANGADAN, G. MURUGAN** *User Financing & Collective action: Relevance sustainable Rural water supply in India.* March 1997.
- W.P. 275** **G. OMKARNATH** *Capabilities and the process of Development* March 1997
- W. P. 276** **V. SANTHAKUMAR** *Institutional Lock-in in Natural Resource Management: The Case of Water Resources in Kerala,* April 1997.

- W. P. 277 PRADEEP KUMAR PANDA** *Living Arrangements of the Elderly in Rural Orissa*, May 1997.
- W. P. 278 PRADEEP KUMAR PANDA** *The Effects of Safe Drinking Water and Sanitation on Diarrhoeal Diseases Among Children in Rural Orissa*, May 1997.
- W.P. 279 U.S. MISRA, MALA RAMANATHAN, S. IRUDAYA RAJAN** *Induced Abortion Potential Among Indian Women*, August 1997.
- W.P. 280 PRADEEP KUMAR PANDA** *Female Headship, Poverty and Child Welfare : A Study of Rural Orissa, India*, August 1997.
- W.P. 281 SUNIL MANI** *Government Intervention in Industrial R & D, Some Lessons from the International Experience for India*, August 1997.
- W.P. 282 S. IRUDAYA RAJAN, K. C. ZACHARIAH** *Long Term Implications of Low Fertility in Kerala*, October 1997.
- W.P. 283 INDRANI CHAKRABORTY** *Living Standard and Economic Growth: A fresh Look at the Relationship Through the Non- Parametric Approach*, October 1997.
- W.P. 284 K. P. KANNAN** *Political Economy of Labour and Development in Kerala*, January 1998.
- W.P. 285 V. SANTHAKUMAR** *Inefficiency and Institutional Issues in the Provision of Merit Goods*, February 1998.
- W.P. 286 ACHIN CHAKRABORTY** *The Irrelevance of Methodology and the Art of the Possible : Reading Sen and Hirschman*, February 1998.
- W.P. 287 K. PUSHANGADAN, G. MURUGAN** *Pricing with Changing Welfare Criterion: An Application of Ramsey- Wilson Model to Urban Water Supply*, March 1998.
- W.P. 288 S. SUDHA, S. IRUDAYA RAJAN** *Intensifying Masculinity of Sex Ratios in India : New Evidence 1981-1991*, May 1998.
- W.P. 289 JOHN KURIEN** *Small Scale Fisheries in the Context of Globalisation*, October 1998.
- W.P. 290 CHRISTOPHE Z. GUILMOTO, S. IRUDAYA RAJAN** *Regional Heterogeneity and Fertility Behaviour in India*, November 1998.
- W.P. 291 P. K. MICHAEL THARAKAN** *Coffee, Tea or Pepper? Factors Affecting Choice of Crops by Agro-Entrepreneurs in Nineteenth Century South-West India*, November 1998
- W.P. 292 PRADEEP KUMAR PANDA** *Poverty and young Women's Employment: Linkages in Kerala*, February, 1999.
- W.P. 293 MRIDUL EAPEN** *Economic Diversification In Kerala : A Spatial Analysis*, April, 1999.

- W.P. 294** **K. P. KANNAN** *Poverty Alleviation as Advancing Basic Human Capabilities: Kerala's Achievements Compared*, May, 1999.
- W.P. 295** **N. SHANTA AND J. DENNIS RAJA KUMAR** *Corporate Statistics: The Missing Numbers*, May, 1999.
- W.P. 296** **P.K. MICHAEL THARAKAN AND K. NAVANEETHAM** *Population Projection and Policy Implications for Education: A Discussion with Reference to Kerala*, July, 1999.
- W.P. 297** **K.C. ZACHARIAH, E. T. MATHEW, S. IRUDAYA RAJAN** *Impact of Migration on Kerala's Economy and Society*, July, 1999.
- W.P. 298** **D. NARAYANA, K. K. HARI KURUP**, *Decentralisation of the Health Care Sector in Kerala : Some Issues*, January, 2000.
- W.P. 299** **JOHN KURIEN** *Factoring Social and Cultural Dimensions into Food and Livelihood Security Issues of Marine Fisheries; A Case Study of Kerala State, India*, February, 2000.
- W.P. 300** **D. NARAYANA** *Banking Sector Reforms and the Emerging Inequalities in Commercial Credit Deployment in India*, March, 2000.
- W.P. 301** **P. L. BEENA** *An Analysis of Mergers in the Private Corporate Sector in India*, March, 2000.
- W.P. 302** **K. PUSHPANGADAN, G. MURUGAN**, *Gender Bias in a Marginalised Community: A Study of Fisherfolk in Coastal Kerala*, May 2000.
- W.P. 303** **K. C. ZACHARIAH, E. T. MATHEW, S. IRUDAYA RAJAN**, *Socio-Economic and Demographic Consequences of Migration in Kerala*, May 2000.
- W.P. 304** **K. P. KANNAN**, *Food Security in a Regional Perspective; A View from 'Food Deficit' Kerala*, July 2000.
- W.P. 305** **K. N. HARILAL, K.J. JOSEPH**, *Stagnation and Revival of Kerala Economy: An Open Economy Perspective*, August 2000.
- W.P. 306** **S. IRUDAYA RAJAN**, *Home Away From Home: A Survey of Oldage Homes and inmates in Kerala*, August 2000.
- W.P. 307** **K. NAVANEETHAM, A. DHARMALINGAM**, *Utilization of Maternal Health Care Services in South India*, October 2000.
- W.P. 308** **K. P. KANNAN, N . VIJAYAMOHANAN PILLAI**, *Plight of the Power Sector in India : SEBs and their Saga of Inefficiency* November 2000.
- W.P. 309** **V. SANTHAKUMAR AND ACHIN CHAKRABORTY**, *Environmental Valuation and its Implications on the Costs and Benefits of a Hydroelectric Project in Kerala, India*, November 2000.

- W.P. 310** **K. K. SUBRAHMANYAN. E. ABDULAZEEZ**, *Industrial Growth In Kerala: Trends And Explanations* November 2000
- W.P. 311** **INDRANI CHAKRABORTY** *Economic Reforms, Capital Inflows and Macro Economic Impact in India*, January 2001
- W.P. 312** **VIJAYAMOHANAN PILLAI** *Electricity Demand Analysis and Forecasting –The Tradition is Questioned*, February 2001
- W.P. 313** **VEERAMANI. C** *India's Intra-Industry Trade Under Economic Liberalization: Trends and Country Specific Factors*, March 2001
- W.P. 314** **U.S.MISHRA AND MALA RAMANATHAN** *Delivery Complications and Determinants of Caesarean Section Rates in India - An Analysis of National Family Health Surveys, 1992-93*, March 2001.

This work is licensed under a
Creative Commons
Attribution – NonCommercial - NoDerivs 3.0 Licence.

To view a copy of the licence please see:
<http://creativecommons.org/licenses/by-nc-nd/3.0/>