A MATHEMATICAL STUDY ON INCOME DISTRIBUTION AND ESTIMATION OF INEQUALITY WITH REFERENCE TO MIZORAM

A THESIS SUBMITTED FOR THE AWARD OF THE
DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS

BY

JV NUNCHUNGA

TO

THE DEPARTMENT OF ECONOMICS
SCHOOL OF ECONOMICS, MANAGEMENT AND INFORMATION SCIENCES
MIZORAM UNIVERSITY : AIZAWL
2009

MIZORAM UNIVERSITY

AIZAWL : MIZORAM

May 2009

DECLARATION

I, JV.Nunchunga, hereby declare that the subject matter of the thesis entitled '***A mathematical study on income distribution and estimation of inequality with reference to Mizoram***' is the record of the work done by me, that the contents of this thesis did not form basis for the award of any previous degree to me or to the best of my knowledge to anybody else; and that the thesis has not been submitted by me for any research degree in any other University/Institution.

This is being submitted to Mizoram University for the Degree of Doctor of Philosophy in Economics.

21/5/09 21/5/09 21/5/2009

(THANGCHUNGNUNGA) (THANGCHUNGNUNGA) (JV.NUNCHUNGA)

Head of Department Supervisor Candidate

HEAD
Department of Economics,
Mizoram University
Aizawl

Professor,
Department of Economics
Mizoram University
Aizawl

AKNOWLEDGEMENTS

It is a great joy for me to have completed my thesis entitled '*A mathematical study on income distribution and estimation of inequality with reference to Mizoram*' which is the result of five years of intensive study. Despite the importance of its study this particular topic has, to the best of my knowledge, remained untouched among the scholars across this region, and this is an important step to throw some light on its importance and relevance to reslide the economic pie more evenly in favour of the economically weak sections of the people.

I am finding it hard to express my heartfelt indebtness to my teacher Dr. Thangchungnunga, Professor, Department of Economics, Mizoram University as my supervisor for his guidance, encouragement and sincere endeavour in the accomplishment of the present study. I consider myself lucky enough to work under his guidance.

My thanks are due to the Governing Body of J. Thankima College for allowing me to avail study leave, and my dear colleagues in our department for bearing necessary class burden during my leave. I wish to record my special thanks to my dear friend Mr. Lalthlamuana, Lecturer, Department of Political Science, J. Thankima College for his valuable suggestions and endless helps he had rendered toward myself

and my family. Financial assistance from Higher and Technical Education Department is also thankfully acknowledged.

My special thanks are due to my beloved mother MC. Phawngi, for her constant prayer support and endless loving care. I would not have been able to complete this thesis but for the love, protection and guidance of my dear GOD. I thank to Him from the core of my heart.

21/5/09

(JV.NUNCHUNGA)

Note from the Supervisor

I do appreciate the view expressed by the examiner in his report, particularly his seriousness and the spirit with which he made appropriate comments. This is a kind of scholarly insight which is of immense value to the scholar. In spite of his limited capacity, the shcolar had tried hard to incorporate the suggestions and reduced the chapter numbers from ten to seven. As we found it appropriate to present the profile of Mizoram at the begining, and that was done at the introductory chapter section 'C'. In the meantime, chapter four was devoted to analysis of various states in India to keep the research link complete.

However, as provided for in the Ordinances, the title of the thesis cannot be altered without prior permission of the concerned School Board (OC-4/8), and in view of this technical problem, I very much wish that the scholar is given the liberty of using his own original title. If this is met with your kind approval, I shall be extremely grateful.

25/5/09

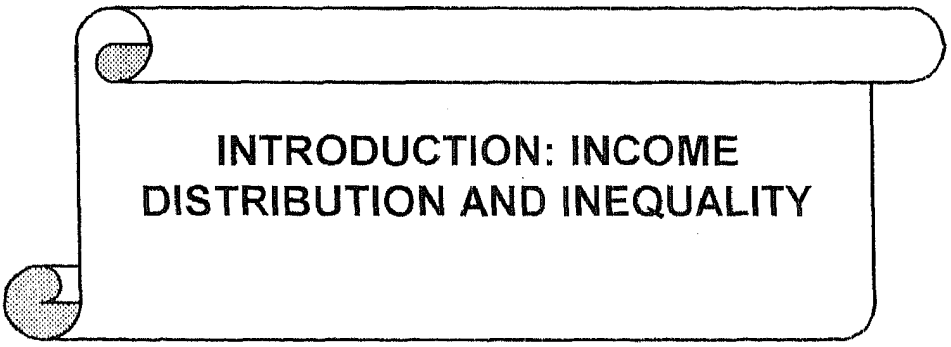
(Prof. T.C NUNGA)
Supervisor.

CONTENTS OF THE THESIS

LIST OF TABLES/FIGURES

LIST OF DIAGRAMS/GRAPHS

CHAPTER – 1



INTRODUCTION: INCOME DISTRIBUTION AND INEQUALITY

INTRODUCTION

The subject matter of income distribution and inequality are of crucial economic issues in global level in general and within a country in particular. This is evident in the shift of focus from theoretical studies to the empirical study on distributive impact of development on various segments of society

This chapter is divided into three sections. Section A deals with some concept like income distribution and inequality while section B explains importance, methodology, objectives, hypothesis, limitations, etc of this study. The last section describes profile including certain socio –economic scenario of Mizoram

SECTION A: INCOME DISTRIBUTION

The subject matter of the theory of income distribution is the study of the determination of the share of the factors of production in the total output produced in the economy over a given period. The distribution of income may be *functional* or *size distribution*. In the *theory of functional distribution of income* we study the principles governing the rewards or remuneration of various factors of production for their services or functions performed by them in the process of production[1]. The *size*

[1] JM Joshi and Rajendra Joshi, *Micro-economic theory, An analytical approach*,(Delhi: Wishwa Prakashan, 5th edition, 1994), p-345.

distribution of income or what is also called *Personal distribution of income* refers to the distribution of national product not on the basis of individuals' contribution to GNP, but on the basis of productive services owned and commanded by them, usually expressed as distributed among different households in the economy.

The *functional distribution of income* has been treated as primarily a reflection of choices made by individuals through the market. The value of factors is derived from the value of the final product that they cooperate in producing; and the values of final products in turn are determined by choices of consumers among the alternatives technically available. The size distribution of income on the other hand, when it has been analysed at all, has been treated as largely independent of choices made by individuals through the market, except in so far as it affects the price per unit of the factors of production. A difference among individuals or families in the amount of income received are generally regarded as reflecting either circumstances largely outside the control of the individuals concerned, such as unavoidable chance occurrences and differences in national endowment and inherited wealth, or collective action and as donation and subsidies. Milton Friedman says that "*The traditional theory of distribution has little to say about the distribution of income among the individual members of the society, and there is no corresponding body of theory that does. The absence of a satisfactory*

theory of personal distribution of income and of a theoretical bridge connecting the functional distribution of income with the personal distribution is a major gap in modern economic theory"[1].

The present study is confined only to the study of size distribution of income of a representative cross section of society.

A.1.1. SIZE INCOME DISTRIBUTION

Size distribution of income can be defined as *'the way in which total national income is divided among the households in a country'*. The distribution takes place on the basis of the Socio-Politic-Economic system of a country or the evaluation of effort, labour, capital and efficiency displayed by individuals in a society[2].

It means different things to different people. Much of the analysis in this study focuses on the distribution of family income while some economists would argue that per capita income is even more appropriate. Figures on income distribution provide insight into many social, political and economic problems. In dealing with the question of income distribution we should bear in mind that if distribution has a middle and a top it must also have a bottom and somebody must be there. The question is why they are there and how much do they get?

---

[1] Milton Friedman, *Income distribution,* (1971) p-14-18, 226 in JM. Joshi and Rajendra Joshi, *op cit.* p-346.

[2] B.N. Ahuja *: Dictionary of Economics,*[New Delhi : Academic (India) Publishers], p-88

Despite the importance of its study, the subject of income distribution has not occupied the central position in economics that one would expect. A glance at the titles in the economic section of any library and bookshop will show that there are relatively few books devoted principally to this topic, especially mathematical and econometrical approach. An analysis of two leading professional journals in Britain and the United States, the American Economic Review and the Economic Journal, reveals that out of more than 1500 articles published in the last 10 years, only some 100 dealt with income distributional question in any form. It is probably fair to say that most textbooks on economics give more prominence to economic efficiency, growth, employment, and the international trade, than to the issues with which this study is concerned[1].

This relative neglect of the distribution of income has not of course passed completely unnoticed and in recent years it has been one of the main criticisms of 'mainstream' economists made by radical economist in the United States and elsewhere. According to Lindbeck (1971) "*The development of the theory and analysis of distribution problems has been considerably weaker than the development in many other branches of economic during the period since World War II*"

[1] D.K. Mal, *Distribution of Income and Wealth during Plans*, (Firma KLM Pvt. Ltd.),

It would be wrong to suggest that economists have always neglected the subject of distribution; indeed classical writers gave it a great deal of importance. Economists' interest in income distribution is as old as modern economics itself. It has cyclical upswings and downswings. Certainly it enjoyed a peak during the time of Ricardo, who wrote to Malthus that "*Political economy you think is an inquiry into the nature and causes of wealth...*". just as distribution theory reached peaks of popularity during the time of Wicksell - Clark - Wicksteed and, in early 1930's of Hicks and Douglas. The great depression, World War II and the Keynesian revolution brought about a marked decline in professional concern about distribution theory that, until recent times, revived only sporadically. (Ferguson 1972).

A.2. THE CONCEPT OF INEQUALITY

The concept of inequality or equality involves social judgment and as such opinions differ as to how 'inequality is defined'.

As Bauer and Prest (1973) have observed, the term may either be applied quite generally to cases where income or wealth are simply different, just as we might refer to two persons being of unequal height, or be restricted to cases where there is a moral content (i.e. a presumption that equality would be desirable). The mere existence of disparities in income and wealth is not a sufficient basis for statement

about justice or injustice. We need to establish that the people involved are comparable in other relevant aspects. The other relevant aspects are a matter of social judgment, and here are some of the important factors which are likely to be taken into account[1]

Resources and needs: An income received by an individual is to be viewed in relation to his needs as represented by his age, size of family, health, level of education, etc. What is adequate for a healthy person or children may not be adequate for unhealthy or adult man. Therefore, the inequality between individuals is to be assessed in the light of one's need and resource.

Tastes and choices: An individual differs in their choice, preference and taste that lead to different decisions that cause wide difference in their income and inequality. Some individual may prepare to accept low wage and low responsibilities than higher wage and heavy responsibilities. They may also differ in regard to their choices for saving, investment and risk taking that result in a wide disparity in their incomes.

Age and life cycle: The distribution of income is also influenced by the age and life cycle of an individual. A person may be richer than the other due to his oldness and had chance of better investment opportunities. A

[1] A.B. Atkinson, *The Economics of Inequality* (Oxford University Press, 1975), p-5.

person may choose to forgo earnings when young to train for a skilled job, whereas other does not due to their oldness.

Opportunity and outcome: The impact of random chance also plays an important role in the distribution of income. The opportunity and chance of one person may be totally different from others that lead to wide disparities in their income, which means a wide range of inequality. If we are concerned only with equality, then all that is relevant is how they start out - whether the expectation of success is the same for anyone. If we are concerned with equality of outcome, then the working of chance becomes a matter for concern.

Thus we conclude that any inequality in income is not injustice, so too, we should not conclude that difficulties of comparison mean that distributional questions should be ignored.

In this text, the term inequality will mean the mere existence of disparity in income.

A.1.2.1. AXIOMS FOR INEQUALITY

For any formula to be termed as good they have to satisfy certain axioms. Henceforth, any measures of inequality so developed are also to be judged in accordance with their ability to satisfy the given axioms. A consistent and reliable formula for measuring income inequality must satisfy the following axioms.

Let $x_1 \leq x_2 \leq x_3 \leq \ldots\ldots \leq x_n$ is an ordered income distribution among *'n'* individuals denoted by a non-negative vector $x = (x_1, x_2, \ldots\ldots x_n)$. The inequality measure $\theta(x)$ is defined as a unique function of $x_1, x_2, \ldots\ldots x_n$ satisfying certain desirable properties. These properties may not all be considered desirable at the same time[1].

1. If $y = \alpha x$ $(\alpha > 0)$, then $\theta(x) = \theta(y)$.

   This axiom requires that a proportionate increase in overall distribution of income should not result in a change of inequality, which implies that inequality measure is independent of the scale of measurement. This axiom is known as *Scale – invariant or Mean-independence.*

2. If the new distribution y is obtained from x by adding a constant amount *'d'* to incomes of all individuals, if it follows that -

   (a) If d > 0, $\theta(y) < \theta(x)$

   (b) If d < 0, $\theta(y) > \theta(x)$

   This axiom requires that equal addition (subtraction) of a constant number to all individuals reduces/increases inequality level. This

[1] Nanak C Kakwani; *Income Inequality and Poverty, Methods of estimation and Policy applications* (Washington: Oxford university press, 1980), p-65

axiom corresponds to *Dalton's principles of equal additions to incomes*[1].

3. Inequality remains unaffected if a proportionate number of persons are added at all Income levels. This axiom corresponds to *Dalton's principle of proportionate addition of persons*. Any inequality measures associated with Lorenz curve always satisfy this axiom.

4. If a transfer of income $d < \frac{h}{2}$ takes place from a person with income x to a person with lower income (x - h), the inequality strictly diminished, where h stands for the difference between the two income.

If the transfer of income takes place from the richer to the poorer subject to the restriction $d < \frac{h}{2}$, the new distribution is Lorenz superior. Because the restriction $d < \frac{h}{2}$ ensures that the transfer is not so large as to reverse the relative position of two (groups of) individuals. This process of transfer is called '*The rank preserving equalisation*'. There will be a maximum reduction in equality if the transfer is $d = \frac{h}{2}$

[1] For proof: ibid, P- 66

5. $\theta(x) = \theta[\pi(x)]$, where π is any permutation of x. This axiom implies symmetric inequality measures, which means that if two individuals interchange their income positions, inequality remains unchanged. The inequality depends only on the frequency distribution of incomes and not on the order in which individuals are ranked within the distribution. This axiom is called '*Symmetry axiom*'.

6. $0 \leq \theta(x) \leq 1$. When every individual receives equal proportion of income, then $\theta(x)$ = 0 and when one individual receives all the income, then $\theta(x)$ = 1. This axiom is called *'Normalization'*.

7. *Continuity Axioms* requires that the inequality index to be continuous in the domain of income distribution.

8. *Sub-group Invariant* requires that, *ceteris paribus*, an increase in inequality in every sub-group within a population should lead to an increase in overall inequality.

A.2.2.1 INCOME INEQUALITY MATRICES

Income inequality metrices or income distribution metrices are techniques used by economists to measure the size distribution of income among members of a society. In particular these techniques are used to measure the inequality, or equality of income within an

economy. These techniques are typically categorised as either absolute measures or relative measures.

Absolute measures define a minimum standard, then calculate the number (or percent) of individuals below this threshold. These methods are most useful when determining the amount of poverty in a society. Examples include Poverty line, Poverty index[1]. **Relative income measures** compare the income of one individual (or group) with the income of another individual (or group). These measures are most useful when analysing the scope and distribution of income inequality. Relative Lorenz curve, Gini coefficient, Robin Hood index, Theil index, Standard deviation and Percentile distributions[2] are some of the best kown measures of income distribution.

SECTION B : METHODOLOGY OF THE STUDY

B.1. Importance and relevant of the study

Every study and work has a specific purpose to focus on and this study is no exception as far as the goal is concerned. The following few

---

[1]Amartya Sen developed as : $I = (P/N)(B - A)/A$, where, P = number of people below the poverty line, N = total number of people in society, B = poverty line income, A = average income of those people below the poverty line.

[2] One percentile is compared to another. For example, it might be determined that the income of the top ten-percentile is only slightly more than the bottom forty-percentile. Or it might be determined that the top quartile earns 45% of the society's income while the bottom quartile has 10% of society's income. The interquartile range is a standard percentile range from 25% to 75%

lines will summarize where this study will go and what will be the means for achieving that goal.

The study of income distribution and severity of the inequality have much and wide importance as well as relevance in the economy especially in developing economies like ours. Income distributions are used by economists to answer a wide range of questions as follows. Is the income level of individuals more equal today than it was in the past? Do taxes necessarily lead to greater equality in the distribution of personal income and wealth? The study of inequality are useful in dealing with the questions like are the developing economies characterised by greater inequality than advanced economy? What kind of planning technique should be applied to have a higher rate of economic development? These questions have attracted a good deal of attention in India in recent years. Apart from enabling us to answer these questions, the income distribution throws light on the pattern of future demand for goods and services, hence enabling us to estimate the levels of personal savings. When the pattern of income distribution and consumption expenditure elasticities of demand for different components are available, it is possible to compute elasticities for different component, showing how planned changed in aggregate consumption would affect the demand for the individual items. In addition, the distribution of consumption is implicit in all welfare

comparisons. The study of income distribution is important to find out and identify rural families who are under poverty line, in order to enable government to formulate suitable scheme to be implemented in an integrated manner by various department for the benefit and upliftment of the poorer section of the society. For these reasons, a study of income distribution and inequality would appear highly relevant and much important.

B.2. OBJECTIVES OF THE STUDY

1. To calculate Gini coefficient and other related inequality measures for Mizoram.
2. To have temporal comparison of income inequality in Mizoram
3. To identify the most suitable distributional form of income distribution for Mizoram.
4. To suggest a suitable mathematical formula to measure growth of per capita income that will take into account the growth rate of all sections of the population.

B.3. TESTING OF HYPOTHESIS

A statistical hypothesis is some statement or assertion about a population or equivalently about the probability distribution

characterising a population, which we want to verify on the basis of information available from a sample.[1]

In this research, the level of significance α, also known as the size of critical region or region of rejection is kept at 5% which means that the level of confidence interval also known as confidence limit or fiducial limit is 95%, i.e. that the probability at which a sample fall within a region of acceptance is 0.95. This can also be interpreted in another way. The probability of committing a type I error i.e. rejection of True H_0 is 0.05.

In this way, the following three hypotheses are to be tested against appropriate alternative hypothesis with a 5% level of significance.

1. The income distribution is positively skewed i.e. skewed to the right.
2. Income Gini coefficient of Mizoram is smaller than that of all India Gini coefficient.
3. Income inequality in Mizoram is increasing

B.4. Sources of Data

As indicated in this research proposal, samples are collected through field study during the month of November and December 2006

[1] SC.Gupta & VK.Kapoor: *Fundamentals of Mathematical Statistics* (New Delhi: S.Chand & Sons, 9th revised edition, reprint, 1999), p-16.1

relating to income from primary, secondary and tertiary sector. Since direct and open questioning quite often fail to extract a correct answer from the respondents, we also made an inquiry of the expenditure incurred by the households so as to arrive at the correct estimate of income. The data were collected by direct and indirect personal interview through schedule questionnaires. Since there is always a tendency to underestimate income among the households but to overestimate expenditure, careful extrapolation through scholarly assessment is made to avoid estimating errors. As such there is the possibility of sampling and non-sampling errors in spite of the utmost care given to the final tabulation of data so collected.

In addition, there are different types of secondary data taken from internet and various statistical handbooks of Mizoram, State Domestic Product of Mizoram, Socio-Economic Review - Mizoram, Village Level statistics of Mizoram-2003, published by Directorate of Economic & Statistics, Govt. of Mizoram, Statistical Abstract (Department of Agriculture & Minor Irrigation, Mizoram) published by Agriculture Department, On all India third census of Small Scale Industries in respect of Mizoram state compiled & Issued by Directorate of Industries Mizoram, various issues of Natural Resources mapping of Mizoram using Remote sensing & Geographical Information System (A project report) published by State Remote sensing center, Science, Technology

and Environment, Planning Department, Aizawl, and many more information brochure received from various directorates of Mizoram government. Regarding the quality and reliability, it is hoped that it would be of a high degree of accuracy and reliability.

Some data relating to income distribution and Gini coefficient in respect of various countries of the world are obtained from various reports of UNO through its website, world bank and other agencies. The reliability and accuracy of these data depends on the concerned organisation.

B.5. STATISTICAL METHODOLOGY EMPLOYED

Complete enumeration of the population in the study area is not possible from the viewpoint of time, accuracy, costs involved, manpower requirements, etc. and as a result it is inevitable to resort to the use of sampling technique. Sampling method is to be used with extreme caution. Firstly, the most important task is to determine the size of sample to be drawn from the population, so that the population parameter may be estimated with a specified degree of precision.

The state is fairly rich in data provided routinely by the Department of Economics and Statistics. It is not unusual for the different agencies to arrive at different figures of statistical data. According to the estimate given in the Statistical Handbook of Mizoram

(2000), the percentage of people living below poverty line (BPL) in Mizoram was 19.47 whereas Village Level statistic of Mizoram (2003) registered below poverty line population as 49.93%. In the mean time by 2006, the Food, Civil Supplies and Consumer Affairs Department, with the voluntary help of the Young Mizo Association (the most trusted NGO in Mizoram) and Village Council, had verified the income status of the households to classify those who are eligible to receive rice ration at BPL rate and identified 68,000 families, that means the percentage is 39.62%. Incidentally, The President of India, Dr. APJ. Abdul Kalam, on the 2nd Convocation of Mizoram University held on 16th October 2006 said the BPL Percentage as 15%. The question is which one is reliable? Any way, one thing is clear, some data are not reliable, and in this situation it is warranted for the researcher to conduct an independent investigation. It is strongly believed that the figure 49.93% for the year 2003 and 39.62% for 2006 are totally wrong and hence it is safe to say that the BPL is in between the 15% and 19.49%. This will be used for determining the sample size.

The degree of precision is usually determined in terms of:

(i) The margin of error permissible in the estimate (d)

(ii) The confidence coefficient (1-α) with which we want this estimate to lie within the permissible margin of error. In this study it will be sufficient if the level of d is 5% and 1- α is 95%. We know that

$\sigma = \sqrt{\frac{PQ}{n}}$, where P = The percentage of BPL. Q = 1-P, n = the sample size. Hence, we may put,

$2\sqrt{\frac{PQ}{n}} = 5$ or $n = \frac{4PQ}{25}$

Now, for any value of P between 15 and 19.49, the product PQ lies between 1275 and 1569 and the corresponding n lies between 319 and 392. To be on the safe side, Approximately 392 can be taken as the initial estimates of the sample size. However, to be more accurate or to achieve greater precision and for reduction of sample collection costs elaborate procedure may be followed to determine the sample size as under.

Here the population is divided into two mutually exclusive groups – Below poverty line (BPL) and Above poverty line(APL). From Probability theory, we know that

$P(|p-P| \geq d) = \alpha$,

Simple random sampling is assumed, and p is taken as normally distributed. We have

$\sigma_p = \sqrt{\frac{N-n}{N-1}}\sqrt{\frac{PQ}{n}}$. Hence the formula that connects '*n*' with the desired degree of precision is $d = t\sqrt{\frac{N-1}{N-1}}\sqrt{\frac{PQ}{n}}$, where *t* is the abscissa of the normal curve that cuts off an area of α at the tails. Solving for '*n*', we get

$$n = \frac{\frac{t^2 PQ}{d^2}}{1 + \frac{1}{N}\left(\frac{t^2 PQ}{d^2} - 1\right)},$$

For practical use, an advance estimate p of P is substituted in this formula. If N is large, a first approximation is $n_0 = \frac{t^2 pq}{d^2}$, If $\frac{n_0}{N}$ is negligible, n_0 is the satisfactory approximation of n. If not, the sample size is

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} \qquad \text{Or} \qquad n = \frac{n_0}{1 + \frac{n_0}{N}}.$$

In Mizoram there are 1,71,631 families[1], the required sample size may be estimated as -

d = 5% = .05, p = 0.1949, q = 1-p = 0.8051, α = 5%, t =2,

$$n_0 = \frac{2^2(.1949)(.8051)}{(.05)^2} = 252.$$

Here, $\frac{n_0}{N}$ is negligible the required sample size is 252.

[1] Directorate of Economics & Statistics, *Village Level statistics of Mizoram-2003* (Aizawl: Govt. of Mizoram, 2004), p-v. For determining sample size the no. of households for the year 2003 is used because there is no data for 2006.

B.6. SURVEY AND DATA COLLECTION

In Mizoram, there are 8 districts and 22 Rural Development Blocks. For the purpose of data collection, it was given a careful thought whether districts will be taken as strata or not. It was agreed to follow the broad classification by treating each district as constituting a stratum.

For allocation of sample, we followed Bowley's principle of sample allocation of sample is used. Before collecting the sample we designed a sampling frame consisting of villages and some villages are selected using cluster technique of sample survey. After a village is selected sampling units are listed out and the final samples are sobtained using simple random sampling with small application of judgment sampling technique.

While the required sample size for precision is 252 households/families, we took a total of 256 households/families covering 1579 persons. The optimum sample size for each district and actually drawn from such district is given in the annexure No. 1.A

For estimating household income an economy is divided into 3 sectors viz; primary, secondary and tertiary sector. Primary sector includes Agriculture & Horticulture (growing of field crops, fruits, nuts,

seeds and vegetables, plantation, foreyard & backyard cultivation, etc) Livestock (slaughtering, preparation and dressing of meat, production of milk, eggs, honey, silk, etc) forestry, fishing and all other related activities including incomes from manual (paid) labours/ paid labourers on daily basis. The production of this sector is calculated by production approach except income from manual daily labourers at 2006 current year prices. However, some standard adjustments are made for this sectoral product[1].

The secondary sectors includes mining & quarrying (production of stone, cubic stone, stone chips/dusts, boulders, sand stone, and all types of mineral products from the soil), manufacturing (registered and unregistered) activities, construction (all types of new construction, repairs and maintenance of building), gas and water supply, rent of house and land, incomes from artistic and handicraft products (village level). For estimating this sectoral contribution to the total production a mixture of income and expenditure is used. For mining & quarrying income method is used with a deduction of input costs of 33% from the total income[2]. For construction expenditure method is used and for others income method is employed.

---

[1] More detail is available in the subsequent paragraphs.
[2] Directorates of Economics & Statistics, *State domestic product of Mizoram* (Aizawl: Govt. of Mizoram, 2004), p-6

The tertiary sector includes transport & communication, trade, hotels, restaurants, wage & salary of government employees including muster roll, work charge, contract employment, self-employment and all other types of service activities. For this sector, income method is used to arrive at the final figure for the sector.

There is a special sector called "others" which includes income from ancestors, lottery/lucky tickets, compensation, reward/prizes, pension benefits including old age pension, any form of grant/subsidy receive from the government or Non Governmental Organizations, charitable gifts, etc. If this sector were eliminated/absent its contribution may be added to tertiary sector. All the valuable and uncountable services of housewife and other members of the family that are honestly rendered for family are excluded while estimating income.

B.7. STATISTICAL TOOLS EMPLOYED

In this study various statistical tools like Snedecor's F- test, Student's t test, χ^2- distribution, Karl Pearson's correlation coefficient, Rank correlation, Contingency table, Z – test, Maximum likelihood estimation, Method of moments for estimation, etc are employed. No introduction to highlight the technique is required for all these topics are readily available in statistical and econometric textbooks. Computer

software like SPSS, Excel and SYSTAT are frequently employed for this study.

B.8. LIMITATIONS AND ASSUMPTIONS OF THIS RESEARCH

1. Since census is conducted at an interval of 10 years, the population figure of Mizoram and that of the districts for the year 2003 are projected figure. For determining the sample size the number of household for the year 2003 is used due to the non-availability of the figure for the year 2006. However, the gap of just 3 years will not make any significant effects on the output of the study.
2. While collecting samples, simple random sampling (SRS) technique is applied with a limited degree. That is, most of the samples are collected using SRS but under a peculiar situation, the researcher is occasionally compelled to use judgment sampling, which is also very efficient at the hand of an expert.
3. For approximation of income for agricultural labourers/farmers their agricultural output like ginger, chilies, potato and other items which are not supposed to be marketed (except rice) are not taken into account due to the fact that rural cultivators/farmers seldom record their agricultural products, their products are meant chiefly for their family consumption and a reliable estimate

is not available. Instead of imputing/or guessing the value, their value is excluded for determining their income. This is the chief limitation of this study.

4. The exclusion of production for home consumption (above point No. 3) from income estimation leads to a relative substantial underestimation of income in less developed region like Mizoram. This, in turn, exaggerates income disparities between the rich and the poor. To compensate this, Kutznet (1966) makes an approximation. He assumes that the missing output would be a quarter of the total product of agricultural sector and concludes that the relative per capita income should be raised by roughly one – tenth[1]. The same adjustment is done here, i.e. the agricultural production is raised by quarter of the product of the sector. This eliminates/compensates the limitation of point No. 3 to some extent, but not entirely.

5. Again, another adjustment/enhancement is made on agricultural production to incorporate the production of 'Mini field or Huan (in Mizo)' in and around the compound of family dwelling place by increasing the output of the sector by a factor 0.22%[2]

---

[1] AB. Atkinson, *op cit*, p-240
[2] Directorates of Economics & Statistics, *State domestic product of Mizoram, op cit, p-4*

6. The income also includes their sure/expected income. Suppose a particular family rear a pig for commercial purpose and there is every likelihood that the same is expected to sell during 2006, those types of expected income are included in the estimate of that particular year. This income estimate also includes all types of monetary income received during 2006 irrespective of the sources.

7. There are different systems of counting the amount of paddy yield in Mizoram. However, the basic unit of measurement is the same i.e. a 'kerosene can' which liquid capacity is 15 litres. The 4 tins are called one 'Kawt' ('kawt' means to carry by shoulder) in south Mizoram, 3 tins are called one 'Phur' (Phur means on one's back), but in the north and in the eastern side the measurement is said simply as 'tin'. Therefore three (3) kawt, four(4) Phur and twelve (12) tins of paddy are the same. The price of Paddy is estimated at a rate of Rs. 100/- only per tin for this is the prevailing price in the rural areas where paddy is grown. Its real equivalent value in urban area is much higher than Rs 100/- per tin, but the actual price received on transaction by the farmer – seller, that is, Rs 100/- has been taken as the price of one tin of

paddy. The standard conversion rate of paddy to cleaned rice is 66%[1].

8. The price of ginger, potato, chilies, and all other marketable products are varying from place to place and year to year. Depending upon the backwardness, distance from main road, the prevailing price in the previous year was taken as the most reasonable price. Considering all relevant possibilities that can affect their prices, it was thought reasonable to assign a predicted value to their prices if the products are not yet marketed.

9. The monetary value is calculated on the basis of their respective local market prices because of the fact that their products are seldom sold in the super market or in urban areas.

10. This research employed a methodology of positive economics which deals with finding of facts or the state of existing order and has nothing to do with normative economic. It is only an attempt to find things in their existing order. The '*why and how*' of economic order with any doses of prescription has not been dealt with.

11. The income data collected is family income. If some family/families is/are financially not independent, then that family,

[1] Directorate of Agriculture, *Agriculture handbook of Mizoram (1999)*, (Aizawl: Govt. of Mizoram, 1999),p-18

along with the member(s), is clubbed with the parent/dependent family.

12. The word 'household' and 'family' may be used interchangeably though they are different. In these samples, fortunately, there are no households that are financially dependent (so as to call them a single family) on others so that the two words, even if used interchangeably, may not matter at all

B.9. CHAPTERISATION OF THE THESIS

This thesis is divided into seven chapters. The content of each chapter is as under –

Chapter one introduces the concept of income distribution, inequality, axioms of inequality measures, importance and relevance of the study, objectives of the study, hypothesis, sources of data, sample collection, tools of analysis, assumptions, limitation of the study and profiles of Mizoram. *Chapter two* explains theories on distribution of income that describe functional income distribution, size income frequency distributions, and also various measurement of inequality. *Chapter three* examines the income distribution at the global level and trend of inequality. *Chapter four* presents the state-wise analysis of income distribution and inequality while *Chapter* five concentrates on Mizoram in respect of income distribution, curve fitting and calculation of

inequality index using various formulae. In *chapter six*, we see the causes and effects of inequality. In the last chapter, i.e. chapter seven, findings and suggestion of this study are presented.

SECTION C: PROFILE OF MIZORAM

At the time of independence, Mizoram was one of the hilly districts of Assam state and attained the status of Union territory on January 21, 1972. On the signing of the so called ***'Mizoram Peace Accord'*** on June 30, 1986 between Government of India and Mizo National Front (who fought complete sovereignty and Independence for Mizoram since 1966) and consequent upon the passing of constitution (53rd) Amendment Bill and the state of Mizoram Bill (1986) by the Parliament on August 7, 1986, statehood was granted to Mizoram on February 20, 1987 to become the 23rd state of the Indian union. Some of her statistic is depicted as below-

Headquarters	:	Aizawl	Area	:	21,087Sq.km
Population	:	8,88,573(2001)	Literacy	:	88.49%
Male	*:*	*4,59,109*	*Male*	*:*	*90.69%*
Female	*:*	*4,29,464*	*Female*	*:*	*86.13%*
Density	:	42	Sex ratio	:	938
No. of RD blocks	:	22	Road length/100sq.km	:	17.93
Urban population	:	49.45%	Infant Mortality rate	:	0.38
Electrified Houses:		75.09%	No. of Villages	:	710

C.1. LOCATION

Mizoram is bounded by Myanmar in the east and south, Bangladesh and Tripura state in the west, Assam state and Manipur in the north. It has an international boundary of 404 km and 318 km with Myanmar and Bangladesh respectively. The lengths of its inter-state boarder with Assam, Tripura and Manipur are 123 km, 66 km and 95 km respectively. Mizoram has a geographical area of 21,081 Sq.km, sandwiched between $92^0$15' E to $93^0$29' E longitudes and $21^0$58' N to $24^0$35' N latitudes[1].

C.2. CLIMATE

The climatic condition of Mizoram is in general cool and wet. It enjoys a moderate climate owing to its tropical location. It is neither very hot nor very cold throughout the year. Mizoram falls under the influence of southwest monsoon. Short winter and long summer with heavy rainfall are the main characteristics of seasonal variation. Based on rainfall, temperature, humidity, wind, etc, four different seasons are observed as - *winter season* - starts from December to first half of February, *spring season* – starts from the second half of February to the first half of March, *summer/rainy season* – starts from second half of

[1] Directorate of Economics & Statistics, *Statistical handbook of Mizoram 2006*, op cit , p-xv

March to the second half of September and Autumn – starts from the month of October to the second half of November.

In autumn, the temperature usually ranges from 18^0C to 25^0C and in winter, temperature is generally between 11^0C and 23^0C. The summer temperature is in between 21^0C to 31^0C. The minimum and maximum temperature (on monthly basis) recorded during 2004 and 2005 is 11.20^0C and 28.57^0C. The minimum and maximum relative humidity (on monthly basis) recorded during the last two years is 17% and 97.2% respectively. The annual rainfall for the last 7 years are as 1999 – 2600mm, 2000 – 2883mm, 2001 – 2535mm, 2002 – 2648mm, 2003 – 2546mm and 2005 – 2094mm.

C.3. RIVERS, MOUNTAINS AND FORESTS

Rivers like Tlawng –185.15kms, Tiau –159.39kms, Chhimtuipui River – 138.46kms, Khawthlangtuipui - 128.08kms, Tuichang – 120.75kms, Tuirial – 117.53kms, Tuichawng – 107.87kms, and their respective tributaries, drain Mizoram. Mizoram is characterised by mountainous terrain of tertiary rocks. The mountain ranges are inclined in north to south alignment between which are found the deep gorges of rivers. The elevation ranges from 40 metres at Bairabi to 2157 metres at Phawngpui, the highest peak in Mizoram[1].

[1] Directorate of Economics & Statistics, *Statistical handbook of Mizoram 2006*, op cit, p-v

We find three types of forest viz. Tropical wet evergreen forest, Tropical semi-evergreen forest and Montane sub – tropical pine forest. Forests in Mizoram support variety of Flora and Fauna. More than 400 medicinal plants and 22 species of Bamboo have been reported to exist. The forest produce during 2005-06 was valued at 257.97 lakhs. As per the last estimation done by Forest Survey of India (State of forest report, 2001), the percentage of forest cover in Mizoram was ranked at third with 82.01%, just after Lakshadweep (89.91%) and Andaman & Nicobar Island (84.01%) among all the states and Union territory of India[1]. There are 8 administrative districts in Mizoram.

C.4. Economy

Mizoram has per capita income of Rs 21,327/- and Rs 26,673/- in 2003-04 and 2006-07 at current prices respectively with a Gross State Domestic Product of Rs 2,96,549 lakh at current Prices (1999- 2000) series during 2006-07. The plan outlay during 11th Five-year plan stood at Rs 4,500/- crore[2].

By 2006, Mizoram has 4,67,159 total workers of which 3,62,450 are main workers and 1,04,709 are marginal workers. Work participation rate is 52.57%. Mizoram is a schedule tribe dominated state where the

---

[1] Planning & Programme Implementation department, op cit, p-25
[2] Planning & Programme Implementation department, *Economic survey 2006-07(Mizoram)*[Aizawl: Govt. of Mizoram, 2006), p-1, 15, 53,

percentage of schedule tribe population is 94.46%, schedule caste 0.03% and others 5.51%. Regarding religion, the Mizo are mostly the followers of Christian faith where the percentages of different religion are Christian 86.97%, Buddhist 7.93%, Hindu 3.55%, Muslim 1.13% and others 0.42%[1].

C.4.1. AGRICULTURE AND ALLIED SECTOR

One of the foremost important ingredients for economic development is a sustained growth in agricultural production. If we look back to the economic development of our global history, it was empirically established that success in agriculture was a precondition for development. As the tenth Five Year Plan has rightly said, "*Agriculture development is central to economic development of the country*". Any change in agriculture sector – positive or negative has a multiplier effect on the entire economy. The agricultural sector acts as a bulwark in maintaining food security and in the process, national security as well. To maintain ecological balance, there is a need for sustainable and balanced development of agriculture and allied sectors.

There is 6,31,000 Ha of estimated area available for horticultural crops, of which 35,984 hectares are actually utilised by 2000-01. Mizoram as a whole has a total gross cropped area of about 1,04,689

[1] Planning & Programme Implementation department, op cit, p-15.

hectares; against this the gross irrigated area was 11,629 hectares only. Fisheries in Mizoram are only fresh water fisheries including both cultured and captured fisheries[1].

TABLE NO. 1.1

(Contribution of agriculture and allied sector in the NSDP/GSDP)

(Rs. are in lakh)

Sl. No	PRIMARY SECTOR	2001-02 (NSDP)	2002-03 (NSDP)	2003-04 (NSDP)	2004-05 (GSDP)*	2005-06 (GSDP)*
1	Agriculture	Rs 36,814	Rs 37,615	Rs 38,906	Rs 30,790	Rs 31,542
2	Forestry	Rs 1,239	Rs 1,340	Rs 1,108	Rs 2,059	Rs 2,181
3	Fishing	Rs 2,405	Rs 2,411	Rs 2,714	Rs 2,077	Rs 2,113
	Total	Rs 40,845	Rs 41,561	Rs43, 642	Rs 34,927	Rs 35,836

Source: Statistical handbook of Mizoram 2006 & * Statistical handbook of Mizoram 2008 at constant (1999-2000) price

Agriculture forms the backbone and strength of Mizoram economy. The net production of agriculture & allied sector at factor cost at current prices (in 1999-2000 series) are given in table No. 1.1

Out of the total forest cover of 16,717 sq.km, 7909 sq.km is classified as Reserved forest, 3568 sq.km Protected forest and 5240sq.km Unclassified forest[2] respectively. The contribution of Primary sector is estimated at 18.52% of total production in Mizoram during 2006-07[3]. The percentage contribution of the sector in the state economy for various years are given in the following table No 1.2

---

[1] Planning and Programme implementation department, op cit. p –21.
[2] Planning and Programme implementation department. op cit. p - 25
[3] Our own research

TABLE NO. 1.2

(Percentage contribution of agriculture and allied sector in NSDP/GSDP)

Sl. No	PRIMARY SECTOR	2001-02 (NSDP)	2002-03 (NSDP)	2003-04 (NSDP)	2004-05 (GSDP)*	2005-06 (GSDP)*
1	Agriculture	21.32%	19.92%	19.23%	14.98%	14.98%
2	Forestry	0.72%	0.71%	0.55%	1.00%	1.04%
3	Fishing	1.39%	1.28%	1.34%	1.01%	1.00%
	Total	23.42%	21.91%	21.12%	16.99%	17.02%

Source: Statistical handbook of Mizoram 2006 & * Statistical handbook of Mizoram 2008 at constant (1999-2000) price

C.4.2. INDUSTRY & ALLIED SECTOR

Industrialisation has a major role to play in the development of the underdeveloped countries. The level of its industrialization largely determines the gap in per capita income between developed and underdeveloped region. Mizoram till today is one of the most backward states in India due to many pertaining inhibiting factors among which, lack of basic infrastructure, shyness of capital and unregulated market facilities are prominent[1].

Industrial & Allied sector contributes 19.01% of total production in 2006-07[2]. The sectoral contribution during the period from 2001-02 to 2005 – 06 is presented in table No 1.3.

---

[1] Directorate of Economics & Statistics; *Socio-economics Review Mizoram 2000-01*. op cit, p-11

[2] Our own research

TABLE NO. 1.3
(Contribution of Industry and allied sector in NSDP/GSDP)

(Rs. are in lakh)

Sl. No	*INDUSTRY AND ALLIED SECTOR*	2001-02 (NSDP)	2002-03 (NSDP)	2003-04 (NSDP)	2004-05 (GSDP)*	2005-06 (GSDP)*
1	Mining & Quarrying	Rs 387	Rs 195	Rs 914	Rs 651	Rs 435
2	Manufacturing	Rs 1704	Rs 1710	Rs 1904	Rs 2874	Rs 3921
3	Construction	Rs 19469	Rs 22120	Rs 24745	Rs 23362	Rs 29030
4	Electricity, Gas & Water supply	Rs 4187	Rs 4229	Rs 4291	Rs 8226	Rs 7984
	Total	**Rs 25747**	**Rs 28254**	**Rs 31854**	***Rs 35,113***	***Rs 41,370***

Source: Statistical handbook of Mizoram 2006 & * Statistical handbook of Mizoram 2008 at constant (1999-2000) price

There are as many as 2,718 registered Small Scale Industries in Mizoram of which 2632, 48 and 38 are perennial, seasonal and casual in nature of operation respectively. These Small Scale Industries generate employment opportunities for 2,176 females and 6,837 males. By 2005-06, the total installed and generated electric power in the state is 47.07MW and 11.46MW respectively.

There are 1,61,247 LPG subscribers up to March 2006 and 84.94 % of villages are electrified and given safe drinking water facilities as well[1]. The percentage contribution of the sector in the state economy for various years are given in table No 1.4

[1] Directorate of Economics & Statistics, *Statistical handbook - 2006*, op cit, p-29,36, 106.

TABLE NO. 1.4
(Percentage contribution of Industry and allied sector in NSDP/GSDP)

Sl. No	INDUSTRY AND ALLIED SECTOR	2001-02 (NSDP)	2002-03 (NSDP)	2003-04 (NSDP)	2004-05 (GSDP)*	2005-06 (GSDP)*
1	Mining & Quarrying	0.22%	0.1%	0.45%	0.32%	0.21%
2	Manufacturing	1.11%	0.99%	0.91%	1.4%	1.76%
3	Construction	10.05%	11.28%	11.72%	11.35%	13.79%
4	Electricity, Gas & Water supply	3.53%	2.42%	2.24%	4.00%	3.79%
	Total	14.91%	14.97%	15.74%	16.99%	17.02%

Source: Statistical handbook of Mizoram 2006 & * Statistical handbook of Mizoram 2008 at constant (1999-2000) price

C.4.3. BASIC INFRASTRUCTURE AND SERVICES

Infrastructure plays a key role in the enterprise of economic development of any country. The three layers of communication (viz. physical communication, electronic communication and knowledge communication), good banking services, quality education, better health services, etc are the key ingredients for a healthy and sustained economic growth. The absence of these services is bound to adversely affect the quality of human life and its productivity.

In certain areas, Mizoram has taken a place of primacy at national level. These areas are literacy, village electrification, provision of safe drinking water and infant mortality rate. However, in some other vital areas Mizoram is still lacking behind other states.

TABLE NO. 1.5
(Contribution of service sector in SDP/GSDP)

(Rs in lakh)

Sl. No	Service sectors	2001-02 (NSDP)	2002-03 (NSDP)	2003-04 (NSDP)	2004-05 (GSDP)*	2005-06 (GSDP)*
1	Transport, storage & communication	Rs 1835	Rs 2285	Rs 1493	Rs 5656	Rs 6500
2	Trade, hotel & Restaurants	Rs 16398	Rs 16382	Rs 17742	Rs 14719	Rs 14846
3	Banking & insurance	Rs 4390	Rs 7090	Rs 7924	Rs 7152	Rs 8338
4	Real estate, ownership of dwelling & Business Services	Rs 30692	Rs 34665	Rs 40854	Rs 35305	Rs 37739
5	Public Administration	Rs 27936	Rs 33915	Rs 33351	Rs 46021	Rs 41209
6	Other services	Rs 25202	Rs 24808	Rs 26370	Rs 26732	Rs 24672
	Total	**Rs 106453**	**Rs 119145**	**Rs 127734**	**Rs 135585**	**Rs 133304**

Source: Statistical handbook of Mizoram 2006 & * Statistical handbook of Mizoram 2008 at constant (1999-2000) price

Since there is a causal relationship between the services sector and basic infrastructure & services, it is worthwhile to look at the sectoral contribution of service sector at factor cost at current prices (in 1999-2000 series) in table No. 1.5

Education institutions which are currently operating are 1 central university, 25 colleges, 67 Higher secondary schools, 452 High schools, 939 Middle schools and 1481 Primary Schools with student enrollment of 414, 7964, 10,555, 41,610, 88,044 and 1,32,046 respectively in 2005-06. There are 43,277 telephone connections with 10 Hospitals, 9 community Health Centers, 57 Primary Health Centre and 351 Sub

Centre respectively manned by 155 doctors, 393 Nurses, 88 pharmacists, 656 health workers and 38 Lab. Technicians.

TABLE No. 1.6

(Percentage contribution of service sector in NSDP/GSDP)

Sl. No	SERVICE SECTORS	2001-02 (NSDP)	2002-03 (NSDP)	2003-04 (NSDP)	2004-05 (GSDP)*	2005-06 (GSDP)*
1	Transport, storage & communication	1.06%	1.21%	0.75%	0.02%	0.01%
2	Trade, hotel & Restaurants	9.5%	8.68%	8.77%	7.165	7.05%
3	Banking & insurance	2.54%	3.76%	3.92%	3.48%	3.96%
4	Real estate, ownership of dwelling & Business Services	17.78%	18.36%	20.19%	17.17%	17.93%
5	Public Administration	16.18%	17.97%	16.48%	22.38%	19.58%
6	Other services	14.6%	13.14%	13.03%	13.00%	11.72%
		61.66%	**63.12%**	**63.14%**	**65.94%**	**63.33%**

Source: Statistical handbook of Mizoram 2006 & * Statistical handbook of Mizoram 2008 at constant (1999-2000) price

During 2005-06, the number of domestic tourists visiting Aizawl is 84,225 and that of foreign tourists is 617[1]. The service sector contributes 62.47% of the state's product in 2006-07[2]. The table No. 1.6 shows the percentage contribution of the sector in the state economy.

[1] Planning and Programme Implementation Department, op cit. p-9, 29.
[2] Our own research

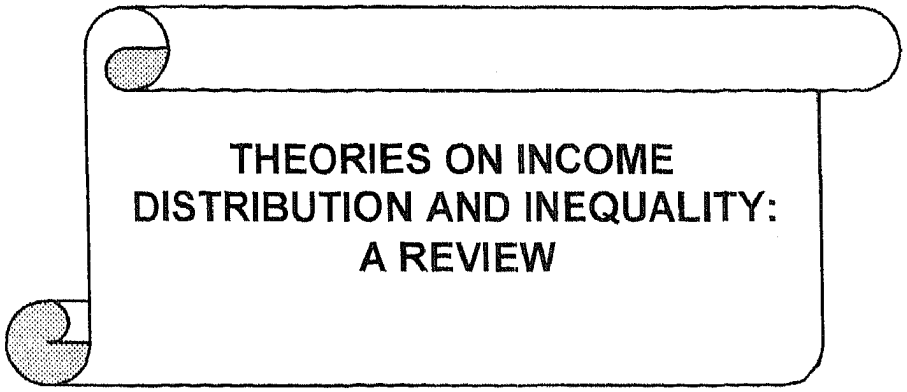
ANNEXURE NO 1.A

(Showing the optimum sample, Actual sample size and No. of persons covered)

Districts	Aizawl	Lunglei	Champhai	Kolasib	Lawngtlai	Mamit	Saiha	Serchhip	Mizoram
Optimum sample	98	37	30	16	21	18	17	15	252
Actual Sample	98	36	27	19	26	16	15	19	256
No. of persons covered	586	218	186	109	191	82	97	110	1579

Source: Our own sample survey.

CHAPTER – 2



THEORIES ON INCOME DISTRIBUTION AND INEQUALITY: A REVIEW

THEORIES ON INCOME DISTRIBUTION AND INEQUALITY: A REVIEW

There are various theories concerning income distribution and income inequality. This chapter is devoted to the discussion of some of those theories. The chapter is divided into two sections, section A deals with income distribution and section B, inequality

SECTION A: INCOME DISTRIBUTION

This section consists of two important topics of income distribution viz theories on size income distribution among individuals and size income frequency distribution.

A.1. SIZE DISTRIBUTION OF INCOME AMONG INDIVIDUALS

Size income distributions that explain *'how much income is being generated'* and what the important *'determinants of income'* are. There are various theories that have been proposed to explain the size distribution of income among individuals. They have emerged from two main schools of thoughts. The first may be called **'Theoretical statistical school'** and is represented by such authors as Gibrat (1931), Roy (1950), Champernowne (1953), Aitchison and Brown (1954), and Rutherford (1950). These authors

explain the generation of income with the help of certain stochastic processes.

The second school of thought, which may be called **'The socio-economic school'** seeks the explanation of income distribution by means of economic and institutional factors such as sex, age, occupation, education, geographical differences, and the distribution of wealth. Three groups of authors belong to this school. The first follows the human capital approach, based on the hypothesis of lifetime income maximisation. This approach was initiated by Mincer (1958) and subsequently developed by Becker (1962, 1967), Chiswick (1958, 1971, 1974), Husen (1968), and De Wolff and Van Slijpe (1972).

The second group of authors, which concentrates on the demand side of the market, has been referred to as 'The Educational planning school' by Tinbergen and is represented by such authors as Bowles (1969), Dougherty (1971,1972), and Psacharopoulos and Hinchliffe (1972). This group holds that the demand for various kinds of labour is derived from the production functions.

The third group of authors is called 'The supply and demand school'. The major contribution of this approach is represented by Tinbergen

(1975), who considers income distribution as a result of the supply and of demand for different kinds of labour. His analysis applies not only to labour incomes, but also to other factors of production. It is the task of this chapter to deal with these different aspects of income distribution.

A.1.1. THEORETICAL STATISTICAL SCHOOL

As stated before, this school tries to explain the distribution of income in terms of certain stochastic process that shed no light on the economics of the distribution process. The important stands of those distribution are as given below.

A.1.1.1 LAW OF PROPORTIONATE EFFECT

In 1931, Gibrat published his theory of 'law of proportionate effect'. A brief outline of his theory is as under.

Suppose an individual income begins with y_0 and subsequently undergoes a series of random, independent, proportional changes m_1, m_2, ... m_i ... m_t; where m_i can be either negative or positive. After *'t'* periods, his income becomes -

$$y_t = y_0(1+m_1)(1+m_2)(1+m_3) .....(1+m_t)$$

or, $\text{Log } y_t = \text{Log } y_0 + \sum_{i=1}^{t} \log(1+m_i)$

$= \text{Log } y_0 + \sum_{i=1}^{t} U_i$; where $U_i = Log(1+m_i)$

According to the Central limit theorem[1] log y_t will tend to toward normality as t becomes large, and a random variable Y_t will follow lognormal distribution[2].

Taking variance of the log y_t, it becomes –

$$\text{Var}(\text{Log } y_t) = \text{Var}[\text{Log } y_0 + \sum_{i=1}^{t} u_i]$$

$$= E[(\text{Log } y_o + \sum_{i=1}^{t} u_i) - E(\text{Log } y_o + \sum_{i=1}^{t} u_i)]^2$$

$$= E[(\text{Log } y_o + \sum_{i=1}^{t} u_i) - (\text{Log } y_o + \sum_{i=1}^{t} E(u_i)]^2$$

$$= E[\sum_{i=1}^{t} u_i - \sum_{i=1}^{t} E(u_i)]^2$$

---

[1] Central limit Theorem states that as t increases, y_t tends to follow Normal Distribution.

[2] Lognormal distribution is defined as the distribution of a random variable whose logarithmic follows Normal Probability Law.

$$= \sum_{i=1}^{t} Var(u_i)$$

The expression indicates that the dispersion in incomes of individuals is solely determined by the proportional changes in income of the individual. Obviously, as t $\rightarrow \alpha$, Var(Log y_t) $\rightarrow \alpha$, which proposition seems unrealistic for such an increase in income have not been observed in the real world and as a result Kalecki suggested a modification of the process by introducing a negative correlation between y_t and m_t, which is just sufficient to prevent Var(Log y_t) from growing steadily. This implies that the percentage increase in y_t is likely to be lower for the rich than for the poor, it is difficult to justify or refute this assumption without evidence in real world.

Based on the following assumptions and by introducing 'birth' and 'death' considerations, Rutherford (1955) suggested an interesting modification to Gibrat model.

1. Newcomers enter the labour force at a constant rate.

2. The income distribution of the newcomers is lognormal.

3. Mortality is unrelated to income power.

4. The number of survivors declines exponentially with age.

From these assumptions he deduced that the resulting income distribution would eventually approach the Gram-Charlier Type A distribution[1]. He also provides a tentative method of fitting this distribution.

A.1.1.2. CHAMPERNOWNE'S MODEL

Champernowne divides the income scale above a certain income x_0 into an innumerably infinite number of income classes. The i[th] income class given by (x_{i-1} *to* x_i) satisfy the condition that $x_i = k\, x_{i-1}$, for i = 1, 2, 3 ... ∞, where k is a constant. This condition assumes that the end points of income classes are equidistant on the logarithmic scale. Obviously, the width of income classes on such a scale is $\log k$. The income units move across these income classes from one discrete time period to the next.

If $P_t(r,\mu)$ is denoted as the transitional probability that a unit belonging to class r at time t will move to class r + μ by time t+1, then $\sum_{\mu=-(r-1)}^{\infty} P_t(r,\mu)=1$, which implies that a unit in class *'r'* at time *'t'* will be

[1] For more detail see Gramer (1946 : P-222)

in one of the income classes 1,2,3...∞, with probability 1. If $P_t(r)$ is denoted as the probability that at time t a unit is in income class r, then the income distribution $P_{t+1}(s)$ at time (t + 1) will generate a probability function of the form

$$P_{t+1}(s)=\sum_{\mu=-\infty}^{s-1} P_t(s-\mu)P_t(s-\mu,\mu)$$

This equation is called a transitional equation, because it links the income distribution at time (t+1) with the income distribution at time t through probabilities $P_t(r,\mu)$.

Assumptions underlying the model are -

1. For every dying income receivers there is an heir to his income in the following year. This assumption implies that the number of incomes is constant over time.

2. For every value of t and r, and for some fixed integer r, $P_t(r,\mu)=0$, *if* $\mu>0$ *or* $\mu<-x$, and $P_t(r,u)=p_u>0$, if $-n \le u \le 1$ and $u>-r$. This implies that no income unit moves up by more than one or down by more than x income classes in a year.

The above formulation has two implications, first, that the transitional probabilities $P_I(r,\mu)$ are constant with respect to time, second, that they are independent of income level r and are determined by μ alone.

3. $\sum_{\mu=-n}^{1} \mu p_\mu < 0$, this formulation implies that in all units, initially in any one of the income classes shifted during the following time period is negative. This assumption is needed to prevent income from increasing without stabilising to an equilibrium distribution.

A.1.2. THE SOCIO-ECONOMIC SCHOOL

As stated before, there are three groups of school supporting this approach, viz. Human capital approach, Educational planning approach and, supply and demand approach[1].

A.1.2.1. HUMAN CAPITAL APPROACH: - This approach was initiated by Mincer (1958), Becker(1967), Chiswick (1968, 1971, 1974), Husen (1968), and De Wolff and Van Slijpe (1972). These authors based their hypothesis on lifetime maximisation of income. To have some idea about this approach let us briefly discuss Mincers' model as below.

---

[1] Nanak C. Kakwani, op cit. p-2

MINCER'S MODEL

Mincer has tried to explain the factors underlying income distribution via earning differentials. In order to focus on this aspect, the human capital theory in its simplest terms makes strong assumption. The labour market is assumed to be competitive and perfectly functioning, so that a person can have a free choice of his occupation. If he wishes to train for a particular job, then there are no barriers to him doing so. Secondly, everyone has the same opportunities. There are no environmental inequalities, such as differences in intelligence, physical skill, or in home background. Everyone has access to capital market on the same terms.

If these assumptions are satisfied, the occupations requiring a longer period of training have to provide a correspondingly higher level of earnings. In order to bring this out more clearly, there are a number of simplifying assumptions[1]

(1) Training involves postponement of entry into the labour force (i.e. there is no on the job-training) where S denotes the number of years of training beyond the minimum school learning age.

[1] A.B Atkinson. *op cit*, p-80

(2) Everyone works for the same number (N) of years after completing his training, so that those with longer training retire at an older age and no one dies before reaching retirement.

(3) There are no costs of education apart from forgone earnings and there are no student grants.

(4) The earnings of a person who has S years of education, denoted by E_s, are assumed constant over his working life, and there is assumed to be no unemployment.

(5) All jobs are alike in every feature except the length of training required, and there is no intrinsic benefit from the education.

The decision to undergo training involves a person's borrowing to finance his living expenses for that period, and it is assumed that he can borrow as much as he requires at a constant interest rate, r percent, per annum. Given these, Mincer's model states that -

$E_S = E_0(1+r)^S$; E_0 is earning of a person with no education.

Taking Log, we have,

Log E_S = Log E_0 + S log (1+r).

The above expression indicates that earnings are directly related to the training required. To sum up, the human capital theory leads to

prediction that earning differentials depend on the training required, in terms of both formal education and on the job training, and are just sufficient to compensate for the cost of this training, taking into account length of working life, uncertainty of earnings, unemployment and non-pecuniary benefits[1].

Evidence for Canada in 1961 (Wilkinson 1966) suggested that human capital theory explains part, but for all, of the earning dispersion. Today, education explains only part of the dispersion of individual earnings, and people with the same schooling and experience may well be paid different amounts. One reason for this, as Friedman and Kutznet pointed out, is that the simple human capital approach leaves out important element, i.e. differences in individual abilities and back- round, and the fact that the labour market does not necessarily operate in the smooth and perfectly competitive way. To conclude, the human capital theory has done a valuable service in pointing out that part of earning differentials may be attributed to the return to training, but does not explain all earning in equality.

[1] ibid. p-82

A.1.2.2. EDUCATIONAL PLANNING MODEL

This educational planning school concentrates on the demand side of the market. This group holds that the demand for various kind of labour is derived from the production function.

For clarifying the idea embedded, one can use the model of Psacharopoulos that presents an insightful study.[1]

Psacharopoulos model

By a well-known macro-economic model, we have

$$Y = \frac{k}{K} \qquad \text{---------- (2.1)}$$

Where Y= Output (Say, Gross National Product)

k = Capital -output ratio

K= The economy's capital stock

This macro-economic model of development has analogy with the manpower requirement approach of educational planning. Labour is divided into several occupational or educational categories (subscript h), the relationship in equation (2.1) becomes –

$$Y = \frac{L_h}{b_h}$$

[1] G. Psacharopoulos: *The Manpower Requirement Approach*. P-331

Where L_h = The No.of persons with h^{th} qualification. (Say University Graduate)

b_h = The labour output rate

This relationship is derived in a similar manner to the capital-output ratio above namely by observing past labour employment and output structures. Then any increase in output (ΔY) would materialise only if the necessary labour of type h would also increase by a given amounts, that is

$$\Delta Y = \frac{\Delta L_h}{b_h} \text{ ---------- (2.2)}$$

Note that the co-efficient b_h has a special meaning. If one considers the way it is derived from historical date on output (Y_o) produced by a number of workers of type h

i.e., $$b_h = \frac{L_{h_o}}{Y_o}$$

This co-efficient represents the inverse of the productivity of labour type h, called here P_h. Therefore, b_h could be called a 'labour utilization co- efficient' and through substitution and rearrangement, equation (2.2)

$$\Delta L_h = \frac{\Delta Y}{P_h} \text{ ---------- (3.3)}$$

Equation (2.3) implies that given labour productivity (l_h), in order to have an increment of output (ΔY), ΔL_h labour of type h is required[1].

A.1.2.3. THE SUPPLY AND DEMAND SCHOOL

The third group is known as "**The supply and demand school**" and the main contribution of this approach is represented by Tinbergen (1975), who considers income distribution as a result of the demand and supply of different kinds of labour. The Tinbergen model was originated at the Organization for Economic Co-operation and Development (OECD) and has been applied in a number of countries[2].

The main feature of the Tinbergen model lies in the examination of the path by which the educational system moves from the present state to a future state and spotting disequilibria in the process. His model can be presented in the following equation (2.4) for secondary Education.

Tinbergen model

Demand $L^t_2 = b_2 Y^t$ --------- (2.4)

Supply $L^t_2 = (1 - r_2) L_2{}^{t-1} + \Delta L_2$

Increment $\Delta L_2 = p_2 (g_2 S_2{}^{t-1} + d_B S_3{}^{t-1} - e_3 S^t_3)$ ------ (2.5)

---

[1] ibid. p-331
[2] ibid. p-338

(ii) For higher education the model can be expressed as follows: -

Demand $L^t_3 = b_3 Y^t + T_2 S^t_2 + T_3 S^t_3$ -------- (2.6)

Supply $L^t_3 = (1 - r_3) L^{t-1}_3 + \Delta L_3$

Increment $\Delta L_3 = p_3 \left(g_3 S^{t-1}_3 \right)$

Where t(superscript) = the time period, (t-1) = the previous time period which does not necessarily correspond to one calendar year. It could refer to a whole educational cycle, 2,3 (subscripts) = secondary and higher educational qualifications respectively, L = labour with the subscripted educational qualification, b = the labour utilization co-efficient for the subscripted educational category, Y = the value of output in the superscripted year, r = the combined labour force retirement and death rate, Δ = the discrete difference operator, it indicates differences between values of the variable to which it refers in successive time period. p = the labour force participation rate of the subscripted category of labour, g = the proportion of students graduating from the subscripted educational level, d =the drop out rate, e = the proportion of higher education entrants as a proportion of the university student body, S = the number of student ratio of the subscripted educational level, T = the teacher - student ratio of the subscripted educational level.

The equation (2.4) states that the demand for labour with secondary educational qualifications is simply the product of the relevant labour utilisation co-efficient and the level of output at a particular year. The demand for university-educated labour is expressed in equation (2.5), which has two parts. The first part on the right hand side is analogous with the secondary educational qualifications whereas the last two terms represents the teacher requirement for secondary schools and higher education itself. Therefore, whereas labour type 2 is needed only for production, labour type 3 is needed for production as well as meeting requirements in teaching staff[1].

The supply equations are more or less self-explanatory. The availability of any kind of labour in a specific period is equal to the surviving labour force from the previous period plus any increment during the last time lapse between the two periods.

The increment themselves are the result of another accounting process. The additions of labour with any qualification in the economy are equal to the labour force participation rate applied to the successful graduates of the particular school level. The last two terms of equation (2.5)

[1] ibid, p-338

allow for secondary-school dropout and higher education entrance respectively.

The system consists of six equations and six unknown which means consistency. Once the values of the different parameters are given, one can solve for the time path of the stock of the two kinds of labour (L_2, L_3), the annual increment (ΔL_2, ΔL_3) and students numbers (S_2, S_3). The parameter known at the base are the labour utilization co-efficient (b), the labour participation rates (p), the retirement-death rate (r), the graduation rates (g), the dropout rate (d), the proportion of higher educational entrance (e), and the teacher - student ratio (T). Here it should be noted that the highlight of the Tinbergen model is the explicit examination of the time path between base and target years.

This theoretical framework is hardly applicable to the context of less developed economy characterised by chronic unemployment or underemployment. It is, however, useful to highlight the direction of change as income grows with the on going process of development. On this count, it may be pointed out that a study of abstract theory applicable to high achieving economy serves as a useful reference point for the less developed economy.

B. SIZE INCOME FREQUENCY DISTRIBUTION

There are a number of continuous frequency distributions used to describe income distribution for different economic stages of development. Some distributions are appropriate to describe the initial stages of development (i.e. low level of inequality) while others are more suited to describe high degree of inequality. From the functional form of income distribution a country follows one can know the level of economic development attained by it. These frequency distributions do not dealt the determinants of income but describe its forms of distribution. Some of those distributions used to describe size income distribution are briefly presented in the pages that follow.

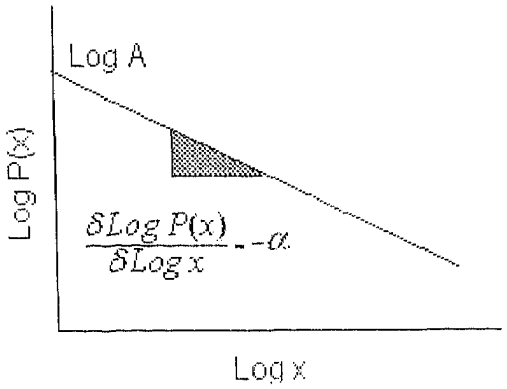
A.2.1. The Pareto Law

Vilfredo Pareto (1848-1923) was the first to make an extensive study, from the statistical point of view, of the problem of the distribution of income among the citizens of a state[1]. Pareto propounded his famous law of income distribution in the 19th - 20th century, primarily basing his arguments and reasoning on the empirical study of the income data of various countries of the world at different times. This idea is sometimes

[1] Gupta SC and VK. Kapoor, *Fundamentals of Applied Statistics* (New Delhi: S.Chand & sons, 1994), p-4.23

expressed more simply as the Pareto principle or the "*80-20 rule*" which says that 20% of the population owns 80% of the wealth. Outside the field of economics, it is sometimes referred to as the *Bradford distribution*[1].

According to his law, *in all places and at all times, the logarithm of the percentage of unit with an income in excess of some value is a negatively sloped linear function of the logarithm of that value*. Symbolically,



$$P(x) = A\,x^{-\alpha}, \quad \text{-------} \quad (2.7)$$

where P(x) is the percentage of units with income in excess of x, x is income, A and α are the parameters of the distribution. This is a cumulative distribution function. From equation (2.7) we have,

$$\text{Log } P(x) = \text{Log } A - \alpha \log x.$$

As income level x approaches zero, P(x), the percentage of income with income in excess of income x in the formula approaches towards infinity. As income gets larger and larger, the frequency falls towards zero.

The parameter A, in the distribution, may then be defined as -

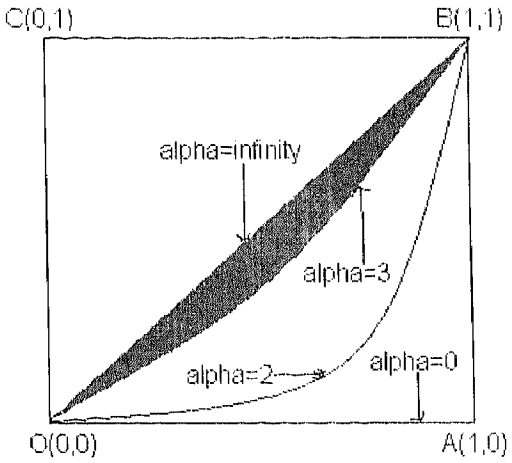
[1] http://en.wikipedia.org/wiki/Brandford_law.

A = x_0^{α}, where x_0 is some low level income which is sometime defined as the threshold limit i.e. the scale factor which is initial incomer (or lowest income at which the curve begins). Then Pareto law can be represented by empirical formula as

$$P(x) = \left(\frac{x_0}{x}\right)^{-\alpha} \text{ ; when } x > x_0 \qquad \text{------ (2.8)}$$

$$= 0, \qquad \text{when } x < x_0$$

When α = 1, it is a condition of perfect inequality and Gini coefficient G = 1. On the other hand, if α = ∞, it is a condition of perfect equality where all the individuals in the society receive equal amount of income, i.e. G = 0. The graph for different values of α (alpha) is given here. Gini coefficient and Pareto distribution are closely related and Gini coefficient for the Pareto distribution can be calculated as[1]



$$G = \frac{1}{2\alpha - 1}$$

[1] See Aberge (2005).

The density parameter of (2.8) is obtain by differentiating it with respect to x:

$$f(x) = \alpha x_0^{\alpha} x^{-1-\alpha} \quad ; \text{ when } x > x_0 \text{ ----- (2.9)}$$
$$= 0 \quad ; \text{ when } x < x_0$$

Pareto observed that in many countries the value of α varies from 1.2. to 1.9, on the average α can be approximately taken as 1.5. Taking Log of equation (2.8), we have,

$$d\,Log\,P(x) = -\alpha \text{ Log } x + x \text{ Log } x_0$$

$$\frac{d\,Log\,P(x)}{d\,Log\,x} = -\alpha$$

Thus the graph of this curve and the double logarithmic scale would be a straight line with slope $-\alpha$. In other words, α can be interpreted as the elasticity of the decrease in the number of persons when passing to a higher income class. The mean is given by

$$E(x) = \alpha x_0^{\alpha} \int_{x_0}^{\infty} x^{-\alpha}\, dx,$$

Which will be finite only if $x > 1$. If this condition is met, it follows that

$$E(x) = \frac{x_0 \alpha}{(\alpha - 1)} = \left(\frac{\alpha}{\alpha - 1}\right) x_0$$

This means that mean of Pareto Distribution is proportional to the initial income x_0. The variance is derived as equal to-

$$V(x) = \frac{x_0^2}{(\alpha-2)(\alpha-1)^2}$$

The first derivative of the equation (2.9) or the second derivative of equation (2.8) is

$$f'(x) = \alpha x_0^{\alpha}(-1-\alpha)x^{-1-x-1}$$

$$= -\alpha x_0^{\alpha}(-1-\alpha)x^{-x-2}$$

which is negative for all positive values of x. Therefore, the density function of Pareto distribution is decreasing monotonically for all value of x greater than x_0. Because of this result, this distribution is generally used when there is a lack of information regarding the number of persons with smaller incomes.

The Pareto distribution is usually assumed to represent the distribution of incomes or other economic phenomenon at upper levels or, at least, above some low values. It was found empirically that Pareto distribution fitted much better for higher incomes than law incomes. That is, it does not graduate the distribution of low income well. It might thought of it as a law of graduation of the distribution of income among taxpayer, and those income units receiving less than the exempted levels for purpose of

taxation are not included. In practice, the Pareto distribution has been fitted to such bodies of data. This means that it will be valid only for income strictly greater than the mode. In otherwords, the Pareto distribution is suitable to describe income distribution of, at most, 40% of the population, a fact that has now been universally accepted, although Pareto asserted that the law was true at all times at all places over the whole range of income. Shirras, after a detail examination of Pareto law arrived at a conclusion that "*There is indeed no Pareto law. It is time that it should be entirely discarded in the studies of distribution*"[1]

In case of negative income, the original data is transformed by subtracting the smallest of the income, (let it be 'c') from all the incomes y, so that the transformed variables (y – c) will be non-negative value. Again, if one more unit is subtracted from (y – c), all the transformed income will be positive and the theory may apply to this positive values.

When Pareto distribution is fitted to Mizoram income data to test its validity, we found that the distribution is of no use to describe the size distribution of income.

---

[1] Shirras (1935), P- 681 as cited in Kakwani Nanak C; *op cit*, p- 16

A.2.2. The Pareto - Levy law

There exist a good numbers of empirical illustrations to assert that Pareto distribution fits well towards the upper tail covering about 40% of income recipients[1]. This empirical evidence led Mandelbrot (1960) to introduce *the Weak Pareto law*, the mathematical formulation of which is presented as -

$$P(x) \text{ behaves like} \left(\frac{x}{x_o}\right)^{-\alpha}, \text{ as } x \to \infty$$

which implies that

$$\lim_{x \to \infty} \frac{P(x)}{\left(\frac{x}{x_o}\right)^{-\alpha}} = 1$$

The Pareto law defined in equation (4.2) is referred to as Strong Pareto law by Mandelbrot. When α = 1.5, the Pareto law is said to be the strongest Pareto law. On the basis of numerical evidence, Pareto strong law is not strictly applicable. Levy (1925) constructed the family of stable laws[2] that

---

[1] Nanak C. Kakwani, op cit p-21.

[2] Suppose the observed income X is equal to the sum of *n* independent random variables X_1, X_2, X_3,.....X_n, such that all X_i follow the same probability distribution up to a linear transformation. This would assume the existence of Coefficients $a_i > 0$ and b_i, so that $a_i X_i + b_i$ have the same distribution. If X has the same distribution as individual X_i, again up to the linear transformation, such probability law is said to be stable. Mathematically, this can be written as
$(a_1 X_1 + b_1) \oplus (a_2 X_2 + b_2) \oplus (a_3 X_3 + b_3) \oplus .....\oplus (a_n X_n + b_n) = (a X + b)$, where *a* and *b* are the two constants that always exist for whatever values a_i and b_i take, so that $a_i > 0$.

are non Guassian[1] but which satisfy the weak Pareto law with the parameter α restricted to the range $0<\alpha < 2$

The density function of Pareto – Levy law cannot be expressed in a closed analytic form but it is determined indirectly with a Laplace transformation. The probability distribution can be expressed for large *x* as

$$P(x) \sim 1 - x^{-\alpha}\left[u^{*}\,\Gamma(1-\alpha)\right]^{\alpha}$$

where $\Gamma(1-\alpha)$ is a Gamma function, α is a Pareto parameter lying in the range $0 < \alpha < 2$, u^{*} is the positive scalar. This P – L distribution is never tested empirically because of its complexity[2].

From empirical evidences it is established that, although, in general, the general set of components constituting income differs from country to country, the shape of the observed income distribution is the same.

A.2.2. Normal distribution

The Normal Distribution was found in 1733 by De Moivré and latter rediscovered by Gauss in 1809 and Laplace in 1812. This distribution was

---

The sign ⊕ denotes the addition of random variables. The probability distribution $(a\,X + b)$ is the same as individual random variables $(a_1X_1 + b_1)$, $(a_2X_2 + b_2)$, $(a_3X_3 + b_3)$, ... $(a_nX_n + b_n)$.

[1] Guassian distribution is a well-known Normal distribution.

[2] Nanak C Kakwani ; *op cit.* p-22

widely used to describe the probability behaviours of a large number of random variables.

Let x be a continuous random variable and is said to have a Normal distribution with parameters μ (mean) and σ^2 (variance), it its density function is given by the probability law as

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{1}{2\sigma^2}(x-\mu)^2} \quad ; -\infty < x < \infty, -\infty < \mu < \infty, \sigma^2 > 0.$$

$$= 0 \quad ; \text{otherwise.}$$

If income can be conceived of as a result of the sum of a large number of random variables, the variable income should, according to the central limit theorem, approximately follow the Normal distribution which is symmetric with finite mean and variance; however, this is not true in the case of income because observed income distribution are always positively skewed with a single mode and a long tail. Thus, Normal distribution is of less use to describe either the frequency distribution or the generation of income[1]. However, if used it would be most suited to describe low level of inequality.

---

[1] ibid, p- 14

A.2.4. Lognormal Distribution

Another useful distribution frequently used for graduating income data is Lognormal distribution whose probability density function is given by –

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{1}{2\sigma^2}(Logx-\mu)^2}, \quad 0 < x < \infty, 0 < \mu < \infty, \sigma^2 > 0$$

$$= 0, \qquad \text{otherwise.}$$

The mean and variance of Lognormal distribution are given by $\alpha e^{\frac{\sigma^2}{2}}$ and $\alpha^2 e^{\sigma^2}(e^{\sigma^2}-1)$ respectively, where $\alpha = e^{\mu}$. The median and mode is given by e^{μ} and $e^{\mu-\sigma^2}$. This Lognormal distribution compresses the distribution of income at higher levels and stretches the distribution at lower levels. This transformation is one that would be likely to change a skew curve with a right-handed tail into a comparatively symmetrical curve. However, it is often difficult to eliminates all the skewness, in that situation it is still a positively skewed distribution; i.e. Mean > Median > Mode. This functional form of distribution is frequently used for representing highly unequal income distribution.

Lognormal distribution can also be dealt with negative income distribution as it is in the case of Pareto distribution by subtracting the least value of income from all incomes.

Both Lognormal and Pareto distribution have simple properties in terms of the Lorenz curve. The usual measure of income inequality stated simply as the ratio of the area between the Lorenz curve and the line of equal distribution to the area of triangle under the line of equal distribution, depends in the Paretian case on α and in the case of Lognormal, on σ. Inequality, on the other hand, varies inversely with α and directly with σ. Nowadays, there is a tendency to view that Pareto and Lognormal distribution explain respectively the upper and lower ends of the income values.

A.2.5. Champernowne Distribution

In 1937, Champernowne proposed three forms of income distribution for the purpose of graduating pre- tax income distribution. The general form of the distribution is

$$\phi(z) = \frac{n}{Cosh\{\alpha\gamma(z-z_0)\}+\lambda} \quad ;$$

where z = log x , is the income power

$\phi(z)$ = The density function of z,

n, α , z_0 , and λ = Parameters and

z_0 = The median income power.

He considered three forms for his general form and out of these three forms, only one gives a good fit to the majority of what he studied. The majority of the income distribution he had studied gave a value of $\lambda < 1$, the distribution function is given as.

$$P(x) = \frac{1}{\theta}\tan^{-1}\left[\frac{\sin\theta}{Cos\theta + \left(\frac{x}{x_0}\right)^{\alpha}}\right]$$; where P(x) represents the

percentage of income exceeding x. The parameter are α and θ and, they are restricted to the ranges $\alpha > 0$ and $0 \le \theta < \pi$. For high income, this expression is closely approximated by a function proportional to $y^{-\alpha}$, and it is thus merge into Paretian form.

This distribution satisfies the Pareto law and x is the Pareto parameter. Fisk(1966) who investigated the effect of θ and the shape of the distribution of *x*, concluded that the shape of the curve is relatively insensitive to changes in the value of θ over the range 0^{o} to 45^{o}, therefore, it can be reasonably correct choice to put θ = 0. It can be seen that as θ approaches zero, the Champernowne distribution approaches the *sech* square distribution. Thus Fisk derived the *sech* square distribution as a limiting case of Champernowne distribution.

A.2.6. Gamma Distribution

The continuous random variable x, which is distributed according to the probability law

$$f(x) = \frac{e^{-x} x^{\lambda-1}}{\Gamma(\lambda)}; \quad \lambda > 0; 0 < x < \infty.$$

$$= 0 \quad ; \text{otherwise.}$$

is known as Gamma distribution with one parameter λ. The mean and variance of Gamma distribution are λ each and the skewness (β_1), and peakedness (β_2) are given by $\frac{4}{\lambda}$ and $3 + \frac{6}{\lambda}$ respectively.

Two parameter Gamma distribution takes the form of

$$f(x:\beta,\lambda) = \frac{\beta^{-\lambda}}{\Gamma(\lambda)} x^{\lambda-1} e^{\frac{x}{\beta}}, \ \beta > 0, \ \lambda > 0, 0 < x < \infty$$

$$= 0, \qquad \text{otherwise.}$$

Salem and Mount fitted the Gamma distribution to personal income data in the United States for the years 1960 to 1969. Their result indicated that the data fit better than the lognormal distribution but still not entirely satisfactory; it exaggerates the skewness, although this tendency is even more marked in the fit of the lognormal[1].

---

[1] Hayakawa (1951) as cited in Nanak C Kakwani; *op cit.* p-29

A.2.7. Weibull Distribution:

The distribution is named after Waladdi Weibull, a Swedish Physicist, who used it in 1939 to represent the distribution of the breaking strength of materials. JHK. Kao(1958-'59) advocated the use of this distribution in reliability studies and quality control. It is also used as a tolerance distribution in the analysis of quantum response data[1].

A continuous random variable x has a Weibull distribution with two parameters if its probability distribution is given by –

$$f(x) = \frac{\alpha}{\beta}\left(\frac{x}{\beta}\right)^{\alpha-1} e^{-\left(\frac{x}{\beta}\right)^{\alpha}}, \quad 0<\alpha<\infty,\ 0<\beta<\infty \text{ and } x>0$$

The mean of Weibull distribution is $\Gamma\left(\frac{1}{\alpha}+1\right)$.

A.2.8. Logistic Distribution

A continuous random variable x has a Logistic distribution with two parameters if its probability distribution is given by –

$$F(x) = \frac{1}{\beta}\left[1+e^{-\left(\frac{x-\alpha}{\beta}\right)}\right]^{2} e^{-\left(\frac{x-\alpha}{\beta}\right)}, \quad -\infty<x<\infty,\ -\infty<\alpha<\infty,\ 0<\beta<\infty$$

[1] Gupta SC and VK. Kapoor, *op cit*, p- 8.91

Logistic distribution is also extensively used as growth function and demographic function and in time series analysis. The mean is α .

A.2.9. Gumbel distribution

A continuous random variable x has a Gumbel distribution with two parameters if its probability distribution is given by

$$f(x) = \frac{1}{\theta}\left[e^{-\left(\frac{x-\alpha}{\theta}\right)} e^{-e^{-\left(\frac{x-\alpha}{\theta}\right)}} \right], \quad -\infty < x < \infty, -\infty < \alpha < \infty, 0 < \theta < \infty$$

A.2.10. *Wald/Inverse Guassian Distribution:*

The continuous random variable x which is distributed according to the probability law

$$f(x) = \left(\frac{\lambda}{2x^3\pi}\right)^{1/2} e^{-\frac{\lambda}{2\mu^2 x}(x-\mu)^2}, \quad x > 0, 0 < \mu < \infty, 0 < \lambda < \infty$$

is called Wald/Inverse Guassian distribution.

A.2.10. Exponential Distribution

The continuous random variable x, which is distributed according to the probability law

$$f(x) = \frac{1}{\lambda} e^{-\left(\frac{x-\theta}{\lambda}\right)}; \; x \geq 0, -\infty < \theta < \infty, 0 < \lambda < \infty .$$

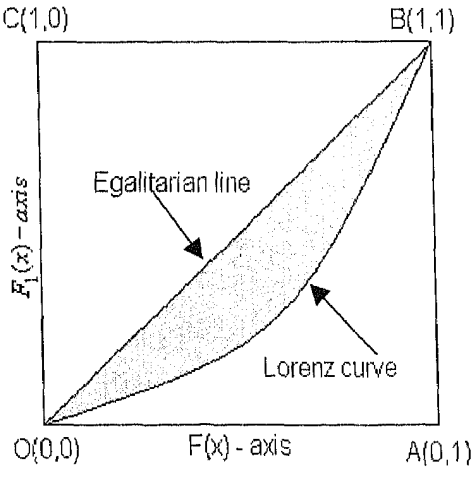
is known as exponential distribution. The mean and variance of this distribution are $\frac{1}{\theta}$ and $\frac{1}{\theta^2}$ respectively.

SECTION B: MEASURING INCOME INEQUALITY

A number of formulae has been used for measuring and analysing income inequality. Lorenz curve is one of the most powerful and widely accepted tools to represent and analyse the size distribution of income and wealth. There are many empirical formulae based on Lorenz curve also. Before dealing those formulae, let us have an overview of the Lorenz curve.

B.1. LORENZ CURVE

The Lorenz curve, widely used to represent and analyse the size distribution of income and wealth, is defined as the relationship between the cumulative proportion of income units $F(x)$ and the cumulative



proportion of income received $L_1(x)$, when units are arranged in ascending order of their magnitude. Lorenz proposed this curve in 1905 in order to compare and analyse inequalities of wealth in a country during different epochs, or in different countries during the same epoch.

Let an income unit x is a random variable with the probability density function $f(x)$[1] given by

$$F(x) = \int_0^x f(x)\,dx \qquad - \qquad (2.10)$$

Further, it was assumed that

$$\frac{dF(x)}{dx} = f(x). \qquad - \qquad (2.11)$$

where $F(x)$ can be interpreted as the proportion of units having an income less than or equal to x, $F(x)$ obviously varies from 0 to 1. i.e., $0 \leq F(x) \leq 1$. Further, if it was assumed that the mean μ of the distribution exist, the first moment of the distribution function of x is defined as

$$L_1(x) = \frac{1}{\mu}\int_0^x x f(x)\,dx \qquad - (2.12)$$

[1] Income can be negative for some unit but it is assumed to be non-negative for the convenience of analysis.

Where $0 \leq F_1(x) \leq 1$ and $F_1(x)$ is interpreted as the proportional share of total income of the unit having an income less than or equal to x. If $f(x)$ is continuous, the derivative of $F_1(x)$ exists and is given by

$$\frac{dF_1(x)}{dx} = \frac{x f(x)}{\mu} \quad - \quad (2.13)$$

which imply that $F_1(x)$ is a monotonically non-decreasing function of x[1].

The Lorenz curve is the relationship between the variable $F(x)$ and $F_1(x)$. The curve can be plotted by generating the values of $F(x)$ from equation (2.10) and (2.12) by assigning arbitrary values to x. The curve is represented in a unit square figure. The ordinate (i.e., vertical) and abscissa (horizontal axis) are $F_1(x)$ and $F(x)$ respectively.

By means of equation (2.11) and (2.12), we obtain the slope of the Lorenz curve as

$\frac{F_1(x)}{F(x)} = \frac{x}{\mu}$, which is always positive for positive income. Similarly, the second derivative of the curve is

---

[1] If successive increase in x always lead to successive increasing in $F(x)$, that is, if $x_1 > x_2 \Rightarrow f_1(x_1) > f_2(x_2)$, the function is said to be strictly monotonically increasing function, but some writers prefer to define an ascending step function, not an increasing function, but a *monotonically non-decreasing function.*

$$\frac{d^2 F_1(x)}{F(x)^2} = \frac{d}{dF(X)}\left(\frac{dF_1(x)}{dF(x)}\right) = \frac{1}{\mu f(x)} \geq 0, \quad \text{- (2.14)}$$

which is also positive. These two derivatives imply that the slope of the curve is positive and increases monotonically, that is, the curve is convex to the F(x) axis, and from this it follows that $F_1(x) \leq F(x)$. When $F_1(x) = F(x)$ the condition is known as egalitarian condition.

There are three conditions:

1. When the curve coincides with the egalitarian line, it is known a 'state of perfect equality' situation.
2. When the curve coincides with the line OA & AB, it is called a 'state of perfect inequality' situation.
3. When the curve falls below the egalitarian line OB, it is called a 'state of inequality'

It is useful to express the relationship as

$$L(p) = F(x_1), \quad \text{-} \quad (2.15)$$

where $p = F(x)$ - *(2.16)*

and $0 \leq p \leq 1$. The functional form *L(p)* can be obtained by eliminating *x* from equation 2.15 and 2.16, and is interpreted as the fraction of total

income received by the lowest p^{th} fraction of families. It satisfies the following conditions (Kakwani and Podder, 1973)[1]

a) *if* $p = 0$, $L(p) = 0$

b) *if* $p = 1$, $L(p) = 1$.

c) *If* $L'(p)=\frac{x}{\mu}\geq 0$ *and* $L''(p)=\frac{1}{\mu f(x)}>0;$

d) $L(p) \leq p$.

Conditions (a) and (b) follow immediately from equation 2.10 and 2.12, condition (c) is obvious from equation 2.13 and 2.14. Condition (d) follows from the condition of (c), which implies that the Lorenz curve lies below the egalitarian Line.

Empirical formula for measuring the degree of inequality have been categorised into two, one, those relate to Lorenz curve and the other, those of independent of Lorenz curve.

INDICES BASED ON LORENZ CURVE

B.1.1. GINI COEFFICIENT: One of the most common and widely used measures of inequality to analyse the size distribution of income is Gini coefficient proposed by Carrodo Gini, an Italian statistician, in 1921. Gini

[1] Nanak C Kakwani, *op cit.* p-33.

coefficient is used in official publication in Britain to summarize the distribution of income and wealth[1]. It is defined as

$$G = \frac{\Delta}{2\mu}, \qquad -- \qquad (2.17)$$

where $\Delta = \frac{1}{n(n-1)} \sum_{i=1}^{n} \sum_{j=1}^{n} |x_i - x_j|,$ -- (2.18)

x_j being the income of the j^{th} unit, and n the total number of units.

Subsequently Gini proposed inequality measure that is equal to [1 – 2(Area under Lorenz curve)]. He demonstrated that this new inequality corresponds to his earlier measure defined in terms of relative mean difference. The relationship can be derived in the following manner.

$$G = \frac{1}{2\mu} \int_0^{\infty} \int_0^{\infty} |x-y| f(x) f(y) dy\, dx$$

$$= \frac{1}{2\mu} \int_0^{\infty} \left[\int_0^{x} (x-y) f(y) dy + \int_x^{\infty} (x-y) f(y) dy \right] f(x) dx$$

Using equation (2.7) and (2.8), we get

$$= \frac{1}{\mu} \int_0^{\infty} [x F(x) - \mu F_1(x)] f(x) dx \qquad - \qquad (2.19)$$

Where $F(x)$ is the probability distribution function and $F_1(x)$ is the first moment of $F(x)$ distribution. Integrating the equation (2.19), we get,

---

[1] AB. Atkinson, *op cit.* p-45

$$= \frac{1}{\mu}\int_0^{\infty} xF(x)f(x)dx - \int_0^{\infty} F_1(x)f(x)dx$$

$$= 1 - \int_0^{\infty} F_1(x)f(x)dx - \int_0^{\infty} F_1(x)f(x)dx$$

$$= 1 - 2\int_0^{\infty} F_1(x)f(x)dx \qquad - \qquad (2.20)$$

G = 1 – 2 [Area under Lorenz curve]

If the Area = 0, G = 1, i.e. the case for perfect Inequality, If Area = $\frac{1}{2}$, G=0, i.e. the case for perfect equality. This proves that $0 \le G \le 1$.

For discrete distribution the Gini coefficient is calculated with the help of the following formula[1]

$$G(x) = 1 + \frac{1}{n} - \left(\frac{2}{n^2 \bar{x}}\right)\sum_{i=1}^{n}(n+1-i)x_i .$$

Where x_i is the income of the i^{th} man/household, n is the number of persons/households. This formula is quite useful for practical calculation.

Another very useful formula can be represented as under–

Let $p_i = \frac{P_i}{P}$, $y_i = \frac{x_i}{x}$, $z_i = \sum_{k=1}^{i} y_k$, $i = 1,2,3...n.$

[1] Amartya Sen, "*Poverty, inequality and unemployment, Some conceptual issues in measurement*" in poverty and income distribution in India, ed. TN. Srinivasan and PK. Bardhan (Calcutta : Statistical Publishing Society, 1974); p-77.

Here P is the total number of persons/households, p_i the number of persons/households in the i[th] income class, $i = 1,2,3...n$, y the total income and y_i the income of the i[th] class. Therefore, p_i is the population share of the i[th] income class, y_i the corresponding income share and z_i the cumulative share of income up to the i[th] income class. Using these, Gini coefficient is calculated as[1]

$$G = 1 - \sum_{i=1}^{n} p_i (z_i + z_{i-1}), \quad z_o = 0.$$

This formula is used in this study to arrive at the final result.

B.1.2. RELATIVE MEAN DIFFERENCE: Von Bortkiewiez proposed the relative mean difference as a measure of inequality in 1898 (his result was published in 1930). The statistical property was investigated by Pietra (1948)[2]. The measure is defined as

$$RMD = \frac{1}{2\mu n} \sum_{i=1}^{n} |x_i - \mu|$$

with perfect equality RMD = 0 and with all income going to one person only, RMD = $\frac{2(n-1)}{n}$. This measure satisfies the Pigou – Dalton condition only

---

[1] AL. Nagar & RK. Das; *Basic Statistics*, (New Delhi: Oxford University Press, 11[th] impression-1994) p-380

[2] Since this measure is classified under this category, it is here also place under Lorenz curve's related measure (see Nanak C. Kakwani, op cit) p-118

so long as the transfer takes place between two sides of the mean. When the transfer between two sides of the mean takes place, the effect is to increase one absolute deviation from the mean and to decrease another by the same amount, so that there is no net change in the value of RMD. This means that RMD is completely insensitive to transfer of income from a poorer person to a richer person as long as both lie on one side of the mean[1]. Thus, Dalton's principle of income transfer is violated. This RMD is equal to the maximum discrepancy between egalitarian line and the Lorenz curve at an income level $x = \mu$[2].

If the population are divided into two groups so that in the first (second) group there are all those income units having income less (greater) than the population mean, the percentage of total income that should be transferred from the second group to the first group so that both have the same income is given by the relative mean difference[3]

B.1.3. BOWLEY'S INDEX[4]: Bowley's index of inequality measure is defined by the following formula -

---

[1] Amartya Sen, *On economic inequality* (New Delhi: Oxford University Press, 1973a).p-25
[2] Nanak C. Kakwani, op cit, p-80
[3] ibid. p-80
[4] Since this measure is classified under this category, it is here also place under Lorenz curve's related measure (see Nanak C. Kakwani, op cit page 118)

$$B = \frac{Q_3 - Q_1}{Q_3 + Q_1};$$

Where $Q_i = l_0 + \frac{\frac{iN}{4} - c.f.}{f_{md}}(l_1 - l_0)$, and l_1, l_0 are the lower and upper limit of the median class. $c.f.$ is the cumulative frequency preceding median class and f_{md}, the frequency of median class. Simply, this formula is a coefficient of quartile deviation. This measure is free from the effect of extreme values for it is based on the value of the 25th and 75th observation only.

B.1.4. PYATT, *et al.* (1980) INDEX[1]: Pyatt, et al. (1980) suggest a simpler formula on the basis of rank of income for calculating Gini coefficient.

$$G = \frac{2Cov(y, r_y)}{n\bar{Y}}$$

Where $2Cov(y, r_y)$ is the covariance between income and rank of all individuals/ recipients according to income ranging r_y from the poorest (rank = 1) to the richest (rank = n) and $\bar{Y}$ is mean income.

[1] This topic is taken from '*survey methods of measuring changes in income inequality*' ECAFE seminar, Bangkok, January, 1972.

B.1.5. MILANOVIC (1997) INDEX[1]: Milanovic (1997) claims to have devised an even simpler formula using coefficient of variation and correlation coefficient for calculating Gini coefficient as

$$G = \frac{CV_y\ \gamma(y, r_y)}{\sqrt{3}},$$

Where CV_y is the coefficient of variation of income and $\gamma(y, r_y)$ is the correlation coefficient between income and rank of individuals by income.

B.1.6. ELTETO AND FRIGYES' INEQUALITY MEASURES: In 1968, Elteto and Frigyes proposed a set of three inequality measures that are defined as -

$$u = \frac{\mu}{\mu_1},\quad v = \frac{\mu_2}{\mu_1} \text{ and } w = \frac{\mu_2}{\mu}$$

Where $\mu = E(x)$, $\mu_1 = E(x|x < \mu)$ and $\mu_2 = E(x|x \geq \mu)$

The range of these measures are from one to infinity, the income variables are being transformed so that they are confined within the finite range of zero to unity as -

$$u' = 1 - \frac{1}{u},\quad v' = 1 - \frac{1}{v}, \text{ and } w' = 1 - \frac{1}{w},$$

These equations demonstrates that[2]

---

[1] ibid

[2] Kondor (1971) established the relationship between these inequality measures and Relative mean deviation.

$\frac{(u-1)(w-1)}{(v-1)} = T$, where T is nothing but RMD. Hence, Elteto and Frigyes' inequality measures convey no more information than RMD conveys. Their measure reflect different aspects of inequality – inequality within the two classes and between the lower and the upper classes.

INDICES WHICH ARE NOT BASED ON LORENZ CURVE

Besides above indices based on Lorenz curve, there are a number of indices that does not base on Lorenz curve and can be represented as under: -

B.2.1. RANGE (R): The range (R) can be defined as the absolute difference between the highest X_{Max} and lowest X_{Min} income levels divided by the mean income ($\bar{x}$).

i.e. $R = \frac{1}{\bar{x}}[\ X_{Max} - X_{Min}\ ]$

If income is absolutely equal, R = 0. At the other extreme, if only one person earned all the income R = n, so that $0 \leq R \leq n$. The Range ignores the distribution inside the extremes, such that it obviously violates the Pigou - Dalton condition[1].

[1] Amartya Sen, op cit, p-25

B.2.2. **STANDARD DEVIATION (σ):** The standard deviation of the income (x) can be written as –

$$SD = \sqrt{\frac{1}{n}\sum(x_i - \bar{x})^2}.$$

If all incomes are multiplied by a scalar factor λ, the variance income is changed by the factor λ^2 as $V(\lambda x) = \lambda^2 V(x)$. This satisfies the Pigou – Dalton condition over the entire income scale because by squaring the deviation from the mean, they ensure the crucial property of concavity.

Any transfer from a poorer person to a richer, other things remaining the same, always increases the standard deviation and this is the attractive property of this measure.

B.2.3. **VARIANCE OF LOG - INCOME:** Unlike the variance of income, the variance of the logarithm of income V (log x) is a mean-independent measure of inequality. Let $\bar{\mu}$ be the geometric mean income of the distribution. So that

$$\text{Log } \bar{\mu} = \frac{1}{n} \text{Log} x_i,$$

$$V(\text{Log } x) = \frac{1}{n}\sum(Log x_i - Log \bar{\mu})^2.$$

If all incomes are multiplied by a positive scalar factor λ, the variance of log income does not change at all. That is V(log$x\lambda$) = V(log x) which satisfy the property of population - size independence. However it does not satisfy the Pigou-Dalton condition for the entire range of incomes.

Sometimes the deviation of logarithms of income x is taken from the logarithm of arithmetic mean log μ, rather than log $\bar{\mu}$.

i.e. $V'(\text{Log x}) = \frac{1}{n}\sum (Log\, x_i - Log\mu)^2$,

$$= \frac{1}{n}\sum[(Log\, x_i - Log\,\bar{\mu}) + (Log\,\bar{\mu} - Log\mu)]^2$$

$$= V(Log\, x) + (Log\,\mu - Log\,\bar{\mu})^2.$$

But $(Log\,\mu - Log\,\bar{\mu})^2$ is it self a measure of inequality, namely, Theil's second measure. Thus $V'(Log\, x)$ is really the sum of two distinct inequality measures. Nevertheless, $V'(Log\, x)$ and $V''(Log\, x))$ have suffer a serious practical defect. They are not defined if any one of X's is zero as it is in the case of Malaysian distribution of income. To tackle this defect some have assigned a small non-negative scalar (e.g.1) income. However, the sensitivity of the measure is arbitrary procedure, and the inability to defend the particular amount assigned, render the measure unusable in such situations.

B.2.4. THE CO-EFFICIENT OF VARIATION (C.V.): The co-efficient of variation (C.V) as a measure of income dispersion can be represented as under.

$$\text{C.V.} = \frac{\sigma}{\mu}, \text{ for discrete distribution.}$$

$$\text{and} \quad \text{C.V.} = \int_0^{\infty} (x-\mu)^2 \, f(x), \text{ for continuous distribution, where}$$

σ and μ are the standard deviation and mean of the distribution respectively. CV method attached equal weights to transfers of income at different income levels[1]. This satisfies the Pigou – Dalton condition over the entire income scale because, by squaring the deviation from the mean, they ensure the crucial property of concavity.

B.2.5. STANDARD DEVIATION OF LOGARITHM: If one wishes to attach greater weight in transfers at the lower end, logarithm recommends itself. The other advantage over the original values is that it eliminates the arbitrariness of the units. The standard deviation of logarithm as a measure of inequality is defined as

$$L = \left[\frac{1}{n} \sum_{i=1}^{n} Log\, \bar{x} - \log x_i \right]^{\frac{1}{2}},$$

[1] ibid p-28

As it is being used in the standard statistical literature, the deviation is taken from geometric mean rather than arithmetic mean, but in the income distribution literature using the arithmetic mean seems more common (Atkitson 1970, Stark 1972)

B.2.6. THEIL'S ENTROPY INDEX: An interesting measure of inequality, proposed by Theil (1967), was derived from the notion of entropy in information theory. When y is the probability that a certain event will occur, the information content T(y) of noticing that the event has, in fact, occurred must be a decreasing function of y - the more unlikely an event, the more interesting it is to know that thing has really happened. It is defined as–

$$T = \frac{1}{n}\sum \frac{y_i}{\mu} Log \frac{y_i}{\mu},$$

Where $n\mu = \sum y_i = y$ is the total income.

Let $\frac{y_i}{\mu}$ be the income share of the i^{th} person and the entropy of income share is defined as

$$H(y) = \frac{1}{n}\sum \frac{y_i}{\mu}\left(Log \frac{1}{\frac{y_i}{Y}} \right)$$

The upper limit of H(y) is *log(n)*, which is reached when all individuals earn equal income, and the minimum of H(y) is zero, which represents one individual receiving all the income. Thus the entropy H(y) of an income distribution can be regarded as a measure of income inequality. Theil obtained a measure of income inequality by subtracting H(y) from its maximum value log n. Thus, the inequality measure as proposed by Theil (T) is -

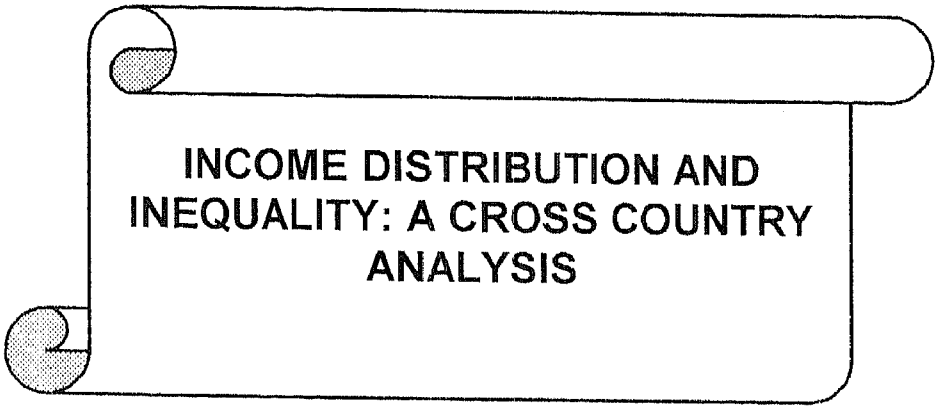
$$T = Log\, n - H(y)$$

$$= Log\, n - \sum \frac{y_i}{Y} Log \left(\frac{1}{\frac{y_i}{Y}} \right)$$

$$= \sum \frac{y_i}{Y} Log \left(\frac{y_i / Y}{1 / n} \right)$$

When there is perfect equality, each person's income share ($\frac{y_i}{Y}$) and population share ($\frac{1}{n}$) are equal, and T assumes the value of zero. Where a single person is receiving all the income and everyone else receives zero income, one of the y's is then equal to Y, and all other Y's are equal to zero. In this case T = log n; all terms with a zero income share tend to zero, since $x\log x \rightarrow 0$ as $x \rightarrow 0$.

CHAPTER – 3



INCOME DISTRIBUTION AND INEQUALITY: A CROSS COUNTRY ANALYSIS

INCOME DISTRIBUTION AND INEQUALITY: A CROSS COUNTRY ANALYSIS

The pattern in which income is distributed among various sections of the community largely determines inequality in the country. This chapter explains income distribution and income inequality at global level

SECTION A: INCOME DISTRIBUTION

According to the World Bank, low-income countries represent 40% of the world's population but only 11% of the world's gross national income in 1999. In sharp contrast, high-income countries represent only 15% of the world's population and 56% of the world's gross national income.

TABLE NO. 3.1
(Table showing Global Income Distribution in 1999)

Countries Ranking	Population (millions)	Per Cent of Population	GNI* ($ billions)	Per Cent of GNI*
Low Income	2,417	40	4,522	11
Lower Middle	2,093	35	8,887	21
Upper Middle	572	10	5,009	12
High Income	896	15	23,032	56
Total	5,978	100	41,450	100

*Purchasing power parity gross national income
Source: World Bank, *World Development Indicators (2001)*

A recent study by senior World Bank Sr. Vice President, Branko Milanovic, shows that the richest 1% of the world currently have income equivalent to the poorest 57%. 80% of the world's population live below what countries in North America and Europe consider the poverty line, and the poorest 10% of Americans are better off than two-thirds of the world population. When the poverty line in the United States was $1000 per person, the World Bank Atlas showed that the average per capita income in Brazil was under half of that figure and that in India was around one – tenth[1].

TABLE NO. 3.2
(World income share by quintile for 1999)

Sl.No	Quintile	Income share
1	Lowest	1.4%
2	Second	1.9%
3	Third	2.3%
4	Fourth	11.7%
5	Highest	82.7%

Source: World Bank (1999)

The following table No.3.3 depicts the income distribution of U.S. by 2001. It appears that the slices of economic pie progressively smaller

[1] Milanovic, B. *True world income distribution, 1988 and 1993: First calculation based on household surveys alone* (World Bank 1999)

as we move into lower quintiles. The bottom quintile get only 3.5% while the top quintile get 50.1% of the whole economic pie.

TABLE NO. 3.3

(US income share by quintile for 2001)

Sl. No	Quintile	Income range	Income share
1	Lowest	Below $ 17,970	3.5%
2	Second	$17,970- $ 33,314	8.7%
3	Third	$33,314 - $53,000	14.7%
4	Fourth	$53,000- $83,500	23.0%
5	Highest	Above $ 83,500	50.1%

Source: World Bank (2003)

A.1. Cross country scenario

In studying income distribution some classification is required for comparing between nations. In a study conducted jointly by the World Bank and the Institute of Development Studies at Sussex University (England), countries are classified into three broad categories[1]. A country is said to be High inequality, Moderate inequality, and Low inequality if the share of bottom 40% are below 12%, between 12% - 17% and more than 17% respectively. After studying the income pattern of 66 countries, the following broad patterns were identified.

"*The socialist countries have the highest degree of overall equality in the distribution of income. ... the average income share of the*

[1] Rudder Dutt and KPM.Sundharam, *Indian Economy, 40th edition* (New Delhi S.Chand & Company, 1999), p-337

lowest 40% - amounting to above 25% of total income may be taken as an upper limit for the larger income share to which policy makers in underdeveloped countries can aspire.

The developed countries are evenly distributed between the categories of low and moderate inequality. The average income share of the bottom 40% amounts to 16% which is lower than the average for socialist countries but better than most of the underdeveloped countries...those of the underdeveloped countries classified in the low inequality category have income share of the lowest 40% average 18% as is the case with the most egalitarian of the developed countries. Against this, however, half the underdeveloped countries show income share of the lowest 40% averaging only 9%"[1]

On the basis of the above categorisation there are 25 countries in Category I like Sierra Leone, Namibia, Lesotho, South Africa, Botswana, Colombia, Brazil, Ethiopia, Niger, Chile, etc where the poorest 40% earns less than 10% of total country's income; Zambia, Costa Rica, Venezuela, Gambia, Panama, etc where the poorest 40% earns less than 12% of national's income (annexure 3.A).

There are 34 countries in category II like Papua New Guinea, Malaysia, Mali, Nigeria, Zimbabwe, Cameroon, Bolivia, Malawi, Peru,

[1] Chenery, Ahluwalia, Bell, Duly and Jolly: *Redistribution with growth* (1974), p-7

Uruguay, etc where the poorest 40% earns less than 14% of the country's income; Russian federation, Singapore, Iran, Hog Kong, Thailand, US, China, Germany, Turkey, Georgia, etc where the poorest 40% gets less than 17% of national economic pie (annexure 3.B). We find 65 countries in a more improved condition of income distribution or low inequality for countries like Madagascar, Jamaica, Senegal, UK, New Zealand, Australia, Italy, Ireland, Israel, Greece, Switzerland, India, France, Sri Lanka, Spain, Canada, Poland, Indonesia, Pakistan, Bangladesh, Korea, etc (annexure No 3.C). Income are evenly distributed in Denmark, Sweden, Norway, Hungary, Finland, Japan and Czech Republic where even the poorest 40% share more than 23% of national economic pie.

It is clearly perceptible that in many developing countries growth is not transformed into economic development or the so-called 'Trickle down effect' fails. Most of the former soviet countries, eastern European and many Asian countries are much better off in income distribution than Latin American and Sub Saharan African countries.

A.2. Latin America: The most unequal distribution of income

Income distribution in Latin America is the most unequal in the world. This is not a new phenomenon: at least since the sixties Latin

American displays the highest Gini coefficient in the world[1]. The income distribution in the Latin America was depicted in table No. 3.4 which shows that the share of bottom 40% and top 20% are almost constant during 1990's in Argentina, Chile, Cambodia, Mexico, Panama and Venezuela, meanwhile there are certain countries where the share of bottom 40% are more or less constant and the top 20%'s share are declining like Honduras, Uruguay. This is a positive distribution of income. We find concentration of income among the rich people in Ecuador, Paraguay, and Venezuela. The income share of top 10% is more or less stable during the 1990's in Chile, Cambodia and Mexico. Brazil and Mexico experienced an increase in inequality during the eighties and relatively stability thereafter.

Recent CEPAL (2002b) data indicates that by the end of nineties in the four Latin America countries (Brazil, Bolivia, Colombo and Honduras), the percentage of total income that accrued to the richest decile nearly trebled the percentage of poorest 40%. In the case of Brazil the ratio reached a value of 4.6 times. In the other extreme, Uruguay and Costa Rica displayed a 1.25 and 1.92 ratio, respectively (Morley, 2001a)[2]

---

[1] Vardana Shalan (ed) "*Globalization and Income Inequality*" (Hyderabad: Icfai University Press. 2007). p-179

[2] Vardana Shalan (ed). op cit. p-181

TABLE NO 3.4

(Income distribution by household during 1990-2000)

Country	Year	Bottom 40%	Next 30%	20% closest to the top 10%	Top 10%
Argentina	1990	14.9	23.6	26.7	34.8
	1997	14.9	22.3	27.1	35.8
	1999	15.4	21.3	26.1	37
Bolivia	1989	12.1	22	27.9	38.2
	1997	9.4	22	27.9	40.7
	1999	9.2	24	29.6	37.2
Brazil	1990	9.5	18.6	28	43.9
	1996	9.9	17.7	26.5	46
	1999	10.1	17.3	25.5	47.1
Chile	1990	13.2	20.8	25.4	40.7
	1996	13.1	20.5	26.2	40.2
	2000	13.8	20.8	25.1	40.3
Colombia	1994	10	21.3	26.9	41.8
	1997	12.5	21.7	25.7	40.1
	1999	12.3	21.6	26	40.1
Costa Rica	1990	16.7	27.4	30.2	25.6
	1997	16.5	26.8	29.4	27.3
	1999	15.3	25.7	29.7	29.4
Ecuador	1999	15.3	25.7	29.7	29.4
	1997	17	24.7	26.4	31.9
	1999	14.1	22.8	26.5	36.6
Honduras	1990	10.1	19.7	27.3	43.1
	1997	12.6	22.5	27.3	37.7
	1999	11.8	22.9	28.9	36.5
Mexico	1989	15.8	22.5	25.1	36.6
	1994	15.3	22.9	26.1	35.6

Country	Year	Bottom 40%	Next 30%	20% closest to the top 10%	Top 10%
Panama	2000	14.6	22.5	26.5	36.4
	1991	12.5	22.9	28.8	35.9
	1997	12.4	21.5	27.5	38.6
	1999	12.9	22.4	27.7	37.1
Paraguay	1990	18.6	25.7	26.9	28.9
	1996	16.7	24.6	25.3	33.4
	1999	13.1	23.0	27.8	36.2
Uruguay	1990	20.1	24.6	24.1	31.2
	1997	22.0	26.1	26.1	25.8
	1999	21.6	25.5	25.9	27.0
Venezuela	1990	16.7	25.7	28.9	28.7
	1997	14.7	24.0	28.6	32.8
	1999	14.6	25.1	29.0	31.4

Source: CEPAL (2002b) as in Vardana Shalan (ed) "*Globalization and Income Inequality*" (Hyderabad: Icfai University Press, 2007), p-1814

SECTION B: INEQUALITY

There have been many attempts to estimate the magnitude of size distribution of global personal incomes and its evolution over time[1]. Mention may be made about Kirman and Tomasini (1969), Whalley (1979), Berry, et al. (1983a, 1983b, 1991), Summers and Hravis (1984), Adelm (1984), Ghosh and Natziger (1986), Theil (1985), Yotopoulos

[1] Francois Bourguignon and Christia Morrison, *The Size distribution of Income among world Citizen 1820-1990.*

(1989), Ravallion, et al.(1991), Theil and Seale (1994), Sprout and Weaver (1997), Schultz (1997), Milanovic (1999).

As discussed earlier countries are categorized into high, moderate and low-income inequality countries on the basis of income share of the poorest 40%. In annexure 3.D, 3.E and 3.F present high, moderate and low income inequality countries respectively and, from these tables we see that Gini coefficient for Botswana is 63, Brazil- 59.1, Malaysia – 49.2, Thailand – 43.2, Australia - 35.2, Japan – 33.7, Switzerland – 24.9, U.K – 36, Norway – 25.8. This divergence of figures indicates that there is a huge income disparity in the world. This leads one to conclude that if high economic growth is accompanied by high Gini index, then re-slicing of economic pie through economic progress has been entirely lost. This is true about Brazil, Malaysia, etc. Eastern Europe has a Gini index close to 25, but US has an index of 45. That means, income in Eastern Europe (formerly Communist ruled) is well distributed and in US it is not so well distributed. Does it mean that, the poverty has vanished from Eastern Europe? Not true. It only indicates existence of mass poverty whose low income is well distributed, with very few belonging to the class of high-income millionaires/billionaires.

From the data of high inequality countries like Sierra Leone, Namibia, Lesotho, South Africa, Botswana, Colombia, Brazil, Ethiopia, etc, it was calculated that correlation coefficient between Gini coefficient

and the percentage income share of bottom 40% of population is – 0.806, which is highly significant. And for a moderate inequality like Singapore, Thailand, Malaysia, Philippine, Federation of USSR, U.K., Portugal, Georgian, Switzerland and China, U.S.A., India, etc, the correlation coefficient is –0.856. And for those low inequality countries like Sri Lanka, U.K, New Zealand, Italy, Ireland and other European countries, the coefficient is –0.93. This indicates that the income share of bottom 40% can explained almost 65% - 87% of the total variation in Gini coefficient. It is appropriate to mention here that the income inequality measured by Gini coefficient and Human Development Index are significantly correlated by - 0.4, which indicate that rich – poor divide can not be ignored to have high quality human capital.

B.1. Inequality by Decade and Region wise

Different countries experienced different phases of inequality. Some country exhibits rising while others decreasing, irregular for certain countries. The trend of inequality was affected by many other things, the economic system of the country, the choice of economic policy and the priority of the country concern. From the close examination of annexure 3.A to 3.F, it can be concluded that income is evenly distributed in Eastern Europe and Asian Countries while it was unevenly distributed in Sub Saharan Africa and Latin America. To have

a glimpse of the degree of inequality in income distribution region-wise is presented in table No. 3.5. A close examination of table 3.5 indicates that inequality is highest in Latin America and Sub Saharan African countries since 1960's. According to Morley (2001a), while Argentina and Venezuela display a significant increase in Gini coefficient during the last two decades, Brazil and Mexico experienced an increase in inequality during the eighties and a relative stability thereafter.

TABLE NO 3.5
(Gini coefficient by region and decade)

Region	1960's	1970's	1980's	1990's
1. Eastern Europe	25.1	24.6	25.0	28.9
2. South Asia	36.2	33.9	35.0	31.9
3. OECD and high income countries	35.0	34.8	33.2	33.7
4. Middle East and North Africa	41.4	41.9	40.5	38.0
5. East Asia and Pacific	37.4	39.9	38.7	38.1
6. Sub Saharan Africa	49.9	48.2	43.5	46.9
7. Latin America	53.2	49.1	49.7	49.3

Source: Deininger and Squire (1996)

Wage inequality is a major determinant of inequality in Latin America. In otherwords, the high inequality is observed in the region is not just a consequence of differences in earning of workers and capitalist, but also of income difference among workers. Wage

differentials, in turn, are to a large extent the result of unequal distribution in quantity and the quality of education (Moerley, 2001a, Behrman, Birdsall and Szekely, 2001)

Income inequality is also very high in Sub Saharan African countries like Cote D'Ivoire, Kenya, Nigeria and Uganda. Gini coefficient of Cote D'Ivoire recorded 46.0 in 1959 and increased to 61.0 in 1979, and was declining to 37.0 in 1995. Kenya recorded 40.0 in 1982 which went up to 57.5 in 1994, while Uganda experienced a worst form of inequality. She recorded 26.6 in 1970 and constantly increased to 37.9 in 1996[1]. Globalization cannot be entirely blamed for increased inequality in Africa in the 1990's. Social and economic afflictions and diseases, including HIV/AIDS, Civil war, famine and external shocks, also bear some of the blames for African bad record[2].

B.2. Trend of Global Inequality

Trend of global income inequality since 1820 upto 2000 measured by Mean Log Deviation (MLD) and Theil index (TI) are given in Table 3.6 and annexure No 3.G. From this table we come to conclude that inequality rose steadily and reached the peak in 1979 (i.e 89.8 by

[1] UNO /WIDER-UNDP, world income inequality data base, World bank (1997), World bank (1995), Bigsten and Kayizzi – Murgewa (1999)
[2] Vardana Shalan (ed), op cit, p-337

MLD or 83.9 by TI), then started declining, again rose during 1990's and declined again as can be seen from table No. 3.6

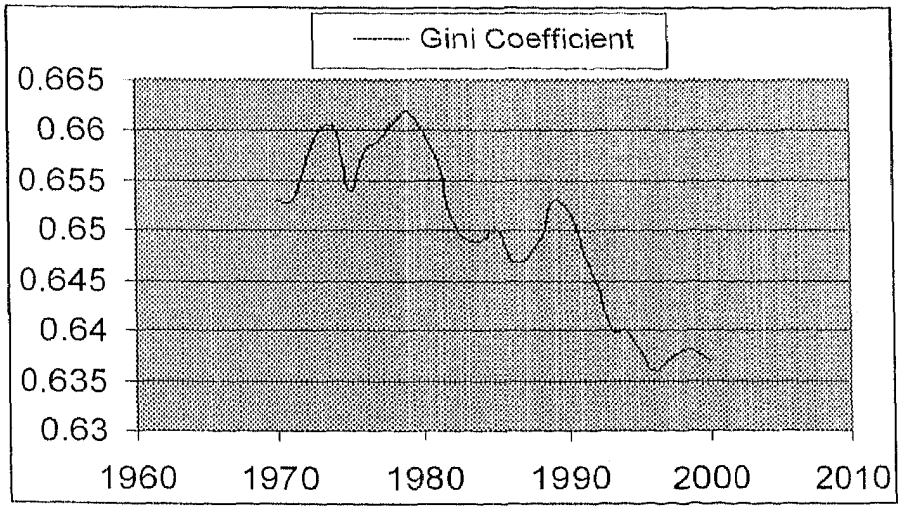
TABLE NO. 3.6
(Trend and decomposition of global inequality)

	MEAN LOG DEVIATION			THEIL INDEX		
Year	Global	Across %	Within %	Global	Across %	Within %
1820	0.441	12.02	87.98	0.53	11.44	88.56
1850	0.504	22.02	77.98	0.61	21.16	78.84
1870	0.561	28.88	71.12	0.67	27.93	72.07
1890	0.625	34.72	65.28	0.75	33.51	66.49
1910	0.682	39.44	60.56	0.8	37.42	62.58
1929	0.707	47.38	52.62	0.78	46.92	53.08
1950	0.781	60.44	39.56	0.81	59.88	40.12
1960	0.772	59.59	40.41	0.77	58.5	41.50
1970	0.845	60.95	39.05	0.81	60.2	39.80
1975	0.871	71.41	28.59	0.81	68.43	31.57
1979	0.898	71.6	28.4	0.839	68.9	31.10
1980	0.888	71.17	28.83	0.83	68.55	31.45
1985	0.847	68.6	31.4	0.81	67.86	32.14
1990	0.855	67.49	32.51	0.82	68.09	31.91
1995	0.814	63.39	36.61	0.78	65.18	34.82
1997	0.814	62.53	37.47	0.78	64.58	35.42
1999	0.819	61.54	38.46	0.79	64.29	35.71
2000	0.82	61.1	38.9	0.78	63.73	36.27
Change	0.379	49.08	-48.08	0.25	52.29	-58.29
Change Since '79	-0.08	-10.5	10.5	-0.06	-5.17	5.17
% Change since 79	-8.69	-14.66	36.97	-7.03	-7.5	16.62

Source: Francois Bourguignon and Christian Morrison; The size distribution of income among world citizen 1820-1990. Revised draft June 1999

The trend of Global inequality for the last three decades can be more closely examine from diagram 3.1 and annexure 3.G. The level of inequality rapidly declined in 1975 due the fact that rich country suffered economic recession in account of Oil which was not felt in the poorest and largest countries of the world. Inequality went down by 8.69% in MLD measurement while it was 7.03% in TI. The ratio 10 – 10 (i.e. ratio of richest 10% to poorest 10%) or 20-20 (i.e. ratio of richest 20% to poorest 20%) are sometimes used as a measure of inequality. From annexure No 3.K, we see that the 10-10 ratio is more sensitive than that of 20-20.

Diagram 3.1
(Trend of global inequality from 1970 – 2000)



Source(figure) : Bourguigon Francois and Christian Morrison(1999)

However, it must be borne in mind that there are a number of debates regarding whether global inequality is rising or declining over the last two or three decades[1]. It turns out that there is no single correct answer, because the answer depends on which combination of measures one adopts. It depends on[2]

(1) The measure of inequality (a coefficient like the Gini, or quintile or decile (tenth) ratios),

(2) The unit of inequality (countries weighted equally, or individuals weighted equally and countries weighted by population), and

(3) The method of converting incomes in different countries to a common numeraire (current market exchange rates or purchasing power parity exchange rates)

Treating these as either/or choices yields eight possible measures, each with some plausibility for certain purposes. Then there is the further question of what kind of data is used—the national income accounts or household income and expenditure surveys. From his

---

[1] Detail information can be obtained from http www.journals.uchicago.edu /AJS/journal/issues/v110n2/080300/080300.web.pdf,http://repositories.cdlib.org/cgirs

[2] Finance & Development, *A quarterly journal of IMF*, December 2001, Volume 38, Number 4

intensive study, Robert Hunter Wade concludes that using market exchange rates of global income distribution has become much more unequal[1].

It is worth noting to say that around 40% of the world population is living in Asia, China being the most populous countries in the world. That means, the inequality trend of china alone will be able to affect the global trend tremendously. The inclusion and exclusion of China from our study would change the trend of global inequality very much. This subject matter had already drawn the attention in the previous years and the graph for the same is readily given in the diagram 3.2

B.3. Country – wise analysis

To have an idea on the trend of inequality in the last three/two decades at the world level let us look at its movement pattern in few countries of the world.

Bangladesh experienced a low level of inequality during the last three decades. The Gini coefficient was 25.88 in 1983-84 which moved upward year after year, and reached 33.63 in 1996. Inequality was declining to 31.79 in 2000 registering a drop of 5.5%.

[1] The Rising Inequality of World Income Distribution, Finance & Development, op cit.

Gini coefficient of Bangladesh by expenditure

1983-84	1985-86	1988-89	1991-92	1995-96	1996	2000
25.88	26.92	28.85	28.27	33.00	33.63	31.79

Pakistan observed irregular fluctuation during 80's and 90's. Gini coefficient was 33.35 in 1987 and remained more or less constant upto early 90's which was drastically dropping to 27.43 in 1996-97, and again jumped to 32.99 in 1998-99

Gini coefficient of Pakistan by expenditure

1987	1990-91	1992-93	1996-97	1998-99
33.35	33.23	34.22	27.43	32.99

China (Rural) was seen to route through an increasing inequality during the early 90's, reached a maximum of 34.00 in 1994 and reversed its direction from 1995. Although the reduction in inequality is quite small but it is an welcoming trend.

Gini coefficient of China (Rural) by expenditure

1990	1992	1993	1994	1995	1996	1997	1998
30.57	32.03	32.13	34.00	33.98	33.62	33.12	33.07

China had taken many steps to reduce income disparity through education, employment and other incentive programmes.

China (Urban) had passed through an increasing trend of inequality like any other developing countries. The inequality was 24.78 in 1990 and more or less stationary during the mid 90's, swinging around 28, 29 in Gini point, but experienced a rapid increase from 1999. The Gini coefficient was recorded to increase by 34.46% during one decade only.

Gini coefficient of China (Urban) by expenditure

1991	1992	1993	1994	1995	1996	1997	1998	1997	1998
24.78	24.17	28.47	29.22	28.27	29.09	29.35	29.94	31.95	33.32

Brazil, one of the fastest growing economy in the world experienced a painful journey in so far as the inequality is concern owing to its nature of growth. Income inequality has remained very high across decades, it is the highest among big and prosperous economy. Inequality rose during the whole decade of 80's and reached the peak in 1989, since then the figure almost become stable between 59.82 and 60.66. Brazil may not able to reduce inequality but can contain it from rising further

Gini coefficient of Brazil by income

1981	1984	1987	1989	1990	1993	1996	1997	1998	2001
57.57	57.88	59.31	63.31	60.68	59.82	59.98	59.05	60.66	59.25

Indonesia, one of the most disrupted countries by political instability observed a moderate inequality. The income gap between the rich and the poor showed an increasing trend during the 80's and the late 90's. It

reached a maximum of 38.36 in 1998 and retreated by late 90's, the country underwent an irregular fluctuation since then. Gini coefficient had shown a drastic fall / rise within a span of one year, to be more specific it was 38.36 in 1998 dipped to 31.73 in 1999, a drop of 17.28%. And, a jump from 30.33 in 2000 to 34.30 in 2002, which is unbelievable from any angles. Those drastic fluctuations may be attributed to a change in the methodology /techniques of measurement. However, one signal is clear, that is, inequality is not so much high with irregular fluctuations.

Gini coefficient of Indonesia by expenditure

1987	1993	1996	1998	1999	2000	2002
33.12	34.36	36.45	38.36	31.73	30.33	34.30

Mexico, one of the major nations of Latin America displayed a very high degree of income inequality since the late 80's upto the middle part of 90's. Inequality measured by Gini coefficient was 55.14 in 1989 and droped to 51.86 in 1996; that is, a drop of 5.95% during just 7 years. However, the trend reversed its course during the 90's and reached 54.93 in 2000.

Gini coefficient of Mexico by income

1989	1995	1996	1998	2000
55.14	53.73	51.86	53.11	54.93

Chile experienced a very high degree of income dispersion throughout the last two decades. As depicted in the table below, the Gini Coefficient was as high as 57.88 in 1989, which fell to its minimum record of 54.93 in 1994, and that inequality is more or less stable with small amplitude of just 3.09 in Gini points. Those data demonstrate that income inequality can be contained in Chile from ever rising which many countries fail to do so.

Gini coefficient of Chile by income

1987	1989	1990	1992	1994	1996	1998	2000
56.43	57.88	56.49	55.75	54.79	57.47	56.65	57.61

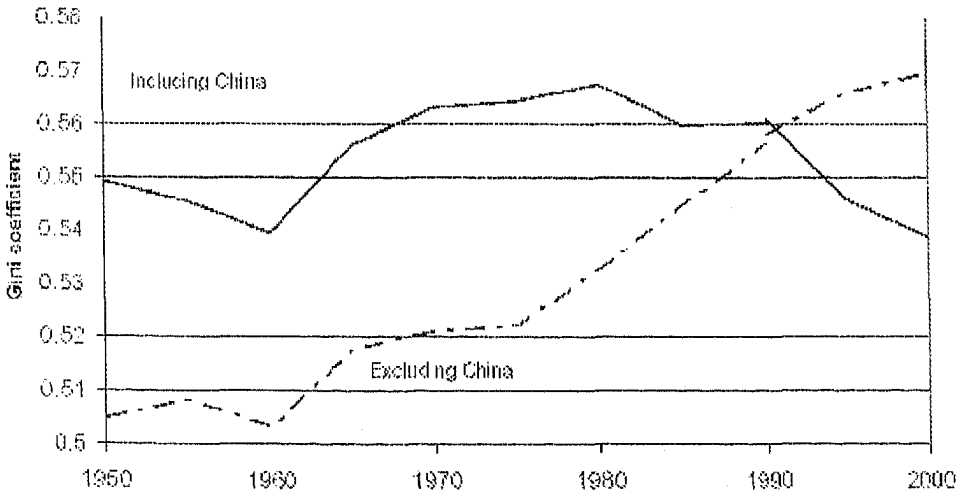
Nigeria, one of the poorest countries in the world, experienced the worst form of inequality during the last two decades. Inequality was steadily rising at an alarming speed. During the early 80's, the country was in the category of moderate inequality and then, the income distribution was deteriorating year after year. The figure of 38.68 in 1985-86 had jumped to 50.56 in 1996-97, a rise of 30.71% during just 10 years. This shows that Nigeria has totally failed to reverse the trend of ever rising income inequality despite the persistent poverty of the majority of its population.

Gini coefficient of Nigeria by expenditure

1985-86	1987	1990-91	1991-92	1996-97
38.68	33.35	33.23	44.95	50.56

The world distribution of income has been an ongoing concern for economist and scholars worldwide. The literature established divergence among the nations in two dimensions. First, growth rates of poor countries have been lower than their counterpart rich countries, this phenomenon is called β- divergence by Barro and Sala-i-Martin (1992) and second, the dispersion of income per capita across countries have tended to increase over time, this phenomenon is called α- divergence by Barro and Sala-i- Martin (1992).

Diagram 3.2
(***Gini coefficient including & excluding China***)



Source: Sutcliffe (2003)

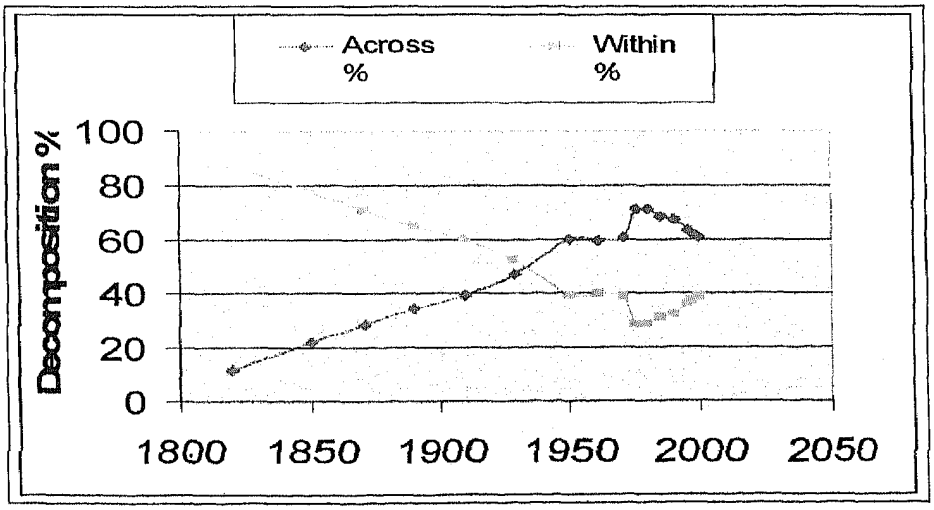
B.4. Inequality Decomposition

In the study of inequality, we decompose global income inequality into two components, "*within-country*" inequality and "*across-country*"

inequality. Within inequality is an equality that would exist in the world if all countries of the world have the same income per capita ($X_i = \mu;\ i = 1, 2....n$, where we have 'n' number of countries) but the actual within country differences. This measure is a population – weighted average of within – country inequalities. The "across – country" component is the amount of inequality that would exist in the world if all citizens within each country had the same level of income, but there were differences in the per capita income across countries. An important point is that this would correspond to a population – weighted (or aggregate income – weighted) measure of inequality[1].

DIAGRAM 3.3

(Decomposition of total global inequality from 1820-2000)



Source: same as table 3.6

[1] The methodology followed by the UNDP (2001) is followed here, as it put equal weights on each country.

The decomposition of global income inequality measured using Log mean deviation and Theil index from the year 1820 to 2000 is given in table 3.6. The decomposition of total inequality into across and within country expressed in percentages is represented in diagram 3.3. It is worth to mention that by 1820, the '*across-country*' component accounts for 12.02% and steadily increased and reached maximum i.e. 71.41% in 1975, and thereafter decrease again.

SECTION C: CAUSES AND CONSEQUENCES

C.1. Causes of increasing global inequality

The causes of disparity in income are very difficult to establish. Opinions differ and many factors are responsible[1].

Differential population growth between poorer and richer countries is one cause. The *fall in non-oil commodity prices*—by more than half in real terms between 1980 and the early 1990s—is another, affecting especially the poorest countries. The *debt trap* is a third. Fast-growing middle-income developing countries, seeking to invest and consume more than can be covered by domestic incomes, tend to borrow abroad; and they borrow on terms that are more favourable

[1] Robert Hunter Wade, op cit.

when their capacity to repay is high and less favourable when—as in a financial crisis—their capacity to repay is low. We saw repeatedly during the 1980s and 1990s that countries that liberalised and opened their financial systems and then borrowed heavily—even if to raise investment rather than consumption—ran a significant risk of costly financial crisis. A crisis pulls them back down the world income hierarchy. Hence, the debt trap might be thought of as a force in the world economy that is somewhat analogous to gravity

Another basic cause is *technological change*. Technological change of the kind we have seen in the past two decades tends to reinforce the tendency for high-value-added activities (including innovation) to cluster in the Western economies rather than dispersed to developing countries. Part of the reason is the continuing economic value of tacit knowledge and "handshake" relationships in high-value-added activities. Technological change might be thought of as distantly analogous to electromagnetic levitation—a force in the world economy that keeps the 20 percent of the world's population living in the member countries of the Organization for Economic Cooperation and Development (OECD) comfortably floating above the rest of the world in the world income hierarchy.

From the last two and a half decades, the global inequality exhibited negative slopes. Many factors are responsible. The most important factors that are attributed to this change are Liberalisation, Privatisation and Globalisation of domestic economy. Many champions of free trade and free capital movements say that the world income distribution is becoming more and more equal as globalisation proceeds. This is the viewpoint of integrationists who believes in *"law of even development,"* which says that all national economies gain from more integration into international markets (relative to less integration), and lower-cost, capital-scarce economies (developing countries) are likely to gain more from fuller integration than higher-cost, capital-abundant economies (developed countries). Developing countries wishing to catch up with standards of living in the west should therefore integrate fully into international markets (by lowering tariffs, removing trade restrictions, granting privileges to foreign direct investment, welcoming foreign banks, enforcing intellectual property rights, and so on). However, a recent study by senior World Bank economist, Branko Milanovic, shows an alarming increase in global inequality in the last decade[1].

---

[1] Robert Hunter Wade, "*The Rising Inequality of World Income Distribution,*" Finance and Development Vol. 38, no. 4 (December 2001)

The other factor is foreign Aid. The concept of foreign aid from rich nations to poor nations is partially based on the premise that a more equal income distribution would be better for the world. Foreign aid is also based on an assumed, albeit justified, moral imperative that the rich have some responsibility to alleviate, if not to eliminate, global poverty. Normatively, there is a stronger case to be made for alleviating poverty in the world than to merely redistribute the income and wealth to achieve greater equality. To the extent that foreign aid from rich nations to poor nations can foster economic growth and development, it seems justified. The problem is that there is virtually no empirical positive correlation between foreign aid and economic development[1]. Critics of foreign aid are quick to point out that the United States has given more than $500 billion to less developed countries since 1945, but the people in many of these countries are no richer today than they were decades ago. Unfortunately, much of the foreign aid from rich countries to poor countries has fallen like thin drops of water on a hot rock. Internal corruptions, restrictions on freedom, and impediments to trade have retarded economic development in those countries to a greater degree than aid has fostered it. Nevertheless, Foreign Aid has helped a lot to reduce global income inequality in one way or the other.

---

[1] Schuelke, Ronald W; *The Global Economics Game (2000)*

The poor performance of foreign aid in terms of fostering development probably explains why the rich countries donate such a small percent of their total income to less developed countries. Appendix 3.8 shows Official Development Assistance (ODA) for 20 industrialized countries in 2000. Note that the United States is the world's 2nd largest aid donor (behind Japan) in terms of total dollars, but last among the 20 countries where ODA is expressed as a percent of each country's Gross National Product (GNP). The United Nation's official development assistance target is 0.7 per cent of GNP. Most nations do not meet their targets

C.2. Causes of increasing global inequality

Income divergence helps to explain another kind of polarisation taking place in the world system, *between a zone of peace and a zone of turmoil.* On the one hand, the regions of the wealthy pole show a strengthening republican order of economic growth and liberal tolerance (except toward immigrants), with technological innovation that is able to substitute for depleting natural capital. On the other hand, the regions of the lower- and middle-income poles contain many states whose capacity to govern is stagnant or eroding, mainly in Africa, the Middle East, Central Asia, the former Soviet Union, and parts of East Asia. Here, a

rising proportion of the people find their access to necessities restricted at the same time as they see others driving Mercedes.

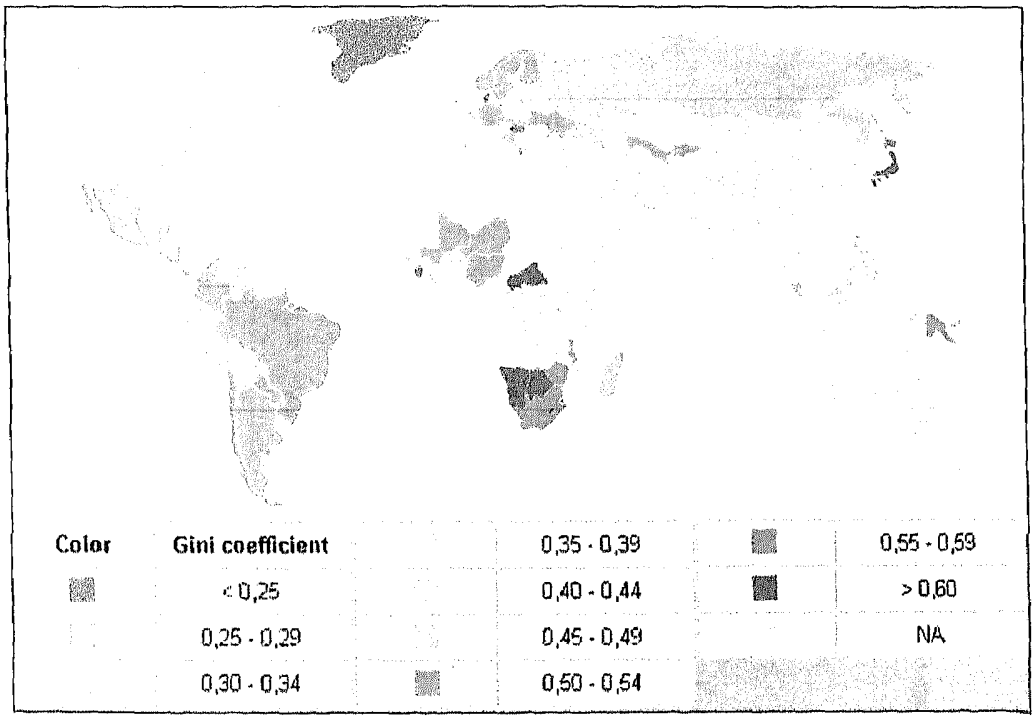
The result is a large *mass of unemployed and angry young people*, mostly males, to whom the new information technologies have given the means to threaten the stability of the societies they live in and even threaten social stability in countries of the wealthy zone. Economic growth in these countries often depletes natural capital and therefore future growth potential. More and more people see migration to the wealthy zone as their only salvation, and a few are driven to redemptive terrorism directed at the symbolic centers of the powerful[1].

This very peculiar map showing the degree of Global size income inequality measured by Gini coefficient may be useful for comparing the Gini Coefficient for different regions of the world and for making a quick look at the distribution of income for different regions.

[1] Schuelke, Ronald W; *op cit*

DIAGRAM NO. 3.4

(Degree of Global size income inequality measured by Gini coefficient)



SOURCE: http:en.wikipedia.org/wiki/image:world_map_Gini_withlegend_2.png

Annexure 3.A
Income distribution for high Inequality Countries

Sl. No	Countries	Survey year	Lowest 10%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
1	Sierra Leone	1989 a.b	0.5	1.1	2.0	**3.1**	9.8	23.7	63.4	43.6
2	Namibia	1993 c.d	0.5	1.4	3.0	**4.4**	5.4	11.5	78.7	64.5
3	Lesotho	1995 a.b	0.5	1.4	3.7	**5.1**	7.7	16.5	70.7	53.6
4	South Africa	1995 a.b	0.7	2.0	4.3	**6.3**	8.3	18.9	66.5	46.9
5	Central African Republic	1993 a.b	0.7	2.0	4.9	**6.9**	9.6	18.5	65.0	47.7
5	Botswana	1993 c.d.	0.7	2.2	4.9	**7.1**	8.2	14.4	70.3	56.6
7	Colombia	1998 c.d.	0.1	1.4	6.1	**7.5**	10.6	18.2	63.8	47.7
8	Brazil	1998 c.d.	0.5	2.0	5.7	**7.7**	10.0	18.0	64.4	46.7
9	Paraguay	1998 c.d.	0.5	1.9	6.0	**7.9**	11.4	20.1	60.7	43.8
10	Honduras	1998 c.d.	0.5	2.0	6.2	**8.2**	11.3	19.5	61.0	44.4
11	Nicaragua	1998 a.b.	0.7	2.3	5.9	**8.2**	10.4	17.9	63.6	48.8
12	Ethiopia	2000 a.b.	0.7	2.4	6.1	**8.5**	11.1	19.6	60.8	43.8
13	Guatemala	2000 c.d.	0.9	2.6	5.9	**8.5**	9.8	17.6	64.1	48.3
14	Swaziland	1994 c.d.	1.0	2.7	5.8	**8.5**	10.0	17.1	64.4	50.2

Sl. No	Countries	Survey year	Lowest 10%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
15	Niger	1995 a.b.	0.8	2.6	7.1	**9.7**	13.9	23.1	53.3	35.4
16	Chile	1998 c.d.	1.1	3.2	6.7	**9.9**	10.7	18.1	61.3	45.4
17	Costa Rica	1998 c.d.	0.4	2.6	8.0	**10.6**	13.2	21.4	54.8	37.7
18	El Salvador	1998 c.d.	7.3	3.3	7.3	**10.6**	12.4	20.7	56.4	39.4
19	Ecuador	1998 a.b.	7.5	3.3	7.5	**10.8**	11.7	19.4	58.0	41.6
20	Mexico	1998 c.d.	1.2	3.4	7.4	**10.8**	12.1	19.5	57.6	41.6
21	Zambia	1998 a.b.	1.1	3.3	7.6	**10.9**	12.5	20.0	56.6	41.0
22	Venezuela	1998 c.d.	0.6	3.0	8.4	**11.4**	13.7	21.6	53.4	36.3
23	Gambia,	1998 a.b.	1.5	4.0	7.6	**11.6**	12.3	20.8	55.2	38.0
24	Panama	1997 a.b.	1.2	3.6	8.1	**11.7**	13.6	21.9	52.8	35.7
25	Burkina Faso	1998 a.b.	1.8	4.5	7.4	**11.9**	10.6	16.7	60.7	46.3

a. Refers to expenditure share by percentiles of population, b. Rank by per capita expenditure,
c. Refers to income share by percentiles of population, d. Rank by per capita income

Source: Human Development Report 2004. UNDP

Annexure 3.B

Income distribution for moderate Inequality Countries.

Sl. No	Countries	Survey Year	Lowest 10%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
1	Papua New Guinea	1996 a.b.	1.7	4.5	7.9	**12.4**	12	19.2	56.5	40.5
2	Malaysia	1997 c.d.	1.7	4.4	8.1	**12.5**	13	20.3	54.3	38.4
3	Mali	1994 a.b.	1.8	4.6	8.0	**12.6**	12	19.3	56.2	40.4
4	Nigeria	96-97a.b	1.6	4.4	8.2	**12.6**	13	19.3	55.7	40.8
5	Zimbabwe	1995 a.b.	1.8	4.6	8.1	**12.7**	12	19.3	55.7	40.3.
6	Cameroon	1996 a.b.	1.8	4.6	8.3	**12.9**	13.0	21.0	53.0	36.5
7	Bolivia	1999 a.b.	1.3	4.0	9.2	**13.2**	15	22.9	49.1	32.0
8	Malawi	1997 a.b.	1.9	4.9	8.5	**13.4**	12	18.3	56.1	42.2
9	Peru	1996 c.d.	1.6	4.4	9.1	**13.5**	14	21.3	51.2	35.4
10	Dominican Republic	1998 c.d.	5.1	5.1	8.6	**13.7**	13.0	20.0	53.3	37.9

Sl. No	Countries	Survey Year	Lowest 10%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
11	Uruguay	1998 c.d.	1.6	4.5	9.2	**13.7**	14	21.7	50.4	33.8
12	Guinea Bissau	1993 a.b.	2.1	5.2	8.8	**14.0**	13	19.4	53.4	39.3
13	Philippines	2000 a.b.	2.2	5.4	8.8	**14.2**	13	20.5	52.3	36.3
14	Guyana	1999 a.b.	4.5	4.5	9.9	**14.4**	15	21.4	49.7	38.8
15	Russian Federation	2000 a.b.	1.8	4.9	9.50	**14.4**	14	20.3	51.3	36.0
16	Singapore	1998 c.d.	1.9	5.0	9.4	**14.4**	15	22.0	49.0	32.8
17	Iran Islamic Republic	1998 a.b.	2.0	5.1	9.4	**14.5**	14	21.5	49.9	33.7
18	Hong Kong, China	1996 c.d.	2.0	5.3	9.4	**14.7**	14	20.7	50.7	34.9
19	Kenya	1997 a.b.	2.3	5.6	9.3	**14.9**	14	20.2	51.2	36.1
20	St.Luisia	1995 c.d	2.0	5.2	9.9	**15.1**	15	21.8	48.3	32.5
21	Burundi	1998 a.b.	1.7	5.1	10.3	**15.4**	15	21.5	48.0	32.8
22	Magnolia	1998 a.b.	2.1	5.6	10.0	**15.6**	14	19.4	51.2	37.0
23	Thailand	2000 a.b.	2.5	6.1	9.5	**15.6**	14	20.9	50.0	33.8
24	Tunisia	1995 a.b.	2.3	5.7	9.9	**15.6**	15	21.8	47.9	31.8

Sl. No	Countries	Survey Year	Lowest 10%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
25	Ghana	1999 a.b.	2.1	5.6	10.1	**15.7**	15	22.8	46.6	30.0
26	United State	1997 c.d	1.8	5.2	10.5	**15.7**	16	22.4	46.4	30.5
27	Trinidad & Tobacco	1992 c.d	2.1	5.5	10.3	**15.8**	16	22.7	45.9	29.9
28	China	1998 c.d.	2.4	5.9	10.2	**16.1**	15	22.2	46.6	30.4
29	Germany	1998 c.d.	2.0	5.7	10.5	**16.2**	16	23.4	44.7	28.0
30	Turkmenistan	1998 a.b.	2.6	6.1	10.2	**16.3**	15	21.5	47.5	31.7
31	Turkey	2000 a.b.	2.3	6.1	10.6	**16.7**	15	21.8	46.7	30.7
32	Georgia	2000 a.b.	2.2	6.0	10.8	**16.8**	16	22.4	45.2	29.3
33	Guinea	1994 a.b.	2.6	6.4	10.4	**16.8**	15	21.2	47.2	32.3
34	Portugal	1997 c.d.	2.0	5.8	11.0	**16.8**	16	21.9	45.9	29.8

a. Refers to expenditure share by percentiles of population, b. Rank by per capita expenditure
c. Refers to income share by percentiles of population, d. Rank by per capita income

Source : Human Development Report 2004. UNDP.

Annexure 3.C
Income distribution for low Inequality Countries

Sl No	Countries	Survey year	Lowest 20%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
1	Madagascar	1999 a.b.	2.5	6.4	10.7	**17.1**	16	22.7	44.8	28.6
2	Morocco	98-99a.b.	2.6	6.5	10.6	**17.1**	15	21.3	46.6	30.9
3	Mozambique	96-97a.b	2.5	6.5	10.8	**17.3**	15	21.1	46.5	31.7
4	Jamaica	2000 a.d.	2.7	6.7	10.7	**17.4**	15	21.7	46	30.3
5	Cambodia	1997 a.b.	2.9	6.9	10.7	**17.6**	14.7	20.1	47.6	33.8
6	Mautania	1995 a.b.	2.5	6.4	11.2	**17.6**	16	22.4	44.1	28.4
7	Senegal	1995 a.b.	2.6	6.4	11.3	**17.7**	15	20.6	48.2	33.5
8	United Kingdom	1995 c.d	2.1	6.1	11.7	**17.8**	16	22.7	43.2	27.5
9	New Zealand	1997 c.d.	2.2	6.4	11.4	**17.8**	16	22.6	43.8	27.8
10	Tanzania	1993 a.b.	2.8	6.8	11	**17.8**	15	21.6	45.5	30.1
11	Australia	1994 c.d.	2	5.9	12	**17.9**	17	23.6	41.3	25.4
12	Armenia	1998 a.b.	2.6	6.7	11.3	**18.0**	15	21.6	45.1	29.7

Sl No	Countries	Survey year	Lowest 20%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
13	Estonia	1998 c.d.	3	7	11	**18.0**	15	21.6	45.1	29.8
14	Italy	1998 c.d.	1.9	6	12	**18.0**	17	22.6	42.6	27.4
15	Uganda	1996 a.b	3	7.1	11.1	**18.2**	15	21.5	44.9	29.8
16	Cote d'Ivoire	1995 a.b.	3.1	7.1	11.2	**18.3**	16	21.9	44.3	28.8
17	Ireland	1987 c.d.	2.5	6.7	11.6	**18.3**	16	22.4	42.9	27.4
18	Israel	1997 c.d.	2.4	6.9	11.4	**18.3**	16	22.9	44.3	28.2
19	Greece	1998.c.d.	2.9	7.1	11.4	**18.5**	16	22	43.6	28.5
20	Algeria	1995 a.b.	2.8	7	11.6	**18.6**	16	22.7	42.6	26.8
21	Moldova	2001 a.b.	2.8	7.1	11.5	**18.6**	16	22	43.7	28.4
22	Azerbaijan	1995 c.d.	3.1	7.4	11.5	**18.9**	15	21.2	44.5	29.5
23	Jordan	1997 a.b.	3.3	7.6	11.4	**19.0**	16	21.1	44.4	29.8
24	Lao PDR	1997 a.b.	3.2	7.6	11.4	**19.0**	15	20.8	45	30.6
25	Nepal	95-96ab	3.2	7.6	11.5	**19.1**	15	21	44.8	29.8
26	Vietnam	1998 a.b.	3.6	8	11.4	**19.4**	15	20.9	44.5	29.9
27	Switzerland	1992 c.d	2.6	6.9	12.7	**19.6**	17	22.9	40.3	25.2
28	Yemen Republic	1998 a.b.	3	7.4	12.2	**19.6**	17	22.5	41.2	25.9

Sl No	Countries	Survey year	Lowest 20%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
29	India	1997 a.b.	3.5	8.1	11.6	**19.7**	15	19.3	46.1	33.5
30	Bulgaria	2001 c.d.	2.4	6.7	13.1	**19.8**	18	23.4	38.9	23.7
31	France	1995 c.d.	2.8	7.2	12.6	**19.8**	17	22.8	40.2	25.1
32	Sri Lanka	1995 a.b.	3.5	8	11.8	**19.8**	16	21.5	42.8	28
33	Netherlands	1994 c.d	2.8	7.3	12.7	**20.0**	17	22.8	40.1	25.1
34	Spain	1990 c.d.	2.8	7.5	12.6	**20.1**	17	22.6	40.3	25.2
35	Austria	1994 c.d.	2.3	7	13.2	**20.2**	18	24	37.9	22.4
36	Canada	1997 c.d.	2.7	7.3	12.9	**20.2**	17	23.1	39.3	23.9
37	Indonesia	2000 a.b.	3.6	8.4	11.9	**20.3**	15	21	43.3	28.5
38	Latvia	1998 c.d.	2.9	7.6	12.9	**20.5**	17	22.1	40.3	25.9
39	Lithuania	2000 a.b.	3.2	7.9	12.7	**20.6**	17	22.6	40	24.9
40	Poland	1998 a.b.	3.2	7.8	12.8	**20.6**	17	22.6	39.7	24.7
41	Egypt, Arab Rep.	1999 a.b.	12.1	8.6	12.1	**20.7**	15	20.4	43.6	29.5
42	Kazakhstan	2001 a.b.	3.4	8.2	12.5	**20.7**	17	22.9	39.6	24.2
43	Luxemburg	1998 c.d.	3.2	8	12.8	**20.8**	17	22.5	39.7	24.7
44	Tajikistan	1998 a.b.	3.2	8	12.9	**20.9**	17	22.1	40	25.2

Sl No	Countries	Survey year	Lowest 20%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
45	Croatia	2001 a.b.	3.4	8.3	12.8	**21.1**	17	22.6	39.6	24.5
46	Romania	2000 a.b.	3.3	8.2	13.1	**21.3**	17	22.9	38.4	23.6
47	Pakistan	98-99 a.b	.3.7	8.8	12.5	**21.3**	16	20.6	42.3	28.3
48	Belarus	2000 a.b.	3.5	8.4	13	**21.4**	17	22.5	39.1	24.1
49	Bangladesh	2000 a.b.	3.9	9	12.5	**21.5**	16	21.2	41.3	26.7
50	Korea Rep	1998 c.d.	2.9	7.9	13.6	**21.5**	18	23.1	37.5	22.5
51	Ukraine	1999 a.b.	3.7	8.8	13.3	**22.1**	17	22.7	37.8	23.2
52	Kyrgyz Republic	2001 a.b.	3.9	9.1	13.2	**22.3**	17	22.5	38.3	23.3
53	Belgium	1996 c.d.	2.9	8.3	14.1	**22.4**	18	22.7	37.3	22.6
54	Macedonia FYR	1998 a.b.	3.3	8.4	14	**22.4**	18	23.1	36.7	22.1
55	Slovakia	1998 c.d.	3.9	9.1	13.4	**22.5**	17	22.5	37.7	23
56	Rwanda	83-85a.b.	4.2	9.7	13.2	**22.9**	17	21.6	39.1	24.2
57	Denmark	1997 c.d.	2.6	8.3	14.7	**23.0**	18	22.9	35.8	21.3
58	Uzbekistan	2000 a.b.	3.6	9.2	14.1	**23.3**	18	22.6	36.3	22
59	Sweden	1995 c.d	3.4	9.1	14.5	**23.6**	18	23.4	34.5	20.1
60	Slovak Republic	1996 c.d.	3.1	8.8	14.9	**23.7**	19	22.8	34.8	20.9

Sl No	Countries	Survey year	Lowest 20%	Lowest 20%	Second 20%	Lowest 40%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
61	Norway	1995 c.d.	4.1	9.7	14.3	**24.0**	18	22.2	35.8	21.8
62	Hungary	1998 a.b.	4.1	10	14.7	**24.7**	18	22.7	34.4	20.5
63	Finland	1995 c.d.	4.1	10.1	14.7	**24.8**	18	22.3	35	20.9
64	Japan	1993 c.d.	4.8	10.6	14.2	**24.8**	18	22	35.7	21.7
65	Czech Republic	1996 c.d.	4.3	10.3	14.5	**24.8**	18	21.7	35.9	22.4

a. Refers to expenditure share by percentiles of population, b. Rank by per capita expenditure,
c. Refers to income share by percentiles of population, d. Rank by per capita income

Source: Human Development Report 2004. UNDP

Annexure 3.D
Gini coefficient of High Inequality Countries

Sl. No	Countries	Survey year	Gini Index
1	Sierra Leone	1989 a.b.	62.9
2	Namibia	1993 c.d.	70.7
3	Lesotho	1995 a.b.	56.0
	South Africa	1995 a.b.	59.3
4	Central African Republic	1993 a.b.	61.3
5	Botswana	1993 c.d.	63
6	Colombia	1998 c.d.	57.1
7	Brazil	1998 c.d.	59.1
8	Paraguay	1998 c.d.	57.7
9	Honduras	1998 c.d.	59.0
10	Nicaragua	1998 a.b.	60.3
11	Ethiopia	2000 a.b.	48.6
12	Guatemala	2000 c.d.	59.9
13	Swaziland	1994 c.d.	60.9
14	Niger	1995 a.b.	50.5
15	Chile	1998 c.d.	57.5
16	Costa Rica	1998 c.d.	45.9
17	El Salvador	1998 c.d.	50.8
18	Ecuador	1998 a.b.	43.7
19	Mexico	1998 c.d.	51.9
20	Zambia	1998 a.b.	52.6
21	Venezuela	1998 c.d.	49.1
22	Gambia,	1998 a.b.	47.8
23	Panama	1997 a.b.	48.5
24	Burkina Faso	1998 a.b.	48.2

Source : Human Development Report 2004. UNDP.

Annexure 3.E

Gini coefficient of moderate Inequality Countries.

Sl. No	Countries	Survey Year	Gini Index
1	Papua New Guinea	1996 a.b.	50.9
2	Malaysia	1997 c.d.	49.2
3	Mali	1994 a.b.	50.5
4	Nigeria	96-97a.b	50.6
5	Zimbabwe	1995 a.b.	56.8
6	Cameroon	1996 a.b.	47.7
7	Bolivia	1999 a.b.	44.7
8	Malawi	1997 a.b.	50.3
9	Peru	1996 c.d.	46.2
10	Dominican Republic	1998 c.d.	47.4
11	Uruguay	1998 c.d.	44.8
12	Guinea Bissau	1993 a.b.	47.0
13	Philippines	2000 a.b.	46.1
14	Guyana	1999 a.b.	44.6
15	Russian Federation	2000 a.b.	45.6
16	Singapore	1998 c.d.	42.5
17	Iran Islamic Republic	1998 a.b.	43.0
18	Hong Kong, China	1996 c.d.	43.4
19	Kenya	1997 a.b.	44.5
20	St.Luisia	1995 c.d	42.6

21	Burundi	1998 a.b.	33.3
22	Magnolia	1998 a.b.	44.0
23	Thailand	2000 a.b.	43.2
24	Tunisia	1995 a.b.	41.7
25	Ghana	1999 a.b.	39.6
26	*United State*	1997 c.d	40.8
27	Trinidad & Tobacco	1992 c.d	40.3

28	China	1998 c.d.	40.3
29	Germany	1998 c.d.	38.2
30	*Turkmenistan*	1998 a.b.	40.8
31	Turkey	2000 a.b.	40.0
32	Georgia	2000 a.b.	38.9
33	Guinea	1994 a.b.	40.3
34	Portugal	1997 c.d.	38.5

a. Refers to expenditure share by percentiles of population, b. Rank by per capita expenditure
c. Refers to income share by percentiles of population, d. Rank by per capita income

Source : Human Development Report 2004. UNDP.

Annexure 3.F

Gini coefficient of low Inequality Countries.

Sl. No	Countries	Survey Year	Gini Index
1	Madagakar	1999 a.b.	46.0
2	Morocco	98-99a.b.	39.5
3	Mozambique	96-97a.b	39.6
4	Jamaica	2000 a.d.	37.0
5	Cambodia	1997 a.b.	40.4
6	Mautania	1995 a.b.	37.3
7	Senegal	1995 a.b.	41.3
8	United Kingdom	1995 c.d	36.0
9	New Zealand	1997 c.d.	36.2
10	Tanzania	1993 a.b.	38.2
11	Australia	1994 c.d.	35.2
12	Armenia	1998 a.b.	37.9
13	Estonia	1998 c.d.	37.6
14	Italy	1998 c.d.	36.0
15	Uganda	1996 a.b	37.4
16	Cote d'Ivoire	1995 a.b.	36.7
17	Ireland	1987 c.d.	35.9
18	Israel	1997 c.d.	35.5
19	Greece	1998.c.d.	35.4
20	Algeria	1995 a.b.	35.3
21	Moldova	2001 a.b.	36.2
22	Azerbaijan	1995 c.d.	36.5

23	Jordan	1997 a.b.	36.4
24	Lao PDR	1997 a.b.	37.0
25	Nepal	95-96ab	36.7
26	Vietnam	1998 a.b.	36.1
27	Switzerland	1992 c.d	33.1
28	Yemen Republic	1998 a.b.	33.4
29	India	1997 a.b.	***37.8***
30	Bulgaria	2001 c.d.	31.9
31	France	1995 c.d.	32.7
32	Sri Lanka	1995 a.b.	34.4
33	Netherlands	1994 c.d	32.6
34	Spain	1990 c.d.	32.5
35	Austria	1994 c.d.	30.5
36	Canada	1997 c.d.	31.5
37	Indonesia	2000 a.b.	30.3
38	Latvia	1998 c.d.	32.4
39	Lithuania	2000 a.b.	36.3
40	Poland	1998 a.b.	31.6
41	Egypt, Arab Rep.	1999 a.b.	34.4
42	Kazakhstan	2001 a.b.	31.2
43	Luxemburg	1998 c.d.	30.8
44	Tajikistan	1998 a.b.	34.7
45	Croatia	2001 a.b.	29.0
46	Romania	2000 a.b.	30.3
47	Pakistan	98-99 a.b	33.0
48	Belarus	2000 a.b.	30.4
49	Bangladesh	2000 a.b.	31.8
50	Korea Rep	1998 c.d.	31.6
51	Ukraine	1999 a.b.	29.0
52	Kyrgyz Republic	2001 a.b.	29.0
53	Belgium	1996 c.d.	25.0
54	Macedonia FYR	1998 a.b.	28.2

55	Slovakia	1998 c.d.	28.4
56	Rwanda	83-85a.b.	28.9
57	Denmark	1997 c.d.	24.7
58	Uzbekistan	2000 a.b.	26.8
59	Sweden	1995 c.d	25.0
60	Slovak Republic	1996 c.d.	25.8

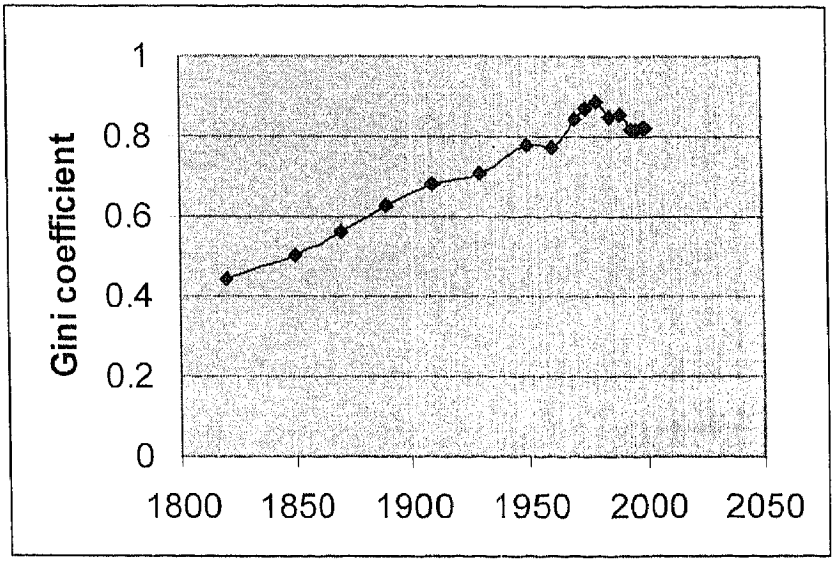
61	Norway	1995 c.d.	25.8
62	Hungary	1998 a.b.	24.4
63	Finland	1995 c.d.	25.6
64	Japan	1993 c.d.	24.9
65	Czech Republic	1996 c.d.	25.4

a. Refers to expenditure share by percentiles of population, b. Rank by per capita expenditure, c. Refers to income share by percentiles of population, d. Rank by per capita income

Source : Human Development Report 2004. UNDP.

Annexure 3.G

(Trend of global inequality measured by Gini Coefficient from 1820 – 2000)



Source (figure): Bourguigon Francois and Christian Morrison (1999)

Annexure 3.H

(WORLD INCOME INEQUALITY – DIFFERENCE MEASURES)

Year	Gini Coefficient	Theil Index	Mean Log Deviation	20%/20%	10%/10%
1970	0.653	0.812	0.861	10.319	28.215
1971	0.653	0.814	0.864	10.43	28.395
1972	0.657	0.825	0.88	10.732	29.345
1973	0.66	0.832	0.893	11.004	30.059
1974	0.66	0.83	0.892	11.031	30.223
1975	0.654	0.814	0.87	10.737	28.943
1976	0.658	0.826	0.89	11.13	30.234
1977	0.659	0.828	0.888	11.002	30.008
1978	0.661	0.835	0.898	11.152	30.592

Year	Gini Coefficient	Theil Index	Mean Log Deviation	20%/20%	10%/10%
1979	0.662	0.839	0.898	11.048	30.544
1980	0.66	0.833	0.888	10.772	29.922
1981	0.657	0.828	0.897	10.485	29.137
1982	0.651	0.807	0.852	10.132	28.018
1983	0.649	0.803	0.845	9.949	27.486
1984	0.649	0.806	0.843	9.72	27.15
1985	0.65	0.809	0.847	9.714	27.397
1986	0.647	0.803	0.837	9.459	26.933
1987	0.647	0.803	0.836	9.344	26.929
1988	0.649	0.808	0.842	9.367	27.22
1989	0.653	0.82	0.857	9.514	28.1
1990	0.652	0.818	0.855	9.503	28.137
1991	0.648	0.807	0.842	9.159	27.479
1992	0.645	0.8	0.833	8.793	26.879
1993	0.64	0.787	0.819	8.533	26.195
1994	0.64	0.789	0.819	8.322	26.039
1995	0.638	0.784	0.814	8.174	25.731
1996	0.636	0.779	0.809	8.082	25.486
1997	0.637	0.782	0.814	7.96	25.736
1998	0.638	0.785	0.816	8.048	25.56
1999	0.638	0.787	0.819	8.074	25.718
2000	0.637	0.783	0.82	8.22	25.704

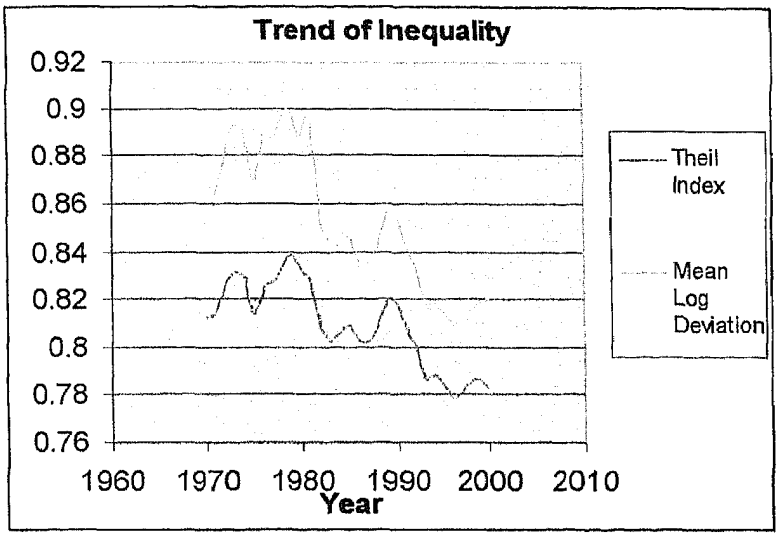
Source: Francois Bourguignon and Christian Morrison; *The size distribution of income among world citizen 1820-1990.* Revised draft June 1999

Annexure 3.I
(Assistance given by various countries as % of their GNP in 2000)

Country	U.S Dollars (millions)	Per Cent of GNP
Denmark	1,664	1.06
Netherlands	3,075	0.82
Sweden	1,813	0.81
Norway	1,264	0.80
Luxembourg	116	0.70
Belgium	812	0.36
Switzerland	888	0.34
France	4,221	0.33
United Kingdom	4,458	0.31
Ireland	239	0.30
Japan	13,062	0.27
Germany	5,034	0.27
Australia	995	0.27
Portugal	261	0.26
New Zealand	116	0.26
Canada	1,722	0.25
Austria	461	0.25
Spain	1,321	0.24
Italy	1,368	0.13
United States	9,581	0.10

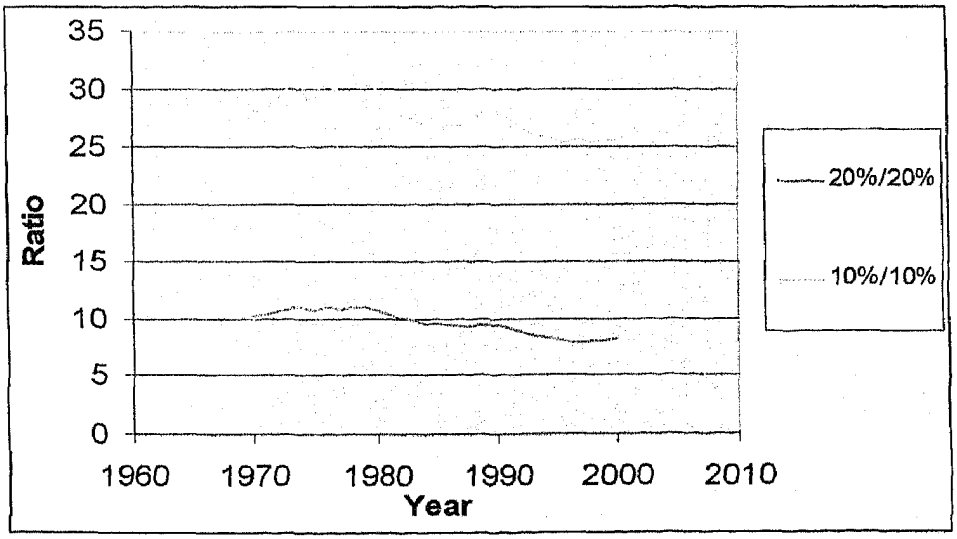
Source: Organization for Economic Cooperation and Development (OECD), ODA flows in 2000

Annexure *3.J* (Trend of Inequality as measured by Theil and Mean Log Deviation)



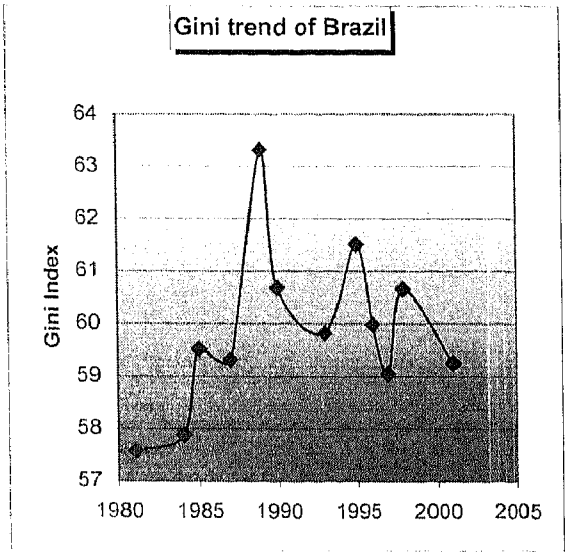
Source (figure): Same as* annexure *3.G

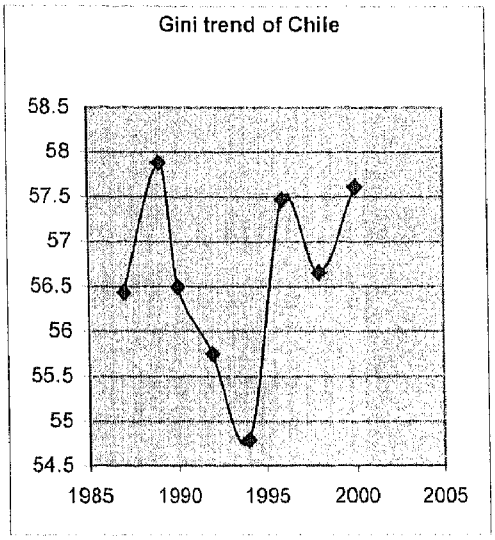
Annexure *3.K* (Trend of Inequality as measured by the ratio of the share of the richest 20% to poorest 20% and the richest 10% to the poorest 10%)

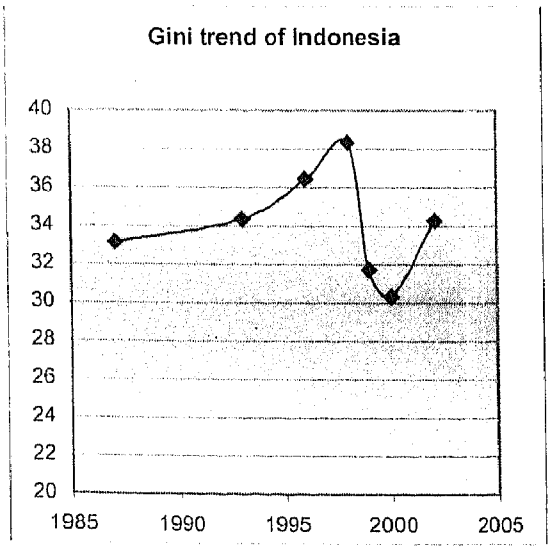


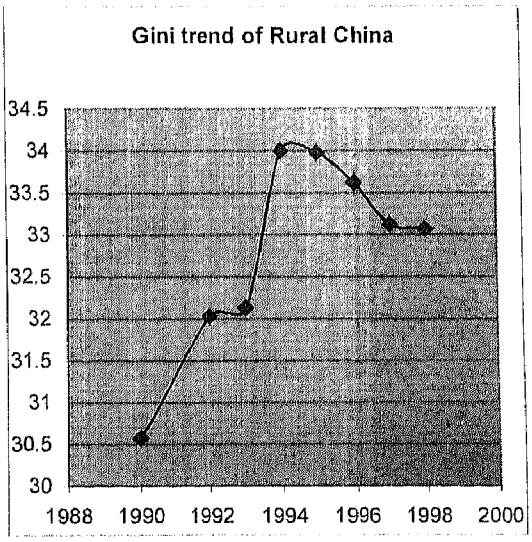
Source (figure): Same as Annexure 3.G

Annexure 3.L (Trend of Inequality in Brazil, Chile, Indonesia and rural China)

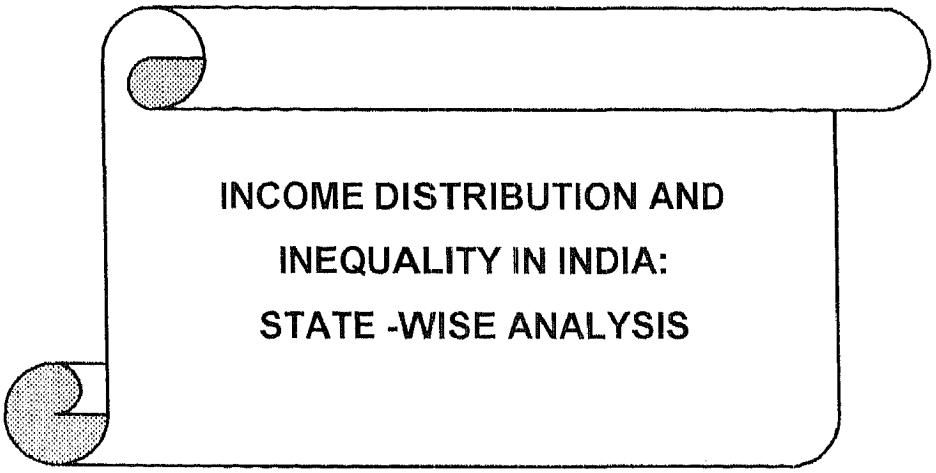








CHAPTER – 4



INCOME DISTRIBUTION AND INEQUALITY IN INDIA: STATE -WISE ANALYSIS

INCOME DISTRIBUTION AND INEQUALITY IN INDIA: STATE - WISE ANALYSIS

The size distribution of income refers to the distribution of national product not on the basis of individuals' contribution to GNP, but on the basis of productive services owned and commanded by them, usually expressed as distributed among different households in the economy.

SECTION A: INCOME DISTRIBUTION AND INEQUALITY IN INDIA

In India there is no official organisation to compile data on income distribution. The Central Statistical Organisation (CSO) has been providing estimates of national income but these data are in no way useful for study of income distribution. In 1960, the committee on '*Distribution of income and levels of living*' under the chairmanship of PC. Mahalanobis was appointed to look into the question of distribution of income, since then a similar attempt has not been made again at government level. However, the National Council for Applied Economic Research (NCAER), RBI and some individual researchers have examined the pattern of income distribution in India at different points of time. Their results are not strictly comparable owing to differences in

their methodology and data sources. However, they are good enough to provide a reasonable clear picture of income distribution[1].

A.1. INCOME DISTRIBUTION

The distributional scenario of income for some years as estimated by various agencies is depicted in the following table.

TABLE NO. 4.1
(Distribution of income in India)

Group	ESTIMATED BY					
	RBI		Iyenger & Mukherjee		NCAER	
	1953-54 to 1956-57		1952-53 to 1956-57		1960-61	
	Rural	Urban	Rural	Urban	Rural	Jrban
Top 5%	17.0	26.0	14.0	17.5	NA	31.0
Top 10%	25.0	37.0	34.0	25.0	33.6	42.4
Top 50%	69.0	75.0	NA	NA	79.3	83.3
Bottom 20%	9.0	7.0	7.5	8.5	4.0	4.0

Source: Rudder Datt and KPM. Sundharam, op cit

From the above data a broad picture of income distribution in India can be arrived at. The percentage share of the bottom 20% is decreasing at a very consistent rate while the share of all top percentages (5%, 10% or 50%) was increasing. This is a clear sign of deteriorating income distribution in India.

---

[1] SK Misra and Puri VK, *Economics of Development and Planning* (Bombay: Himalaya Publishing House, sith edition, 1995), p-830

In 1951, Mukherjee and Ghose attempt to obtain the size distribution of income by combining tax statistic and NSS data on consumption expenditure during 1949 – 50. Their study reveals that the top 5% of the household shared among themselves 16.1% of aggregate income while the bottom 20% of the households enjoyed only 8.1% of the total income

In their study Iyergar and Jain (1973) found, empirically, that the simple relationship of Keynesian variety operates between personal income and consumption function c = ay + b, where a & b are constants. As for the distribution of income, it was verified that it is much closer to three-parameter lognormal hypothesis.

Planning Commission in the draft 5-year plan 1978-83 observed, "*Trends in the distribution of income and wealth are difficult to discern, but the evidence of persistence of gross inequality is clear*". NSS 28th round shows that in 1973-74, the lowest 20% accounted for 9.5% of total consumption in rural areas while the highest 20% accounted for 38%. For urban areas the corresponding figure were 9.2% and 40% respectively. The income inequality for both groups would be greater than consumption inequalities[1].

The planning commission's view that income inequality is far greater than consumption inequalities is corroborated by the World Bank

[1] Govt of India, Planning Commission, *draft five year plan 1978-83* (New Delhi, 1978), p-3

estimates of income inequalities. The World Bank estimate for 1975-76, given in table No 4.2 below, shows that the lowest 20% earn only 7% while the top quintile earns 49.4% of total income.

Even though the World Bank's two estimate of income distribution are not strictly comparable, but nevertheless show the trend of income distribution. From the table we can have an idea that the income distribution was improved in 1983, the share of the lowest quintile was increased, the share of the top quintile was reduced to 41.4% and the income share of top 10% also decreased from 36.6% in 1975-76 to 26.7% in 1983.

TABLE NO 4.2
(Percentage share of household income by percentile group of income)

Percentile groups of households	% Share of household income	
	1975-76	1983
Lowest quintile	7.0	8.1
Second quintile	9.2	12.3
Third quintile	13.9	16.3
Fourth quintile	20.5	20.0
Top quintile	49.4	41.4
Top 10 %	36.6	26.7

Source: World bank, *Development Report 1988*, Table 24, p 272-3 and *world Development Report 1992*, table 30, p-266-7

National Council of Applied Economic Research (NCAER)'s data for 1975 was adjusted by Bhalla and Vashistha[1] which was given in table 4.3

TABLE 4.3
(Distribution statistic for Alternative Estimate of income in 1975-76)

Variable	Bottom 20%	Bottom 40%	Top 20%	Top 10%
Y	5.77	15.69	49.34	33.90
Y_1	5.63	15.44	49.52	34.09
Y_2	5.77	15.66	49.69	34.53
Y_3	6.01	16.20	48.62	33.72

Source: NCAER, Household Income and Its Disposition (New Delhi, 1980), and Surjet S Bhalla and Prem Vashishtha *"Income Distribution in India – A re-examination"* in TN Srinivasan and Pranab K Bardhan (eds), Rural poverty in South Asia, (Delhi, 1988), table No 2.5, p.50

In table 4.3, Y indicates unadjusted NCAER estimates of income distribution while Y_1,Y_2 and Y_3 measures of income have been obtained by Surjet S Bhalla and Prem Vashishtha by employing different methods of adjustment. It here observed that the three methods yield almost similar result and we also see that the pattern of income distribution does not improve much from the time estimated by Ojha and Bhatt (1963-64 and 1964-65) and NCAER (1964-65)[2]

[1] Surjet S Bhalla and Prem Vashishtha "Income Distribution in India – A re-examination" in TN Srinivasan and Pranab K Bardhan (eds), Rural poverty in South Asia, (Delhi, 1988), p-36-38.
[2] SK Misra and Puri VK, *"Economics of Development and Planning"* (Bombay: Himalaya Publishing House, 1995), p. 834

A.1.2. INEQUALITY

NS Iyengar and PB Brahmananda have calculated Gini coefficient of size per capital household private consumption expenditure during the first six 5-year plans periods[1]. Their main findings were reproduced in table 4.4

TABLE No 4.4
(Plan wise average Gini coefficient)

Plan	*No of observations*	*Rural*	*Urban*
First (1951-56)	6	34	38
Second (1956-60)	6	33	37
Third (1961-65)	4	33	35
1966-68*	3	30	33
Fourth (1969-73)	4	29	33
Fifth (1974-79)	1	29	33
1979-1980*	NA	NA	NA
Sixth (1980-84)	1	30	33

* Annual Plans & Source: NS Iyengar and Brahmananda PR, "Estimated Distributed Parameters and their Bahaviour" in PR Brahmananda and VR Panchamukhi (eds), *the Development Process of the Indian Economy* (Bombay: Himalaya Publishing House, 1987), p-87

From table No 4.4 we see that inequality was always higher in urban than in rural area and inequality is declining in both rural and urban areas over time. The urban Gini coefficient was stagnant at 33 from plan holiday period of 1966-68 while it was steadily decreasing in

[1]NS Iyengar and Brahmananda PR, "*Estimated Distributed Parameters and their Bahaviour*" in PR Brahmananda and VR Panchamukhi (eds), *the Development Process of the Indian Economy* (Bombay: Himalaya Publishing House, 1987), p-87

rural area. The overall conclusion is that inequality in India was decreasing.

NS Iyengar and PR Brahmananda draw a conclusion that "The hypothesis that growth and development in a poor economy tend to accentuate the skewness of the distribution is not supported by Indian data. In fact, if we take the entire period, we can argue that in a democratic country where political leaders are responsive to public opinion, the degree of skewness may actually get reduced through planning and associated market effects[1]"

World Bank and other agencies have estimated the Gini coefficient for India, which was reproduced in table No 4.5. The same index for Brazil is 59.1, Botswana – 63, Malaysia – 49.2, Thailand – 43.2, Australia - 35.2, Japan – 33.7, Switzerland – 24.9, U.K – 36, Norway – 25.8. A more detailed information is available in appendix No. 3.A to 3.C.

Table No. 4.5

(India's Gini coefficient for various years)

Sl. No	Year	Rural	Urban	India	Urban – Rural gap
1	1951 (NSS Round II)	36.2	NA	NA	NA
2	1952 (NSS Round IV)	33.99	36.53	NA	2.54
3	1953	32.97	36.67	NA	3.70

[1] Suresh D Tendulkar, "*Economics inequalities and poverty in India*" in PR Brahmananda and VR Panchamukhi (eds), op cit, p-123-25

Sl. No	Year	Rural	Urban	India	Urban – Rural gap
	(NSS Round VI)				
4	1953-4 (NSS Round VII)	33.34	37.16	NA	3.82
5	1954-5 (NSS Round VIII)	34.95	39.04	NA	4.09
6	1955 (NSS Round IX)	33.59	37.07	NA	3.48
7	1955-56 (NSS Round X)	34.45	36.82	NA	2.37
8	1956-57	31.9	40.2	34.17	8.30
9	1957-8	33.4	35.9	35.36	2.50
10	1958-9	34	34.8	34.46	0.80
11	1959-60	31.4	35.7	36.64	4.30
12	1960-1	32.1	35	32.59	2.90
13	1961-62	31.2	35.7	33.08	4.50
14	1963-4	29.7	36	30.73	6.30
15	1964-5	29.4	34.9	31.05	5.50
16	1965-6	29.7	33.9	31.14	4.20
17	1966-7	29.3	33.7	31.06	4.40
18	1967-8	29.1	33.2	30.55	4.10
19	1968-9	30.5	32.9	31.66	2.40
20	1970-1	28.8	34.6	30.38	5.80
21	1972-3	30.5	34.5	31.85	4.00
22	1973-4	28.2	31.7	29.17	3.50
23	1977-8	31.2	33.7	32.14	2.50
24	1983	30.1	33.4	31.49	3.30
25	1986-7	30.2	35.6	32.22	5.40
26	1988-89	30.2	35.6	31.82	5.40
27	1987-8	29.5	35.6	31.15	6.10
28	1989-90	28.2	35.6	30.46	7.40

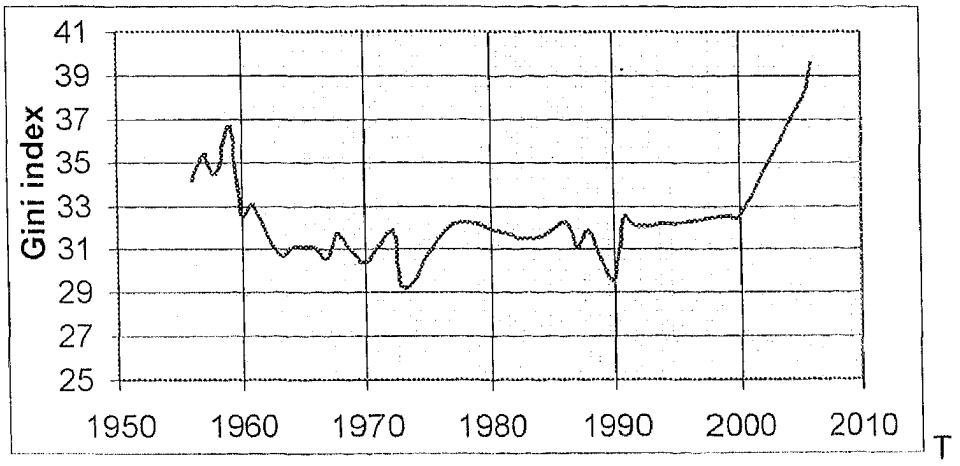
Sl. No	Year	Rural	Urban	India	Urban – Rural gap
29	1990-1	27.7	34	29.69	6.30
30	1991	31.1	35.1	32.53	4.00
31	1992	29.8	35.6	32.02	5.80
32	1993-4	28.5	34.5	NA	6.00
33	1999*	28.11	35	32.5	6.89
34	2000*	NA	NA	32.5	NA
35	2005[1]	NA	NA	37.8	NA
36	2006[2]	NA	NA	37-42	NA

Source: Kirit S Prarikh (Ed), *India Development Report* 1999-2000.
For NSS data, the Gini coefficients are based on consumption data
* Estimated by UNDP

The following diagram shows the trend of Gini coefficient from 1950's to mid 2000's. Inequality was initially at a high of around 34, 35 and from this peak it was declining irregularly to reach its minima by early 70's. As shown in the diagram there was a slight rise after 1970 which got flattened for over a decade and then fell to its new low point in 1990. It was then observed that the trend started to reverse and pick up speed of upward movement since 2000 probably owing to the effect of globalisation

[1] South Asia Analysis group, *Rich and poor in India*, paper No 1818
[2] The Indian express, Sunday December 4, 2005 writes "*Estimates of the Gini coefficient in India vary, from 0.37 to 0.42. After remaining more or less constant for the first four decades after independence, it has been steadily rising after the advent of liberalisation and globalisation*".

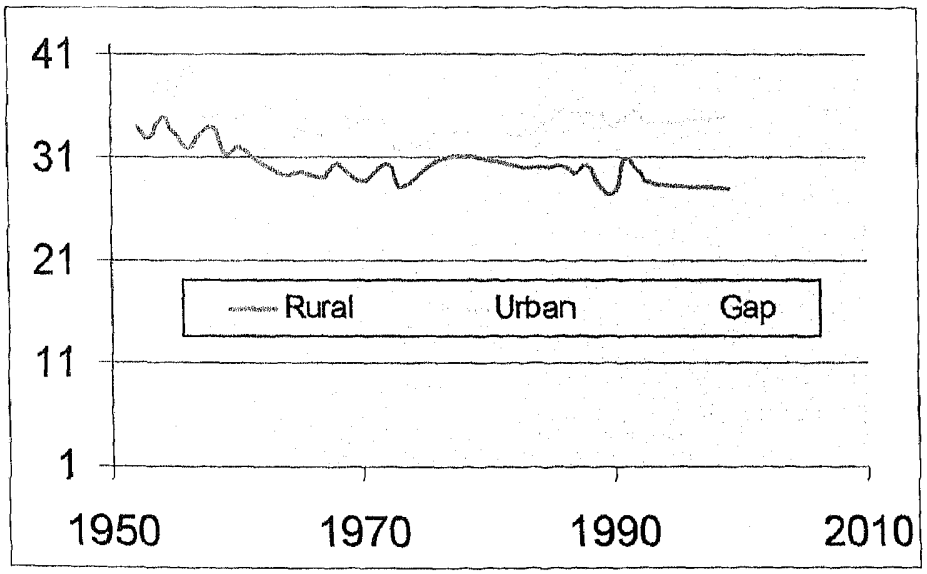
DIAGRAM. 4.1
(Trend of Gini coefficient in India)



This indicates that there is a huge income disparity not only in India, but also in the world. This leads one to conclude that if high economic growth is accompanied by high Gini index, then re-slicing of economic pie through economic progress has been entirely lost. This is true about Brazil, Malaysia, etc. Eastern Europe has a Gini index close to 25, but US has an index of 45. That means, income in Eastern Europe (formerly Communist ruled) is well distributed and in US it is not so well distributed. Does it mean that, the poverty has vanished from Eastern Europe? The most plausible explanation is that despite the slow growth of economy, income is more equitably distributed in socialist countries with very few of them belonging to a high income class and still fewer being in abject poverty

Diagram No 4.2 shows the trend of Gini coefficient for rural, urban and the difference (Gini gap) between urban & rural. Urban inequality is always higher than rural inequality, which was not necessarily in the case of states. Trend of urban and rural Gini coefficient is the same with a small difference in respect of smoothness. This graph shows that inequality was high in 1950's and was falling irregularly upto 1970's. It smoothens its path since then except for a small fluctuation in 1990's, and thereafter it follows a constant path as depicted below.

DIAGRAM. 4.2
(Gini trend of rural, urban with rural –urban gap)



The curve in the bottom of this diagram (white in colour) is showing the magnitude of 'rural – urban Gini coefficient' difference, the curve shows that rural – urban difference was highest in 1956-57, which

was drastically reduced and recovered immediately. The gap is fluctuating around Gini point 3 – 4.

Ashutosh Kumar (2003) studied the relationship between per capita income and Gini coefficient for 16 major states of India for four points of time Viz, 1983-84, 1987-88, 1993-94 and 1999-2000[1]. He fitted a Linear, Quadratic and Cubic model for the data and he found that none of the model fitted is statistically significant for the year 1983-84 and 1987-88. The only significant model for 1993-94 is linear model that takes the form-

G = - 0.0918 + 0.0961 Log y, R^2 = 23.6%, where y = Per capita state domestic production.

Again, Linear model is the only statistically significant for the year 1999-2000 that takes the form G = - 0.065 + 0.0719 Log y, where R^2 = 20.8%

SECTION B: STATE WISE ANALYSIS

In this section we consider the variations in level of income inequality among some states of India. Per capita income or state Domestic Product (SDP) may not be the most appropriate variables for

[1] Ashutosh Kumar, *Economic Development and Income distribution* (Delhi: Deep & Deep publication, 2003). P.191-205

measuring income inequality or comparing the level of inequality among states because some of the state's product is not received by her population alone, but by other states also. Therefore, it is imperative to find other alternative measures, such as consumption expenditure which is found to reflect the well being of individuals more correctly. Consumption expenditures are particularly useful for the light they throw on the distribution of income within sates. In this connection, it must be understood that income inequality is always higher than consumption inequality that lead to the conclusion that income inequality for these states are higher than those shown in the subsequent tables. If expenditure Gini coefficient is used in this study, it will be explicitly stated.

B.2.1. Situation in late 1970's

As of now, we shall confine to NSS data for which figures are provided separately for urban and rural. However, NSS data are to be used with extreme caution due to the fact that these data are based on a small sample only[1].

[1]RM Sundrum, *Growth and income distribution in India* (New Delhi: Sage Publication), 1987, p-51

TABLE 4.6
(Income inequality for various states during 1977-78)

Sl. No	State	Urban	Rural	Urban-Rural Difference
1	J & K	29.4	22.2	7.2
2	Rajasthan	30.1	46.5	-16.4
3	Bihar	30.4	25.8	4.6
4	Gujarat	30.8	28.5	2.3
5	Haryana	31.7	28.8	2.9
6	W Bengal	31.7	29.2	2.5
7	Andra Pradesh	31.9	29.8	2.1
8	Assam	32.4	18.3	14.1
9	Orissa	32.4	30.1	2.3
10	UP	32.7	29.9	2.8
11	Tamil Nadu	33.3	31.9	1.4
12	Karnataka	34.2	32.1	2.1
13	Maharastra	36.2	46.2	-10
14	Madhya Pradesh	37.7	33.1	4.6
15	Punjab	38.0	30.3	7.7
16	Kerala	39.5	35.3	4.2

Source: NSS Report No 311

One interesting feature of this data is that most of the variation between states is due to the variation between their rural areas, while their urban areas is considerably more uniform. The degree of inequality is generally higher in urban than in rural areas. There is also a great variation among states, ranging from the rural Gini coefficient of 18.3 in

Assam to 46.5 in Rajasthan. In Urban areas, a Gini index of 29.4 in J & K and 39.5 in Kerala. Another interesting point is that rural index in higher than urban index for the state of Rajasthan and Maharastra

Urban – rural difference was largest in the state of Rajasthan followed by Assam, Maharastra, Punjab, J & K and it was moderately large in Bihar, UP, Tamil Nadu, Karnataka, Madhya Pradesh and Kerala. Assam shows a record low of 18.3 while the corresponding figure for urban is 32.4, a gap of 14.1 in Gini points. In other states like Gujarat, Haryana, West Bengal, Andra Pradesh and Orissa, there is no much difference in inequality between urban and rural sector. Gini index of neither rural nor urban throw any light on the level of economic development or per capita income for the state concern, but simply indicate how even or uneven income was distributed among the people. It is not only developing economy that experienced high Gini index, but also a developed and under developed economy also. Therefore, it is not possible to draw any conclusion on the level of economic development on the basis of Gini coefficient. But one thing is clear from this analysis, that Rajasthan and Maharastra are doing well in poverty alleviation and creation of opportunity for the poor in urban areas but totally fails in rural development.

One may feel surprise to know that rural Gini coefficient was higher than urban Gini coefficient in the state of Rajasthan and Maharastra. It seems paradoxical. Rural Gini is 46.5 while urban Gini is only 30.1 for Rajasthan; incidentally, per capita income of rural (i.e. Rs 108.7) is also higher than urban per capita income (i.e. Rs 93.2). This phenomenon may be due to government schemes implemented during the survey year. If not, it is difficult to assign any genuine reason for it.

Maharastra, an industrial state in India, is also experiencing this kind of scenario of inequality with a wide range of 10 in Gini points. This may be a result of either –computational mistake, or –any other assignable /genuine causes. Of these two, the first one is unlikely and the most plausible explanation is the second one. We shall see in the subsequent sections that many states are also experiencing this kind of income inequality.

B.2.2. Situation since late 50's to early 90's

In the following table No 4.7 presents the inequality as measured by Gini coefficient over a period from late 50's to early 90's giving urban and rural figure separately.

TABLE NO. 4.7
(Average Gini coefficient over some years)

Sl. No	Name of some States of India	Average over 1957-58 to 1959-60		Average over 1990-91 to 1993-94	
		Urban	Rural	Urban	Rural
1	Assam	22.1	28.47	28.94	19.27
2	J & K	29.34	26.6	28.45	27.87
3	Kerala	30.51	34.66	37.16	30.67
4	Bihar	31.23	29.76	31.72	22.36
5	Andra Pradesh	31.73	31.15	32.5	28.39
6	Rajasthan	32.03	36.47	29.61	27.98
7	W. Bengal	32.28	27.36	34.37	25.75
8	Karnataka	33.79	34.78	34.63	26.46
9	Gujarat	33.85	26.64	29.52	24.07
10	Tamil Nadu	34.28	30.95	36.82	29.39
11	Maharastra	35.54	29.21	34.86	30.02
12	Madhya Pradesh	36.99	36.67	33.76	30.53
13	Uttar Pradesh	37.53	30.94	32.75	28.09
14	Orissa	38.41	29.65	37.83	26.29

Source: World Bank, India achievement and challenges in reducing poverty, Report No – 16483 IN.

A close examination of the table reveals that – Assam (during 1950's Assam includes many states of North east India), Kerala, Rajasthan and Karnataka obtained a higher Gini coefficient of rural than urban areas. The widest gap was observed in Assam state, that is, 6.37 in Gini points followed by Rajasthan (4.44 Gini point), Kerala (4.15 Gini

point) and Karnataka (0.99 Gini point). Rural income inequality was falling between the two periods of the late 50's and early 90's for almost all the states like Assam, Kerala, Bihar, Andra Pradesh, Rajasthan, W Bengal, Karnataka, Gujarat, Tamil Nadu, Madhya Pradesh, Uttar Pradesh and Orissa. On contrary, J & K and Maharastra registered a small increase.

By the late 50's the rural Gini coefficient was higher than the urban ones in **Assam** and this situation was just reversed in the 90's. That is, income was distributed more unevenly in urban area while it was evenly distributed in rural area; income inequality in Assam was generally low as compared to other state. This proves that Assam was one of the most successful states in improving the economic condition of rural area. **Jammu and Kashmir**, the northern most state neither improved nor worsened its income distribution over these three decades. Its urban – rural Gini difference was slightly improved in the early 90's compared with its position in the 50's. **Kerala**, the highest literate states in India, observed a higher rural Gini coefficient than urban area during late 50's like other states of Assam, Rajasthan and Karnataka. This situation was reversed in the early part of 90's.

In Bihar, the condition was more or less the same during these periods except a few reductions of inequality in rural area. This is a very

positive trend. **Andra Pradesh** observed a similar pattern of income inequality in rural and urban areas during 50's. Inequality was not much inflated even after 30 years or so in urban area, but we see an improvement in income distribution in rural area. **W Bengal,** one of the most populous states in India could route through a normal journey in so far as income inequality is concerned. Inequality was reduced in rural area like many other states during a period from 1950's to 1990's.

Karnataka improves its income distribution in rural sector while **Gujarat** performs well in inequality reduction. Inequality was reduced in both the rural and urban area, thereby reducing urban – rural differences. **Tamil Nadu** and **Maharastra** experienced more or less similar condition, the scenario remain almost the same in rural and urban during the period from late 1950's to early 1990's with an exception of small increment in rural area.

In **Madhya Pradesh**, the urban – rural difference was negligibly small and both of them are reduced during the same period referred to above. Uttar Pradesh and Orissa are also successful in reducing income inequality both in rural and urban areas. But this does not necessarily mean that their economic condition has been improved.

In **Kerala**, Gini Coefficient showed to decline from 34.5 in 1957-58 to an all-time low of 29.5 in 1965-66, which rose to 33.0 in 1983, although there were wide random variations in 1968-69 (41.3) in 1977-78 (35.3)[1]. In 1980-81 Dilip S. Thakur studied the income inequality for **Himachal Pradesh** covering 109 households from 5 villages and he estimated the Gini coefficient of income to be 36.59[2] at the state level.

B.2.3. Situation in early 90's

Table No 4.8 illustrates income inequality across some states for year the 1993-94. These states can be categorised into two. Those states having high inequality like UP, Madhya Pradesh and Bihar are in the **first category**. In these states, the overall Gini coefficient is higher than that of rural and urban. This means that intra- income inequality is not very cruel within rural and urban areas separately whereas inter-income inequality was very much felt between rural and urban. We see a clear distinction between rural and urban in respect of inequality that there is a wide gap in the level of income, which is supported by the overall Gini coefficient. Owing to this reason, their BPL percentages are higher than national average of 26.10%. They are respectively 31.15%, 37.43% and 42.60% in UP, Madhya Pradesh and Bihar. It may be

---

[1] BA Prakash, *Kerala's Economic Development* (New Delhi, Sage Publication, Second edition, 2004), p-135

[2] Dilip S. Thakur, *Poverty, Unemployment and Inequality in rural India*, (New Delhi: BR. Publishing corporation, 1985). P-201

pointed out here that per capita income of these states are all less than national average of Rs 4963/- for the survey year.

Table No 4.8
Gini Index by income for some states in 1993-4

Sl No	States	Rural	Urban	Overall	Per capita income (Rs)	BPL % in 1999-'00
1	Uttar Pradesh	27.82	32.30	40.85	3521	31.15
2	Madhya Pradesh	27.74	32.67	42.52	4058	37.43
3	Bihar	22.39	30.70	54.96	2649	42.60
4	Haryana	30.09	21.62	25.05	7503	8.74
5	Himachal Pradesh	27.62	43.45	28.44	4910	7.63
6	Rajasthan	25.99	29.04	27.41	4191	15.28
7	J & K*	NA	28	NA	NA	NA
8	Orissa*	NA	39	NA	NA	NA
9	Assam*	19	NA	NA	NA	NA
	All India	28.16	33.99	35.97	4963	26.10

Source: North India Human Development Report (New Delhi: National Council of Applied Economic Research, 2003), p-272
*Source: Kirit S. Parikh (Ed), *India Development Report 1999-2000*, (New Delhi: Oxford University Press, 1999), *p-13*

Those states which are classified under **second category** are Haryana and Rajasthan, and they exhibit a moderate inequality so much so that the state overall figure is lying between urban and rural figure. Apart from this, their BPL percentage are quite low as compared to national average of 26.10% while their per capita income is also relatively high as compared to those states in category one. There is a

special case, a case of Himachal Pradesh. Its urban Gini coefficient is at a record high of 43.45 while the rural Gini coefficient is just 27.62, which is very close to its rural Gini coefficient of 28.44. This indicates that rural outweighs the entire state's scenario of income distribution.

Among these states, Himachal Pradesh and Assam have the highest and the lowest income inequality respectively while Bihar recorded the highest overall inequality with very low per capita income, and at the same time the highest BLP percentage for the survey year.

B.2.4. Situation in mid 2000's

In the following table (No 4.9) presented income inequality measured by consumer expenditure for 18 major states of India during 2004-05. From the table it can be observed that in urban areas, inequality measured by Gini index, is found to be the highest in Chhattisgarh followed by Kerala, Madhya Pradesh, Punjab and West Bengal.

Inequality is low in urban Gujarat and Bihar followed by Assam and Himachal Pradesh. Inequality in rural India is lower than urban India in all these major States. In rural India, inequality is the highest in Kerala, followed by Haryana, Tamil Nadu and Maharashtra. Assam has found to be lowest inequality followed by Bihar, Jharkhand and

Rajasthan in rural India. Meanwhile, in rural Punjab, Gini coefficient for Agricultural Labourers is 37.42 in 2001-02[1]

TABLE NO 4.9
Gini Index by consumption for various States during 2004-05

	A.P.	Assam	Bihar	Gujarat	Haryana	H.P.	K'taka	M.P.	Mah'tra
Rural	30	20	20	27	32.3	30	26.4	30	31
Urban	40	31	30	30	36.1	30	36.5	40	37.1

	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	W. Bengal	Chhattisgarh	Jharkhand	Kerala	All-India
Rural	30.2	27.8	24.8	31.5	28.7	27.3	30.5	23.1	34	29.7
Urban	35.5	39.3	36.7	35.8	37	37.6	43.9	35.4	40	37.3

Source: Economic survey 2007-2008, p-28

B.2.5. A temporal study

The Trend of income inequality from the early part of 1950's to 2004-05 for various states in India are presented for rural and urban

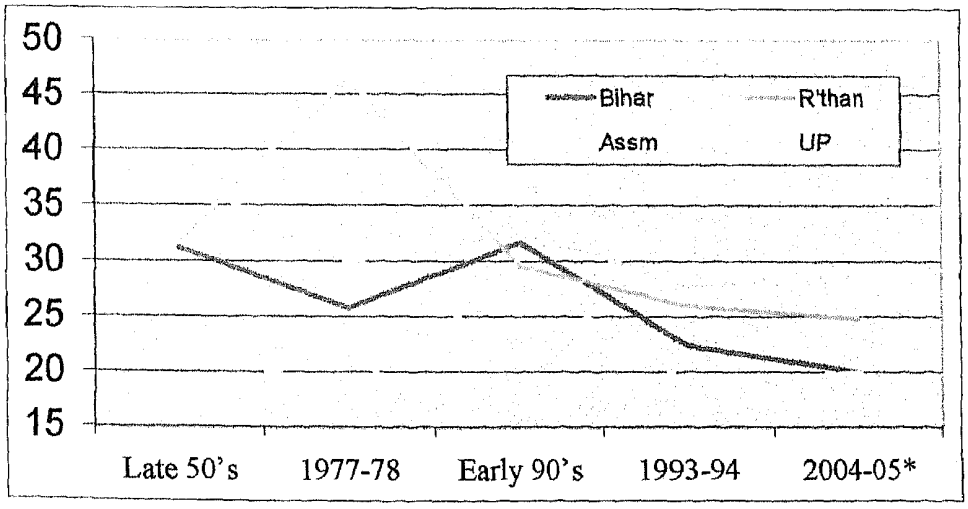
[1] K Nageswara Rao (Ed), *Poverty in India, Global and Regional dimensions* (New Delhi: Indian Economic Association) 2005, p-382

separately in annexure No 4.A and 4.B respectively. These inequality indices are to be used with caution because some of them are obtained from income while some others are from consumption expenditure. However, consumption and income inequality are highly and positively related, and as such they may be used as a proxy to one another for studying the trend of income inequality.

B.2.5.1. Rural scenario

We have five distinct points of time for comparision of the states like Bihar, Assam, Rajasthan and UP. Of out which UP recorded the

Diagram 4.3
(Rural Gini coefficient for some states)



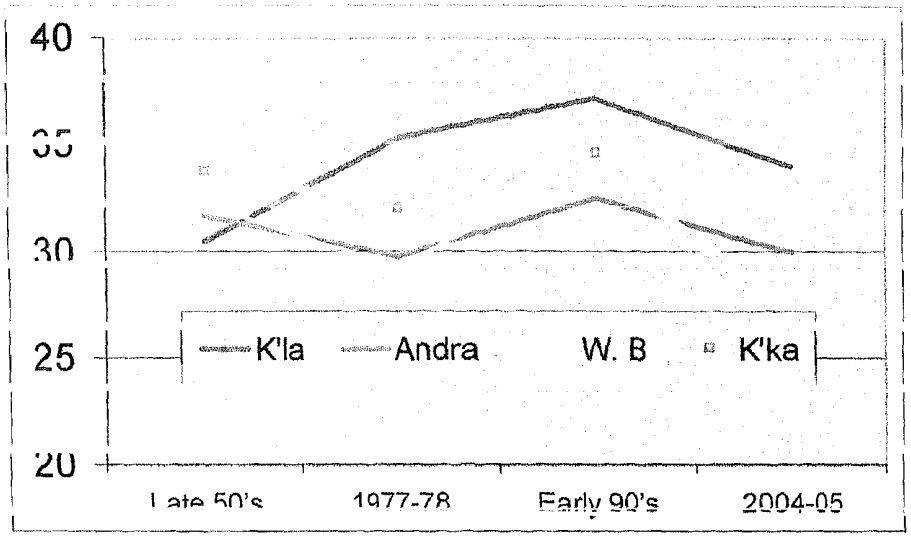
highest level of inequality (37.53) in the late 1950's and its inequality level was decreased just as it did in Bihar and Assam state whereas it

was increasing in Rajasthan. But Rajasthan showed a decreasing trend upto 2004-05. UP, Bihar and Assam exhibits the same movement pattern of inequality for the last five decades as shown in diagram 4.3. Among them all, Assam has the lowest Gini coefficient throughout the five points of time. One very interesting point is that inequality level has been showing a decreasing trend since the last two decades.

We have four distinct points of time (viz, late 50's, 1977-78, early 90's and 2004-05) for comparision of 8 states like Kerala, Andra Pradesh, W. Bengal, Karnataka, Gujarat, Madhya Pradesh. Orissa and Tamil Nadu (Diagram 4.4 and 4.5). Inequality in Karnataka is behaving in a separate pattern upto the early 1990's as shown in the diagram. All other states follow the same path of decreasing first, and then increasing and again decreasing from late the 50's to 1977-78, 1977-78 to early 90's and, early 90's to 2004-05 respectively with a small variation in their range of movements. Orissa and Karnataka have the highest range of movement 8.31 and 8.23 respectively in Gini points.

As a whole in Indian rural states, inequality follows the same path of movements i.e. decreasing, increasing and decreasing from the late 50's to 1977-78, 1977-78 to early 90's and, early 90's to 2004-05 respectively excepting few states like Rajasthan and Kerala.

Diagram 4.4
(Rural Gini coefficient for some states)

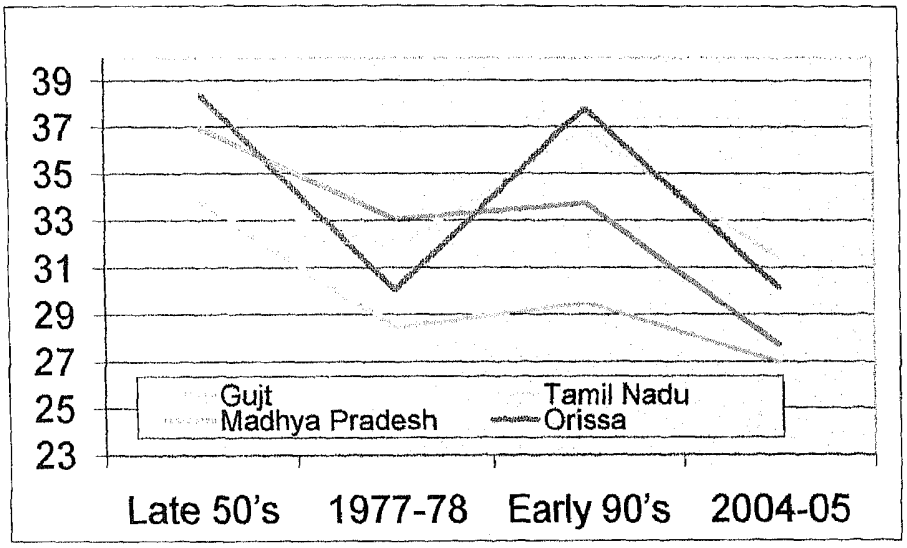


Bihar, Assam, UP, Karnataka, W Bengal, Andra Pradesh, Tamil Nadu and Orissa experience similar pattern of movement, which is a sequence of decreasing first, then increasing, and again decreasing. In the meantime, Kerala has experienced the opposite movement i.e. a sequence of increasing, decreasing and increasing

There is one thing which is common to all these states is that inequality has been deceasing from early 1990's to 2004-05 even though the level of reduction is not the same. In this connection, it may be interesting to relate globalisation and inequality in rural India. In the context of rural India, it might be safe to conclude that globalisation and inequality in rural India are independent to each other. But, for the state

of Haryana and Punjab inequality is increasing since 1978-78 to 2004-05 and 1993-94 to 2004-05 respectively as shown in annexure 4.A

Diagram 4.5
(Rural Gini coefficient for some states)



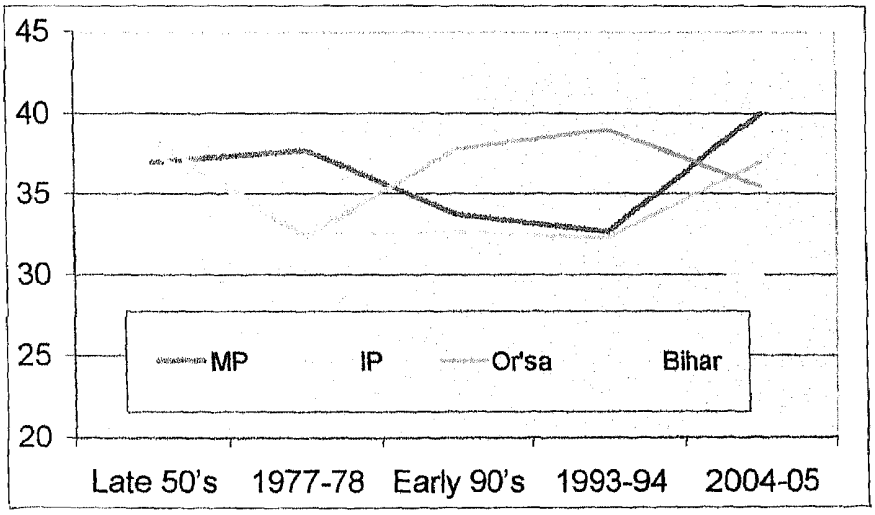
The range of Gini coefficients for those states are respectively 16.31, 28.21, 9.38 and 14.0 for the years of late 50's, 1977-78, early 90's and 2004-05. Assam is found to record the lowest inequality throughout the temporal analysis.

B.2.5.2. Urban scenario

We have five points of time for comparision for the states of Madhya Pradesh, Uttar Pradesh, Orissa and Bihar. As shown in diagram 4.6, Bihar has the lowest level of inequality right from the very beginning and its Gini coefficient is almost constant throughout the five

points of time. Madhya Pradesh and Orissa record an opposite trend of inequality all the times, when one shows an increasing, the other is showing the opposite trend. In the mean time, Uttar Pradesh reversed its movement of decreasing first and increasing during the five decades of analysis. Orissa has the highest range of Gini coefficient during the five points of analysis.

Diagram 4.6
(Urban Gini coefficient for some states)



We have four points of time (viz, late 50's, 1977-78, early 90's and 2004-05) for the states of Andra Pradesh, West Bengal, Karnataka, Gujarat, Tamil Nadu, Maharastra and Assam. Diagram 4.7 shows that inequality in Karnataka, Andra Pradesh and West Bengal are increasing while it shows decreasing trend for the state of Gujarat. Karnataka

exhibits a constant rate of increase from the very beginning while it was rapid movement in Andra Pradesh and W Bengal.

Diagram 4.7
(Urban Gini coefficient for some states)

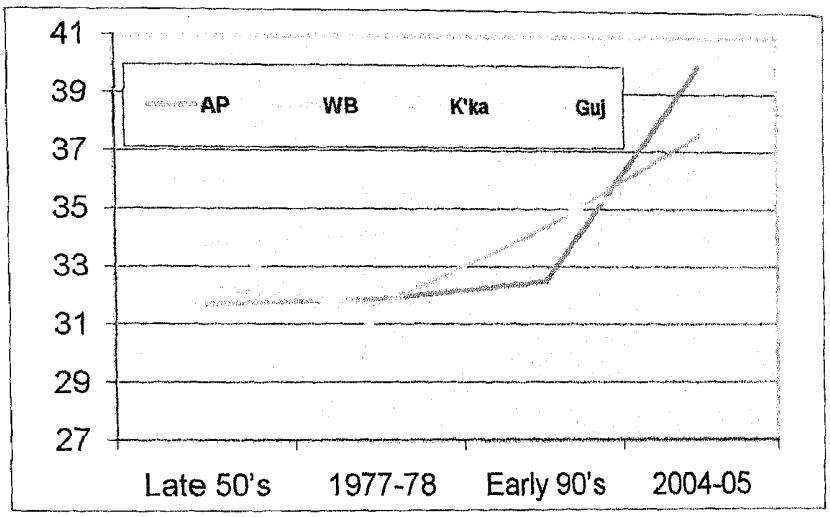
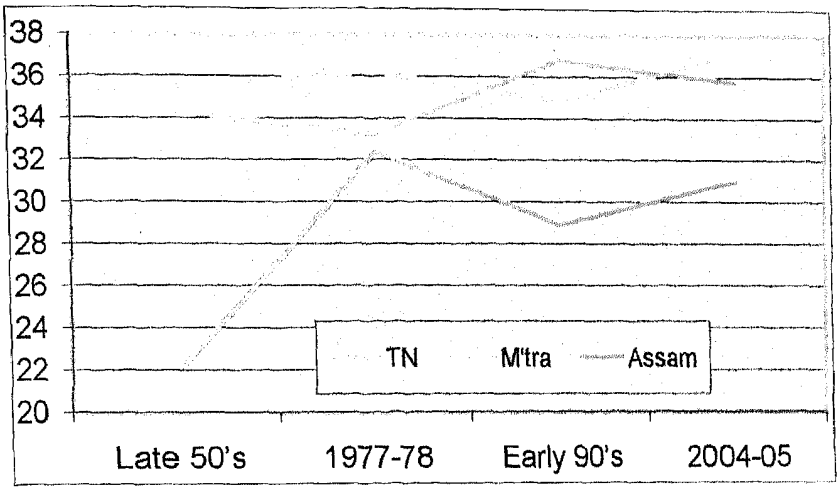


Diagram 4.8 below shows that inequality is found to be the lowest in Assam again but increasing while Tamil Nadu and Maharastra show an opposite movement. Inequality is decreasing, increasing and again deceasing in Tamil Nadu while it was the reverse way in Maharastra during the five decades of analysis.

If we observe the long-term movement of inequality in urban India from diagram 4.7 and 4.8, it is correct to say that inequality is increasing in these states except in Gujarat and Bihar. However, for certain states like Madhya Pradesh and UP, it is difficult to have any idea if it will reverse its tracks

Diagram 4.8
(Urban Gini coefficient for some states)



To sum up, Madhya Pradesh and Maharastra follow exactly the same pattern of movement while Orissa and Tamil Nadu exhibit exactly the opposite pattern. Karnataka, W Bengal and Andra Pradesh show a regularly increasing Gini coefficients while Gujarat experienced a decreasing trend for the last five decades. One of the most developed states in India, Punjab has virtually a constant rate of inequality during the period from 1977-78 to 2004-05 as presented in the annexure 4.B

Annexure 4.A
(Gini coefficient of rural area for various states)

Sl No	States	Late 50's	1977-78	Early 90's	1993-94	2004-05*
1	Assam	22.1	18.3	28.94	19	20
2	J & K	29.34	22.2	28.45	NA	NA
3	Kerala	30.51	35.3	37.16	NA	34
4	Bihar	31.23	25.8	31.72	22.39	20
5	Andra Pradesh	31.73	29.8	32.5	NA	30
6	Rajasthan	32.03	46.5	29.61	25.99	24.8
7	W. Bengal	32.28	29.2	34.37	NA	27.3
8	Karnataka	33.79	32.1	34.63	NA	26.4
9	Gujarat	33.85	28.5	29.52	NA	27
10	Tamil Nadu	34.28	31.9	36.82	NA	31.5
11	Maharastra	35.54	46.2	34.86	NA	31
12	Madhya Pradesh	36.99	33.1	33.76	27.74	30
13	Uttar Pradesh	37.53	29.9	32.75	27.82	28.7
14	Orissa	38.41	30.1	37.83	NA	30.2
15	Haryana		28.8		30.09	32.3
16	Himachal Pradesh	NA	NA	NA	27.62	30
17	Punjab	NA	30.3	NA	NA	27.8
18	Chhattisgarh	NA	NA	NA	NA	30.5
19	Jharkhand	NA	NA	NA	NA	23.1

Source: Compiled from various tables of this paper
*By consumption

Annexure 4.B
(Gini coefficient of urban area for various states)

Sl No	States	Late 50's	1977-78	Early 90's	1993-94	2004-05*
1	Assam	22.1	32.4	28.94	NA	31
2	J & K	29.34	29.4	28.45	28.0	NA
3	Kerala	30.51	39.5	37.16	NA	40
4	Bihar	31.23	30.4	31.72	30.70	30
5	Andra Pradesh	31.73	31.9	32.5	NA	40
6	Rajasthan	32.03		29.61	29.04	36.7
7	W. Bengal	32.28	31.7	34.37	NA	37.6
8	Karnataka	33.79	34.2	34.63	NA	36.5
9	Gujarat	33.85	30.8	29.52	NA	30
10	Tamil Nadu	34.28	33.3	36.82	NA	35.8
11	Maharastra	35.54	36.2	34.86	NA	37.1
12	Madhya Pradesh	36.99	37.7	33.76	32.67	40
13	Uttar Pradesh	37.53	32.7	32.75	32.30	37
14	Orissa	38.41	32.4	37.83	39.0	35.5
15	Haryana	NA	31.7	NA	21.62	36.1
16	Himachal Pradesh	NA	NA	NA	43.45	30
17	Punjab	NA	38.0	NA	NA	39.3
18	Chhattisgarh	NA	NA	NA	NA	43.9
19	Jharkhand	NA	NA	NA	NA	35.4

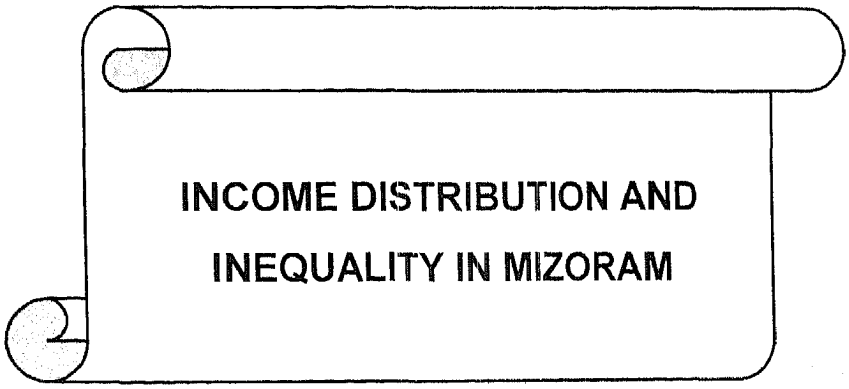
Source: Compiled from various tables of this paper
*By consumption

Annexure 4.C
(Gini coefficient of some states in 1983)

Sl.No	States	Rural	Urban
1	Andra Pradesh	29.72	31.95
2	Assam	19.85	26.54
3	Bihar	26.01	30.82
4	Gujarat	25.86	27.73
5	W. Bengal	28.83	34.42
6	J & K	22.68	24.54
7	Karnataka	30.40	34.04
8	Kerala	33.88	39.36
9	Madhya Pradesh	29.6	30.33
10	Rajasthan	34.59	30.96

Source: World Bank, India achievement and challenges in reducing poverty, Report No -16483 IN

CHAPTER – 5



INCOME DISTRIBUTION AND INEQUALITY IN MIZORAM

INCOME DISTRIBUTION AND INEQUALITY IN MIZORAM

This chapter is divided into three sections. Section A explains the income distributional scenario of Mizoram during 80's while section B is devoted to fitting of income frequency distribution. The last section, section C discuses calculation of income inequality using pre defined formulae in chapter 2

SECTION A: INCOME DISTRIBUTIONAL SCENARIO

Scenario during early 80's

The organisation of National Sample Survey had conducted income survey in Mizoram for rural and urban areas in the year 1981 (Jan) and 1984 (April 1983 – March 1984) respectively. During 1981 the urban population comprised of 25.17% of the state population and the then urban towns are Aizawl, Lunglei, Kolasib, Champhai, Serchhip and Saiha[1]. For the survey period the average income at current price of the then Aizawl, Lunglei and Saiha district are Rs 405.10p, Rs 280.50p and Rs 228.90p respectively whereas, the average income for the rural area of these districts was Rs 569.66p, Rs 360.68p and Rs 443.45p respectively. There are seven blocks having per capita income higher than the state average in Aizawl district while one each in Lunglei and

[1] Directorate of Economics & Statistics, *Statistical handbook Mizoram 1981(Aizawl: Govt. of Mizoram, 1982)*

Chhimtuipui district[1]. The income share of the bottom 10% and top 10% for rural Mizoram during the period is 2.96% and 20.06% respectively. The percentage share of bottom 40% in 1981 was estimated to be 25% of total state production and hence, Mizoram may be categorised as low-income inequality during the early part of 1980's. The rural Gini coefficient is 10.11[2], which is extremely low as compared to the corresponding figure of other states (Annexure No 4.C)

The reason why rural average income is higher than that of urban was most probably on account of monetary assistance received by several household through the implementation of the Integrated Rural Development Programme (IRDP) during the survey year. From this observation it is clear that there is no significant difference between rural and urban income distribution in a semi-primitive economy of the type found in the state as a whole. In the survey for rural areas as many as 3,12,526 persons from 50,037 families are covered, this survey covers 64.07% of the total population, which is sufficient to represent the whole state of Mizoram. Rural population and rural scenario of the state in respect of economic activities will; any way; dominate Mizoram. Therefore, the only available detail data of rural Mizoram will be used to

[1] Directorate of Economics & Statistic department, Mizoram as cited in RN. Prasad & AK. Agarwal, *Political and economic development of Mizoram*, (New Delhi : Mittal ublications,1991), p-171

[2] 1981 figure suffers certain degree of distortion however can be, somehow, calculated as such this Gini coefficient is supposed to be underestimate.

represent Mizoram State for the year 1981 with a good degree of confidence. This is justified because the official data is collected for the purpose of assigning strategic needs of developmental work. There is, moreover, no other option but to use official data for the temporal study of income distribution in the state

In another survey in 1984, it was found that the urban monthly per capita income of the then Aizawl district is Rs 405.10p/-, Lunglei – Rs 280.50p/- and the then Chhimtuipui district – Rs 228.90p[1]. Most of the people are engaged in Agriculture & allied activities and as such the level of inequality was extremely low during that year. It is here appropriate to mention that by the year 1960-61, primary sector alone contributed around 76.9% of the state net domestic product and the figure is declining to 33.75% in 1983-84[2], and to 21.12 in 2003-04[3]

This income survey reveals that there is a tendency income distribution in the urban area that will result in widening the gap between the rich and the poor unless some appropriate economic measures are taken by the government. This study will investigate whether economic

---

[1] RN. Prasad & AK. Agarwal, *Political and economic development of Mizoram*, (New Delhi: Mittal Publications, 1991) *p-170*
[2] ibid, *p-168*
[3] Directorate of Economics & Statistics, *Statistical handbook Mizoram 2006.*(Aizawl: Govt. of Mizoram, 2006), p-87

planning did enough to re-slide economic pie more unevenly between the elite and economically weaker section of the people.

SECTION B: FITTING OF INCOME FREQUENCY DISTRIBUTION

Income frequency distribution

Many curves that have been frequently used for graduating income data at various places are briefly highlighted in chapter 2. These curves have been tested fitting the income data of Mizoram to see which model/curve is most suitable for graduating the income data. These curves have their own characteristics that facilitate them to posses their unique advantage to explain a particular condition of income distribution. The identification of the functional distributional form of income is of crucial importance for it gives an analytical tool for further developmental planning and policy prescriptions.

In this study, there are three types of random variables Viz, Village/Locality (69 samples), household income (256 samples) and monthly income per capita (256 samples). After fitting the various distributions, we found that some of them are not applicable to Mizoram data. Those distributions that are applicable are listed below and the summary results are displayed hereunder.

B.1. When 'village/Locality' is taken as random variable

When the 'mean income of the villages/localities' is taken as random variables with sample size of 69, there are three distributions that fit well Mizoram data and the fitted results are summarised as follows.

B.1.1. Lognormal Distribution:

Estimated: Location (μ) = 7.625 Scale (σ) = 0.6248

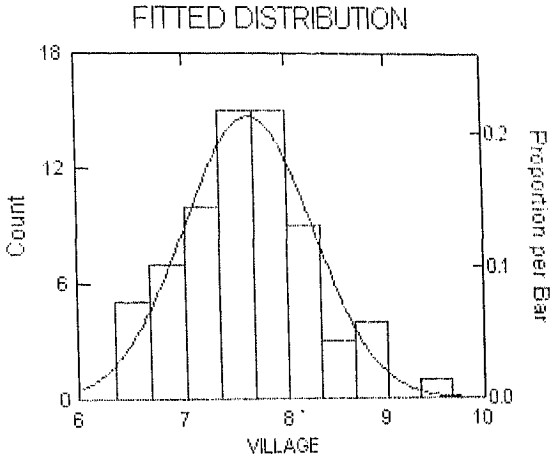
Estimation of parameter(s): Maximum likelihood method. Log transformation is used on data.

TABLE NO 5.1
(Test of goodness of fit for Lognormal distribution)

Limit	Limit	Observed	Expected
.	7.006	14.0	11.074
7.006	7.323	7.0	10.577
7.323	7.640	14.0	13.457
7.640	7.957	17.0	13.311
7.957	8.274	7.0	10.234
8.274	.	10.0	10.347
		69.000	69.000

Calculated χ^2 = 4.06, Tabular χ^2 at 5 df for 5% = 11.07

FIGURE NO. 5.1
(Fitted graph of Lognormal distribution)



B.1.2. Wald/Inverse Guassian Distribution:

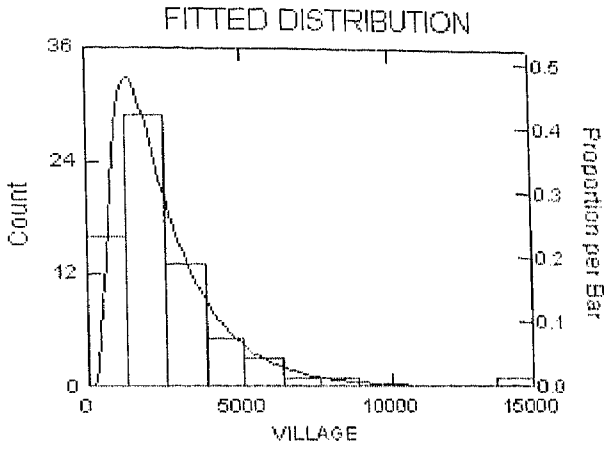
Estimated: Location (μ) = 2533.3, Scale (λ) = 5262.4 Estimation of parameter(s): Maximum likelihood method.

TABLE NO 5.2
(Test of goodness of fit for Guassian distribution)

Limit	Limit	Observed	Expected
.	1919.078	29.0	33.033
1919.078	3253.106	26.0	19.429
3253.106	4587.134	7.0	8.633
4587.134	.	7.0	7.905
		69.000	69.000

Calculated χ^2 = 3.127, Tabular χ^2 at 3 for 5% =7.815

FIGURE NO. 5.2
(Fitted graph of Wald/Inverse Guassian Distribution)



B.1.3. Exponential Distribution:

Estimated: Location (θ) = 585.050, Scale (λ) = 1948.289275. Estimation of parameter(s): Maximum likelihood method.

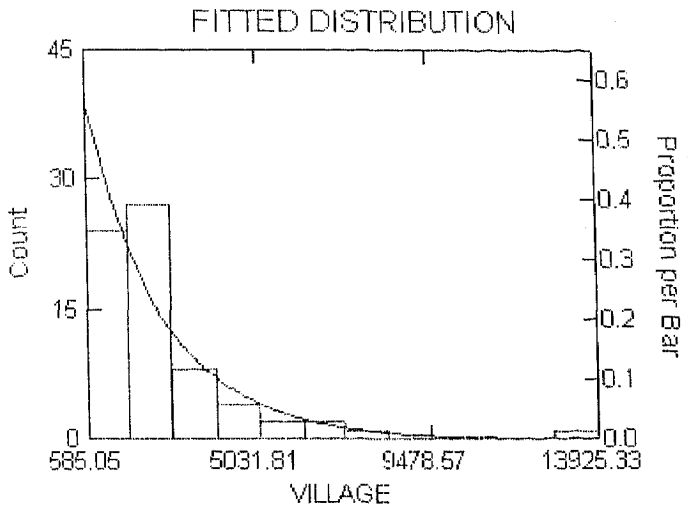
TABLE NO 5.3

(Test of goodness of fit for Exponential distribution)

Limit	Limit	Observed	Expected
.	1919.078	29.0	34.208
1919.078	3253.106	26.0	17.249
3253.106	4587.134	7.0	8.697
4587.134	.	7.0	8.846
		69.000	69.000

Calculated χ^2 = 5.949, Tabular χ^2 at 3df for 5% = 7.815

FIGURE NO. 5.3
(Showing the fitted graph of Exponential Distribution)



B.2. When 'family monthly income' is taken as random variable.

When the family monthly income is taken as random variable, there are only 2 distributions that fit well Mizoram data and the fitted result is as under.

B.2.1. Lognormal Distribution

Estimated: Location (μ) = 9.164, Scale (σ) = 1.0127

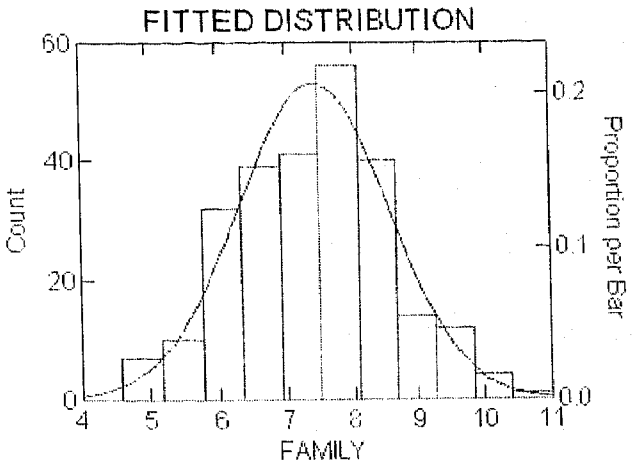
Estimation of parameter(s): Maximum likelihood method.
Log transformation is used on data.

TABLE NO 5.4
(Test of goodness of fit for lognormal distribution)

Limit L	Limit U	Observed	Expected
.	7.208	6.0	6.820
7.208	7.730	14.0	13.235
7.730	8.253	37.0	27.065
8.253	8.776	35.0	42.638
8.776	9.299	40.0	51.753
9.299	9.822	55.0	48.399
9.822	10.345	41.0	34.874
10.345	10.868	18.0	19.360
10.868	.	10.0	11.857
	Total	256.000	256.000

Calculated χ^2 = 10.189, Tabular χ^2 at 8 df for 5% = 15.507

Figure No. 5.4
(Fitted graph of Lognormal Distribution)



B.2.2. Exponential Distribution

Estimated: Location (θ) = 800 Scale (λ) = 14866.8

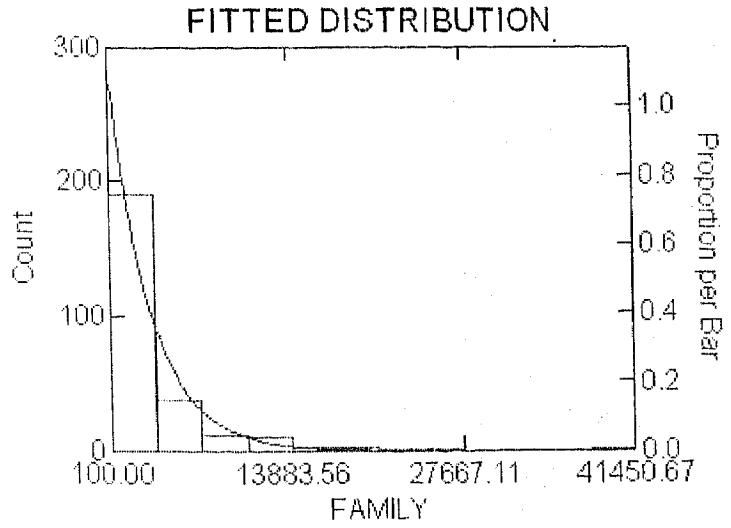
Estimation of parameter(s): Maximum likelihood method.

TABLE NO 5.5
(Test of goodness of fit for exponential distribution)

Limit L	Limit U	Observed	Expected
.	15648.500	169.0	161.707
15648.500	30497.000	58.0	59.562
30497.000	45345.500	13.0	21.939
45345.500		16.0	12.793
	Total	256.000	256.000

Calculated χ^2 = 4.81, Tabular χ^2 at 3df for 5% = 7.815

Figure No. 5.5
(Showing the fitted graph of exponential Distribution)



B.3. *When 'monthly income per capita' is taken as random variable*

When the 'monthly income per capita (total family income divided by total family members)' is taken as random variable, only Lognormal distribution fits well Mizoram data and the fitted result is as under.

B.3.1. *Lognormal distribution*

Estimated: Location (μ) = 7.421, Scale(σ) = 1.1263.

Estimation of parameter(s): Maximum likelihood method.

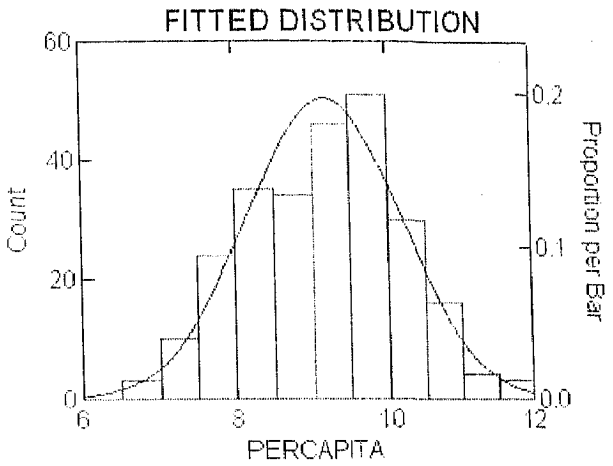
Log transformation is used on data.

TABLE NO 5.6
(Test of goodness of fit for lognormal distribution)

Limit L	Limit U	Observed	Expected
.	5.208	08.0	06.325
5.208	5.811	12.0	13.225
5.811	6.413	34.0	27.921
6.413	7.016	36.0	44.564
7.016	7.619	49.0	53.779
7.619	8.221	57.0	49.072
8.221	8.824	31.0	33.856
8.824	9.427	19.0	17.660
9.427	.	10.0	09.598
	Total	256.000	256.000

Calculated χ^2 = 5.59, Tabular χ^2 at 8 df for 5% = 15.507

(Fitted graph of Lognormal Distribution)



For policy and estimation purposes the properties of these distributions have an advantage in that they can give predictable results. To make clear this point, let us take a simple example. Suppose, for 'family income', the location (μ) = 9.1647 and scale (σ) = 1.013, so that the statistic of the income unit can be calculated as:

1) Mean = $\alpha e^{\frac{\sigma^2}{2}} = e^{\mu+\frac{\sigma^2}{2}} = e^{9.1647+\frac{1.013^2}{2}} = 15959.1$

i.e. the estimated mean income is Rs 15,959.10p whereas the actual mean is Rs 15,666.82p

2) Median = $e^{\mu} = e^{9.1647}$ = Rs 9,553.85p.

i.e. The estimated median income is Rs 9,553.85p whereas the actual median is Rs *10,540.81p.*

Following this technique one can estimate the number of persons whose income is in between certain intervals 'a' and 'b'.

The fitted graphs of some distributions that do not suitable to Mizoram data are given in the annexure 5.B.

SECTION C: CALCULATION OF INEQUALITY

Various measures of inequality have been discussed in chapter 2. In this chapter, the actual calculation of these measures is done to facilities comparison and to explore the ground reality in respect of income inequality prevailing in the state. Measures are categorised into those that are -

1) Based on Lorenz curve.
2) Not based on Lorenz curve.

The suffix '*fam*' denotes family and '*Ind*' denotes individual which is equal to monthly income per capita

LORENZ CURVE

For the first time in Mizoram the Lorenz curve was drawn for the year 1981 and 2006 are presented in annexure 5.A. These curves indicate the degree of income inequality for the corresponding year. The percentage of population and their income share are represented in the horizontal and vertical axis respectively. Many of inequality measures are dependent on this Lorenz curve. The greater the distance between

Lorene curve and line of equality, the greater is the degree of inequality and vice versa.

C.1. INDICES BASED ON LORENZ CURVE

C.1.1. Gini Coefficient: One of the most common and widely used measures of inequality to analyse the size distribution of Income is Gini Coefficient proposed by Gini in 1921 which is define as

$$G = \frac{\Delta}{2\mu},$$

$$\text{where } \Delta = \frac{1}{n(n-1)} \sum_{i=1}^{n} \sum_{j=1}^{n} |x_i - x_j|,$$

x_i being the income of the j[th] unit, and n the total number of units. Subsequently Gini proposed inequality measure that is [1 – (twice the area under Lorenz curve)].

i.e. $G = 1 - 2$ [Area under Lorenz curve]

Another very useful formula can be represented as under[1]–

$$\text{Let } p_i = \frac{P_i}{P}, \quad y_i = \frac{x_i}{x}, \quad z_i = \sum_{k=1}^{i} y_k, \; i = 1,2,3,\ldots.n.$$

Here P is the total number of persons/households, P_i the number of persons/households in the i[th] income class, $i = 1,2,3,\ldots.n.$ y the total income and y_i the income of the i[th] class. Therefore, P_i is the

[1] AL. Nagar & RK. Das; *Basic Statistics*, Delhi Oxford university Press, 11[th] edition impression (1994), p-380.

population share of the i[th] income class, y_i the corresponding income share and z_i the cumulative share of income up to the i[th] income class. Some times the figure is multiplied by a factor of 100 for easy remembrance. Using these, Gini coefficient is calculated separately for 1981 and 2006 as

$$G^{81} = 1 - \sum_{i=1}^{n} p_i (z_i + z_{i-1}),\ z_0 = 0.$$

$$= 1 - 8988.93$$

$$= 0.101107 \text{ or } \mathbf{10.11}$$

Similarly.

$$G^{06} = 1 - 6873.068979$$

$$= 0.312693102 \text{ or } \mathbf{31.27}$$

C.1.2. Relative Mean difference[1] : Von Bortkiewiez proposed the relative mean difference as a measure of inequality in 1898 (his result was published in 1930). Pietra (1948) investigated the statistical property. The measure is defined as

$$RMD = \frac{1}{2\mu n}\sum_{i=1}^{n}\left|x_i - \bar{x}\right| \text{ or } \frac{1}{2\mu N}\sum_{i=1}^{n} f_i\left|x_i - \bar{x}\right|$$

$$RMD_{Ind}^{81} = \frac{1}{2x513x322382}\sum_{i=1}^{20} f_i\left|x_i - 513\right|$$

$$= 0.151641$$

[1] Since this measure is classified under this category, it is here also placed under Lorenz curve's related measure (see Nanak C. Kakwani, op cit page 118)

$$RMD_{fam}^{06} = \frac{1}{2x15666.82x256}\sum_{i=1}^{256}|x_i - 15666.82|$$

$$= 0.3703$$

Similarly,

$$RMD_{Ind}^{06} = \frac{1}{2x2540.0285x1579}\sum_{i=1}^{256}f_i|x_i - 2540.0285|$$

$$= 0.35044$$

C.1.3. Bowley's Index: Bowley's index of inequality measure is defined by the following formula-

$$B = \frac{Q_3 - Q_1}{Q_3 + Q_1};$$

Where $Q_i = l_0 + \frac{\frac{iN}{4} - c.f.}{f_{md}}(l_1 - l_0)$. l_1, l_0 are the lower and upper limit of the median class. $c.f.$, the cumulative frequency preceding median class and f_{md} the frequency of median class. In our case study, the first and third quartile for the year 1981 are respectively ${}^{81}Q_1^{Ind} = 307.07$ and ${}^{81}Q_3^{Ind} = 555.13$, so that, the Bowley's index is $B_{Ind}^{81} = 0.2877$.

Again, arrange families into ascending order of their income and locate the quartiles. The first and third quartiles for the year 2006 are ${}^{06}Q_1^{fam} = 4191$ and ${}^{06}Q_3^{fam} = 18860$ respectively. So that,

B_{fam}^{06} = 0.6364

Similarly, the corresponding figure are ${}^{06}Q_1^{Ind}$ = 830.246,

${}^{06}Q_3^{Ind}$ = 3103.6 respectively. So that B_{Ind}^{06} = 0.5779

C.1.4. Pyatt, *et al.* (1980) formula: Pyatt, et al.(1980) suggest a very simple formula on the bases of rank of income for calculating Gini coefficient.

$$G = \frac{2Cov(y, r_y)}{n\bar{Y}}$$

Where $2Cov(y, r_y)$ is the covariance between income and rank of all individuals/recipients according to income ranging r_y from the poorest (rank = 1) to the richest (rank = n) and $\bar{Y}$ is mean income. In our data, $2Cov(y, r_y)$ = 62491.36, $n\bar{Y}$ = 174800.43, so that

G = *0.3575012 or 35.75*

C.1.5. Milanovic (1997) formula : Milanovic (1997) claims to have devised an even simpler formula using Coefficient of variation and correlation coefficient for calculating Gini coefficient as –

$$G = \frac{CV_y\ \gamma(y, r_y)}{\sqrt{3}},$$

Where CV_y is the coefficient of variation of income and $\gamma(y,r_y)$, the correlation coefficient between income and rank of individuals by income. In our data CV_y = 0.7994436, $\gamma(y,r_y)$ = 0.7803079 and $\sqrt{3}$ = 1.7320508. So that G = 0.3601581 or 36.02

C.1.6. Elteto and Frigyes' inequality measure: In 1968 Elteto and Frigyes proposed a set of inequality measures that are defined as -

$$u = \frac{\mu}{\mu_1}, \quad v = \frac{\mu_2}{\mu_1} \text{ and } w = \frac{\mu_2}{\mu}$$

Where $\mu = E(x)$, $\mu_1 = E(x|x < \mu)$ and $\mu_2 = E(x|x \geq \mu)$

The range of these measures are from one to infinity, it has transformed them so that they are confined within the finite range of zero to unity as-

$$u' = 1 - \frac{1}{u} \quad v' = 1 - \frac{1}{v} \text{ and } w' = 1 - \frac{1}{w}$$

Among 3,22,382 persons covered in 1981 survey, there are 1,62,247 and 1,60,135 persons whose mean income is less than and more than population mean income of Rs 513.00p respectively. So that μ = 513.00p μ_1 = 358.43 and μ_2 = 669.618.

Then, u_{Ind}^{81} = 1.43, v_{Ind}^{81} = 1.87 and w_{Ind}^{81} = 1.305

Among the sample of 256 households there are 169 and 87 households whose income is less than and more than the household

mean income of Rs 15666.82p respectively. So that μ = 15666.82, μ_1 = 6878.69 and μ_2 = 32737.99. Then,

u_{fam}^{06} = 2.278, v_{fam}^{06} = 4.76 and w_{fam}^{06} = 2.09

Among 1579 persons covered in this survey, there are 1040 and 539 persons whose mean income is less than and more than mean income of Rs 2540.03p respectively. So that μ = 2540.03, μ_1 = 1164.15 and μ_2 = 5194.78,

Then,

u_{Ind}^{06} = 2.182, v_{Ind}^{06} = 4.46 and w_{Ind}^{06} = 2.045

Accordingly, we obtain u', v' and w' from the above values.

C.2. INDICES NOT BASED ON LORENZ CURVE

C.2.1. Range (R): The value of range have been calculated for family income and individual income separately. Recall that

$$\text{Range R} = \frac{1}{\bar{x}}[X_{Max} - X_{Min}]$$

$$R_{Ind}^{81} = \frac{1}{513}[1040.36 - 128.78]$$

$$= 1.777$$

$$R_{fam}^{06} = \frac{1}{15666.817}[149285 - 800]$$

$$= 9.4777$$

$$R_{Ind}^{06} = \frac{1}{2540.029}[41450.667 - 100]$$

$$= 16.28$$

The Range ignores the distribution inside the extremes; that it obviously violates the Pigou - Dalton condition.

***C.2.2.* Standard deviation (σ)**: The standard deviation of the income (x) can be written as-

$$\sigma = \sqrt{\frac{1}{n}\sum(x_i - \bar{x})^2} \text{ or } \sqrt{\frac{1}{N}\sum f_i(x_i - \bar{x})^2}$$

$$\sigma_{Ind}^{81} = \sqrt{48753.24155}$$

$$= 220.801$$

$$\sigma_{fam}^{06} = \sqrt{341848703.6}$$

$$= 18489.151$$

i.e. Standard error = 1155.57

$$\sigma_{Ind}^{06} = \sqrt{11773379.84}$$

$$= 3431.236$$

i.e. Standard error = 21.327

***C.2.3.* Variance of log – income:** Unlike the variance of income, the variance of the logarithm of income V (log x) is a mean-independent measure of inequality.

$$V(\text{Log } x) = \frac{1}{n}\sum(Log\, x_i - \overline{Log\, \mu})^2 \text{ or}$$

$$= \frac{1}{N}\sum f(Log\, x_i - \overline{Log\, \mu})^2$$

$$V(Log\ x)^{81}_{Ind} = \frac{1}{322382}[12075.43551]$$

$$= 0.0374569$$

$$V(Log\ x)^{06}_{fam} = \frac{1}{256}(49.521)$$

$$= 0.19344$$

$$V(Log\ x)^{06}_{Ind} = 0.2342$$

Sometimes the deviation of logarithms of income x is taken from the logarithm of arithmetic mean $\log \mu$, rather than $\log \bar{\mu}$.

i.e. $V'(\text{Log x}) = \frac{1}{n}\sum(Log\ x_i - Log\mu)^2$,

$$= \frac{1}{n}\sum[(Log\ x_i - \overline{Log\ \mu}) + (\overline{Log\ \mu} - Log\mu)]^2$$

$$= V(Log\ x) + (Log\ \mu - \overline{Log\ \mu})^2$$

$V'(Log\ x)^{81}_{Ind} = 0.0374569 + (\log 513 - 2.63069)^2$

$= 0.11688$

$V'(Log\ x)^{06}_{fam} = 0.19344 + (\log 15666.82 - 3.98)^2$

$= 0.23957$

$V'(\text{Log x})^{06}_{Ind} = 0.2342 + (\log 2540.029 - 3.223)^2$

$= 0.2673$

If all incomes are multiplied by a positive scalar factor λ, the variance of log income does not charge at all. That is $V(\log x\lambda) = V(\log$

x) which satisfy the property of population - size independence. However it does not satisfy the Pigou-Dalton condition for the entire range of incomes.

C.2.4. **Standard deviation of logarithm:** The standard deviation of logarithm as a measure of inequality is defined as the square root of variance of log-income defined above.

$$\text{i.e. } L = \left[\frac{1}{n}\sum_{i=1}^{n} Log\,\bar{x} - \log x_i\right]^{\frac{1}{2}},$$

By taking the square root of the Variance of log-income, we can easily obtain the standard deviation of log-income as -

$$SDL_{Ind}^{81} = 0.1935378$$

$$SDL_{fam}^{06} = 0.4895$$

$$SDL_{Ind}^{06} = 0.4839$$

C.2.5. **The Co-efficient of Variation (C.V.) :** The co-efficient of variation (C.V) as a measure of income dispersion can be represented as under.

$$C.V = \frac{\sigma}{\mu},$$

$$(CV)_{Ind}^{81} = \frac{220.801}{513}$$

$$= 0.430411$$

$$(CV)^{06}_{fam} = \frac{18489.151}{15666.82}$$

$$= 1.18$$

$$(CV)^{06}_{Ind} = \frac{3431.236}{2540.028}$$

$$= 1.351$$

This satisfies the Pigou – Dalton condition over the entire income scale because, by squaring the deviation from the mean, they ensure the crucial property of concavity.

C.2.6. Theil's Entropy index: The first Theil's Entropy Index T based on notion of Entropy in information theory is defined as –

$$T = \frac{1}{n}\sum \frac{y_i}{\mu} Log \frac{y_i}{\mu},$$

Where $n\mu = \sum y_i = y$ is the total income

Let $\frac{y_i}{\mu}$ be the income share of the i^{th} person and the entropy of income share is defined as

$$H(y) = \frac{1}{n}\sum \frac{y_i}{\mu}\left(Log \frac{Y}{y_i} \right)$$

The upper limit of H(y) is *logn*, which is reached when all individuals earn equal income, and the minimum of H(y) is zero, which represents that one individual is receiving all the income. Thus the Entropy H(y) of an income distribution can be regarded as a measure of income inequality. Theil obtains a measure of income inequality by

subtracting H(y) from its maximum value log n. Thus, the inequality measure as proposed by Theil (T) is -

$$T = Log\, n - H(y)$$

$$= Log\, n - \sum \frac{y_i}{Y} Log\left(\frac{Y}{y_i}\right)$$

$$T^{81}_{Ind} = Log\ 20 - \frac{11846.109}{9375.82}$$

$$= 0.03756$$

$$T^{06}_{fam} = \log 256 - \frac{8842662.316}{4010705.068}$$

$$= 0.2035$$

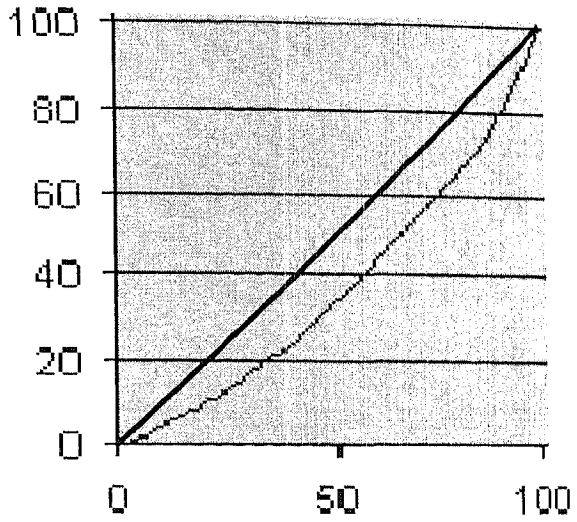
Here household is taken as an income unit represented by the family mean income.

$$T^{06}_{Ind} = \log 256 - \frac{1715928.48}{799735.72}$$

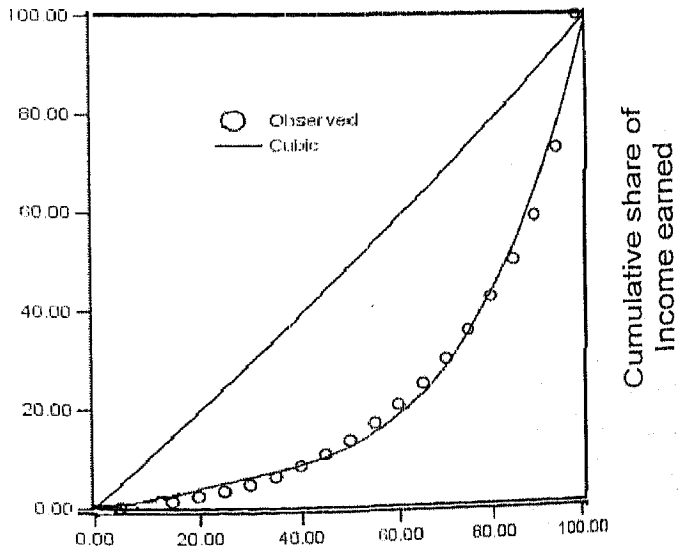
$$= 0.26262$$

Annexure 5.A

Lorenz curve for Mizoram1981



Lorenz curve of Mizoram 2006

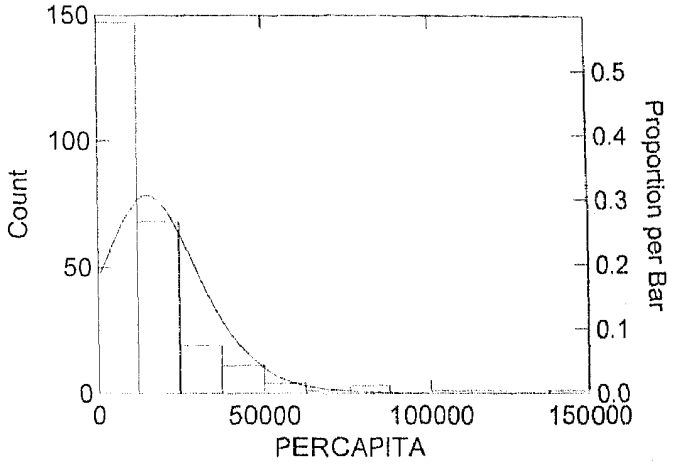


Annexure 5.B.

(Fitted graphs of some distributions that do not suitable to Mizoram)

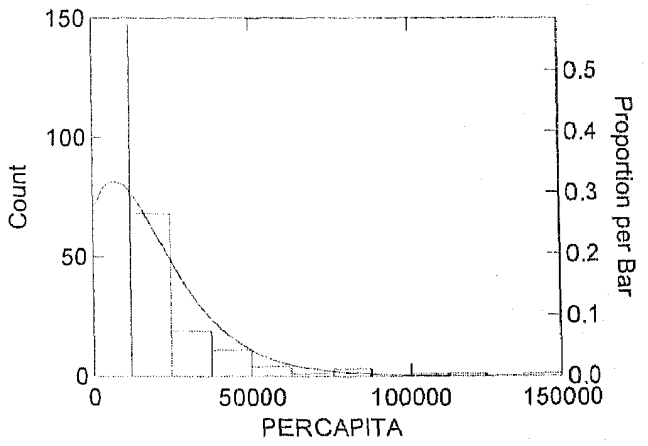
1. Distribution: Logistic

FITTED DISTRIBUTION

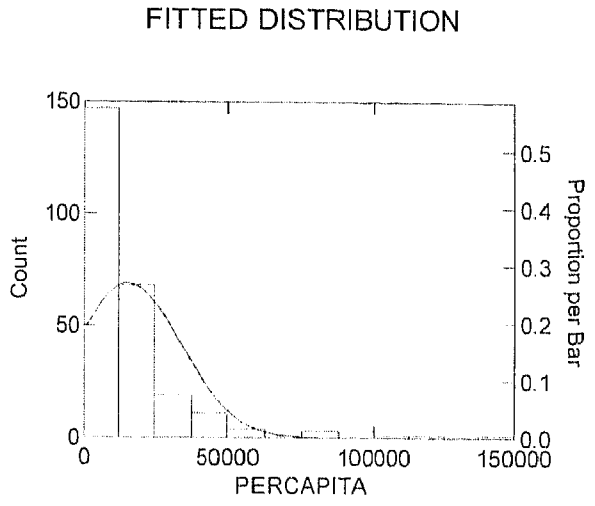


2. Distribution: Gumbel

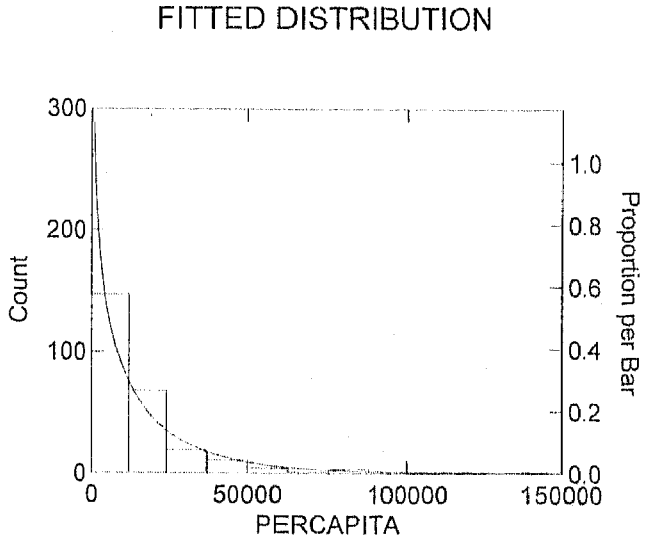
FITTED DISTRIBUTION



3. Distribution: Normal

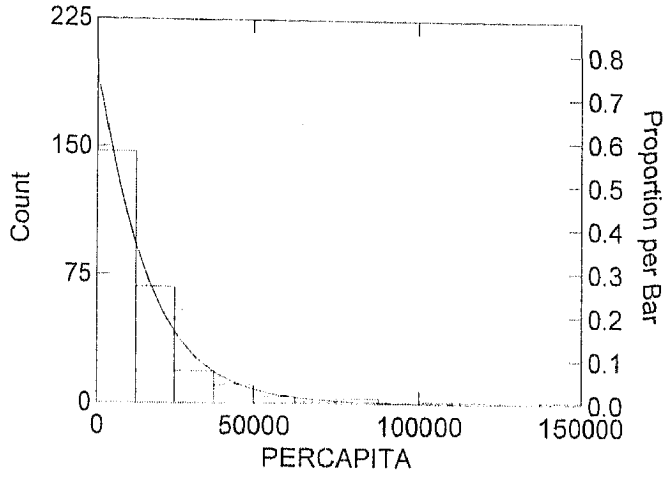


4. Distribution: Gamma



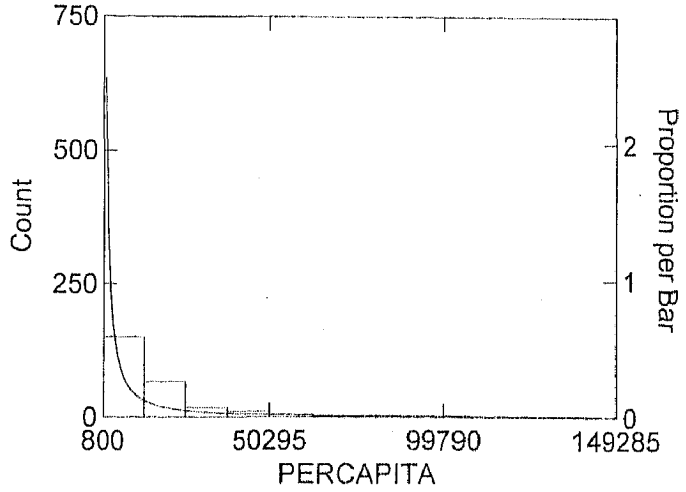
5. Distribution: Weibull

FITTED DISTRIBUTION

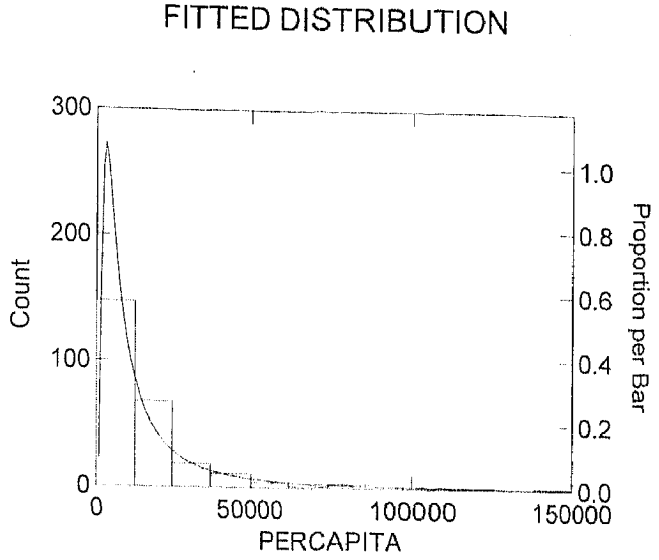


6. Distribution: Pareto

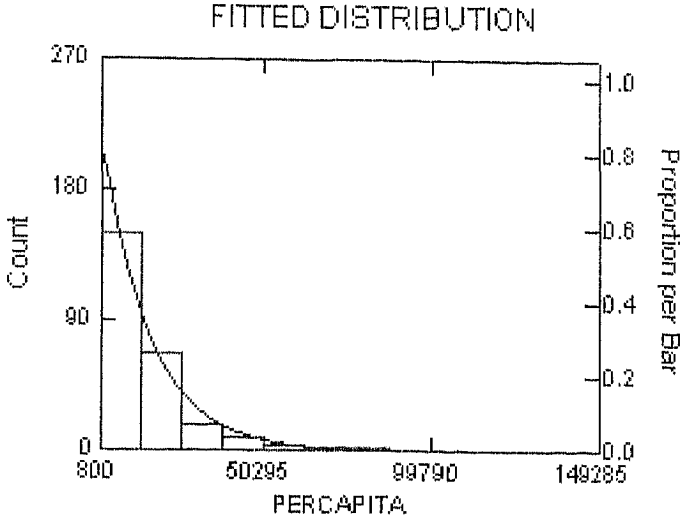
FITTED DISTRIBUTION



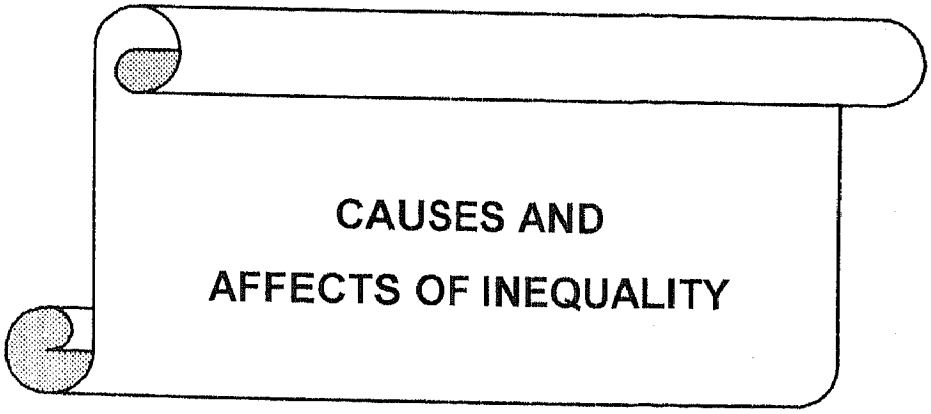
7. Distribution: Wald/Inverse Guassian



8. Distribution: Exponential



CHAPTER – 6



CAUSES AND AFFECTS OF INEQUALITY

CAUSES AND EFFECTS OF INEQUALITY

Inequality of income can be the result of different causes whereas its manifestation can be viewed from the level of international or intra-society dimension. The differences between countries in terms of per capita income are referred to as *International distribution* of income. When we allow for the inequality within countries, then the distribution of income among all the people of the world is expressed as *World distribution* of income. For measuring the size distribution of income among members of a society (i.e. within country inequality) economists use *inequality matrices.*

CAUSES OF INTERNATIONAL INEQUALITY OF INCOME

There are many causes for the existence of economic inequality among nations of the globe. Natural resources, climatical and geographical condition, quality of human capital and religious faith influence and control man's economic activities everywhere.

Natural resources are one of the most important factors that determine the possibility of creating wealth by the country. Countries those are rich in natural resources like Oil (Viz; Kuwait, Iraq, Iran, Saudi

Arabia, Venezuela, etc), minerals (Viz, USA, former Soviet Union, Canada, Mexico, UK, etc) and water resources/power have a greater chance of earning high as compared to countries that are less endowed. *Climatical and geographical condition is* also equally important. Climate exerts a great influence on man's physical and mental capacities and upon all his economic activities. Therefore, people in large numbers have concentrated in such areas where climate is suitable for health and activities. Plains offer maximum facilities for all types of economic activities like agriculture, transport, mining and manufacturing. In this way, such important factors have largely determined the economic/income level of a country[1].

Above all these, at all times and at all places, *Human Capital* of a country is the most important factor that determines the level of income. Human capital is the sum total of all knowledge, skill, ability, good habits, etc which are conducive to wealth creation in the country. There are vast areas of economic activities which are the concern of a particular topic, but it is outside the purview of the present study and we leave it here. Furthermore, there is a latent factor i.e. *Religious factor*. If we examine the distribution of income across countries, it is obvious that eastern European

---

[1] S.K. Dutta: *Studies in commercial geography*, (Imphal: Students store,1999), p-3,4,5

and North American countries that are dominated by protestant ethics become well placed in regard to income distribution, whereas most of the Asian-Hindu and other Islamic dominated countries' income is quite low owing to the presence of unfavourable social factors, for example, that women are not given equal opportunity with men.

CAUSES OF INTRA-COUNTRY INEQUALITY OF INCOME

One of the most important factors in the emergence of inequality is the varying opportunity of individuals to get acces to good *education.* Education, especially education in an area where there is a high demand for workers, creates high wages for those with this education. Contrariwise, those who are unable to afford higher – level education generally receive much lower wages. Many Economists believe that a major reason the world has experienced increasing levels of inequality since the 1980s is because of an increase in the demand for highly skilled workers in high-tech industries. They believe that this has resulted in an increase in wages for those who have the required skill or science – literate while the uneducated and unskill workers hardly have pay enhancement.

One of the major reasons why there is economic inequality within modern market economies is that wages are determined by the labour market and are hence influenced by supply and demand. In this view, inequality is caused by the interacting forces of supply and demand for different types of work. What have finally emerge from these supply and demand interactions are a gradation of wages in a gap of significant magnitude leading to income inequality within society. It is globally recognised that there is a connection between differences in *innate ability*[1], such as intelligence, strength, or charisma and between individuals level of wealth. Relating these innate abilities back to the labour market suggests that such innate abilities are in high demand relative to their supply and hence play a large role in increasing the wage of those who have them. Contrariwise, such innate abilities might also affect individuals ability to operate within society in general, regardless of the labour market[2].

The existence of different *genders, races and cultures* within a society is also thought to contribute to economic inequality. Scientists such as Richard Lynn argued that there are innate group differences in ability that are partially responsible for producing race and gender group

[1] Innate ability is an ability acquired through genetic heritage.
[2] Dr. Richard Lynn, *The book titled "IQ and the Wealth of Nations".*

differences in wealth[1]. *Wealth condensation* is a theoretical process by which, in certain conditions, newly-created wealth tends to become concentrated in the possession of already-wealthy individuals or entities. This is reflected in the common saying *'the rich get richer and the poor get poorer'* . According to this theory, those who already hold wealth have the means to invest in new sources for creating wealth or to otherwise leverage the accumulation of wealth, becoming the beneficiaries of the new wealth. Over time, wealth condensation can significantly contribute to the persistence of inequality within society[2].

EFFECTS OF INEQUALITY

Just as the coin has two sides, the issue of inequality can also be examined with respect to negative and positive aspects and let us first examine the negative side of a high degree of inequality.

1. ***INEQUALITY REDUCES SOCIAL COHESION***

Researcher has shown a clear link between income inequality and social cohesion. In a more equal societies, people are much more likely to

---

[1] For more information log on 'race and intelligence, sex and intelligence'
[2] Main article: Wealth concentration log on 'downloadable international distribution of income 1960 – 1987'.

trust each other, measures of social capital suggest greater community involvement, and homicide rates are consistently lower. One of the earliest writers to note the link between economic equality and social cohesion was Alexis de Tocqueville in his *Democracy in America*[1].

There is a clear evidence that the more equal in the society the higher is the supply of social capital. The diagram of annexure 6.A depicts the correlation between equality and social capital in 50 states of United states[2]

In a 2002 paper, Eric Uslaner and Mitchell Brown showed that there is a high correlation between the amount of trust in society and the amount of income equality. They did this by comparing results from the question "would others take advantage of you if they got the chance?" in U.S General Social Survey and others with statistics on income inequality. Robert Putnam, professor of Political science at Harvard, established links between social capital and economic inequality. His most important studies established these links in both the United States and Italy[3]. In a society charactarised by equitable distribution of income, there is often a corresponding enrichment of social capital and social security.

---

[1] Alexis de Tocqueville, Democracy in Amarica(1831)
[2] Main article: Wealth concentration log on 'downloadable international distribution of income 1960 – 1987'.
[3] Putnam, Leonardi, and Nanetti (1993), Putnam (2000)

2. *INEQUALITY INCREASES CRIME RATES*

In addition to effecting levels of trust and civic engagement, inequality in society has also have found to be highly correlated with crime rates. Most studies looking into the relationship between crime and inequality have concentrated on homicides - since homicides are almost identically defined across all nations and jurisdictions. There have been over fifty studies showing tendencies for violence to be more common in societies where income differences are larger. Research has been conducted comparing developed countries with less developed countries, as well as cross – section population within countries. It was found that among U.S States and Canadian Provinces there is a ten-fold difference in homicide rates related to inequality. They estimated that about half of all variations in homicide rates can be accounted for by differences in the amount of inequality in each province or state (Daly, et al. 2001). Fajnzylber, et al. (2002) found a similar relationship worldwide. From the study of growing income inequality some scholar hypothesized that there is a high degree of correlation between inequality and the rate of homocide and I quote:

"The most consistent finding in cross-national research on homicides has been that of a positive association between income inequality and homicides."(Neapolitan 1999 pp 260)

"Economic inequality is positively and significantly related to rates of homicide despite an extensive list of conceptually relevant controls. The fact that this relationship is found with the most recent data and using a different measure of economic inequality from previous research, suggests that the finding is very robust."

(Lee and Bankston 1999 pp 50)

2 *INEQUALITY AND SOCIAL HEALTH*

Recently there has been increasing interest from epidemiologists on the subject of economic inequality and its relation to the health of population. There is a very robust correlation between socioeconomic status and health. This correlation suggests that it is not only the poor who tend to be sick when everyone else is healthy, but that there is a continuous gradient, from the top to the bottom of the socioeconomic ladder, relating status to health. This phenomenon is often called the "SES Gradient". Lower socioeconomic status has been found to have a close link with chronic stress, heart disease, ulcers, type 2 diabetes, rheumatoid arthritis, certain types of cancer, and premature aging.

Despite the reality of the SES Gradient, there is debate as to its cause. A number of researchers see a definite link between economic status and mortality due to the differences of wealth possesion, but they find little correlation due to social status differences[1]. Other researchers such as Richard Wilkinson, J. Lynch, and G.A. Kaplan have found that socio-economic status strongly affects health even when controlling for economic resources and access to health care. The most well known study which established a definite link between social status with health is a studies conducted by Whitehall on civil servants in London. The studies found that, despite the fact that all civil servants in England have the same access to health care, there was a strong correlation between social status and health. The studies found that this relationship stayed strong even when controlling for health-affecting habits such as exercise, smoking and drinking. Furthermore, it has been noted that no amount of medical attention will help decrease the likelihood of someone getting type 2 diabetes or rheumatoid arthritis - yet both are more common among populations with lower socioeconomic status.

Inequality does not only affect the health of human populations. David H. Abbott at the Wisconsin National Primate Research Center found

[1] A. Leigh, C. Jencks, A. Clarkwest - see also Russell Sage working papers.

that among many primate species, less egalitarian social structures correlated with higher levels of stress hormones among socially subordinate individuals.

The most probable sequel to health effect of income inequality is reduction in longevity. Reducing inequality can increase life expectancy. Diagram in the annexure 6.B suggests that there is an association between GDP/capita (horizontal axis) and life expectancy (vertical axis). Differences in GDP per person indicate inequality between nations. So this graph shows how people in poor countries have shorter lives than people in rich countries. In reality, inequality within each country will exacerbate these differences. Poor people in poor countries live even shorter lives than the average for their country[1].

The factors like better health care, higher income, better provision of water and sanitation condition, etc could provide a positive causal link between GDP/capita and life expectancy. But this is not the complete story. There is a substantial variation around a line that best fits these points.

At similar levels of GDP/capita, people in some countries live much longer than the norm and people in others live much less than the norm.

[1] http://ucatlas.ucsc.edu/glossary.html#life.

China and Sri Lanka are in the first group, living longer than the norm. Brazil and South Africa, Saudi Arabia and Barbados, are in the second, with shorter lives than the norm.

In the low-income but high well-being countries, public action, often but not exclusively by governments, can reduce material inequalities. Examples of such action would include land redistribution, health care provision for the poor, subsidised food provision, livelihood support and progressive taxation. In the graph of annexure 6.B, China and Sri Lanka are examples where public action enabled high life expectancy despite low GDP/capita. Other examples include Cuba, and the Indian state of Kerala (Sen 1993; Dreze and Sen 1989)

South Africa, Saudi Arabia and Brazil have high levels of income inequality, and governments that have been chronically unresponsive to the needs of the poor. These two deficiencies are often reflected in low life expectancy relative to the GDP/capita of the country. Lack of income in the hands of the poor means they are unable to purchase medical care and other basic needs. Lack of government action to facilitate provision of livelihoods, food, health care, and other needs, also lowers life expectancy among the poor.

3. DISTRIBUTIVE EFFICIENCY

Income inequality is thought to reduce distributive efficiency within society. That is to say, inequality reduces the sum total of personal utility because of the decreasing marginal utility of wealth. For example, a house may provide less utility to a single millionaire as a summer home than it would to a homeless family. The marginal utility of wealth is lowest among the richest. In other words, an additional dollar spent by a poor person will go to things providing a great deal of utility to that person, such as basic necessities like food, water, and healthcare; meanwhile, an additional dollar spent by a much richer person will most likely go to things providing relatively less utility to that person, such as luxury items. From this standpoint, for any given amount of wealth in society, a society with more equality will have higher aggregate utility. Some studies have found evidence for this theory, noting that in societies where inequality is lower, population satisfaction and happiness tend to be higher[1].

4. *INEQUALITY IS AN ECONOMIC INCENTIVES*

Now one side of the coin is examined and let us turn the other side of the very same coin.

---

[1] Layard (2003); Blanchard and Oswald (2000, 2003)

Many people, especially after the downfall of former Soviet Republic, believe that income inequality provides an incentive for competition and innovation within an economy. It is also believed that a functioning economy requires a certain level of unemployment. These are some points supporting income inequality as an economic incentive. Income inequality

1. encourages labour force to improve their education & skills – better rewards as incentive;
2. encourages workers to work longer hours – higher incomes and so higher economic growth;
3. encourages entrepreneurs to accept more risks – vital to increase productive capacity.

The validity of this point have been rightly proved by the work of –

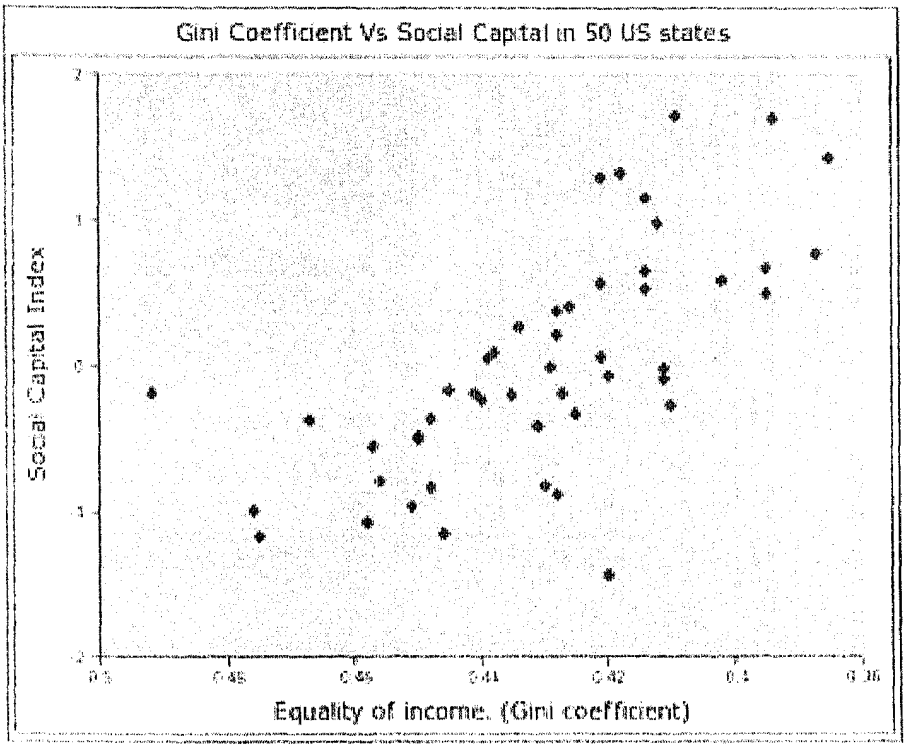
(a) Papanek and Kyn (1985) using the cross section data of 83 countries, concluded that "rapid growth in a mixed economy is quite consistent with unchanged, or even improved, income distribution even at early stages of development."

(b) Annand and Kanbur (1993) have tested the robustness of Ahluwalia's estimates (which confirm Kutznet's U-hypothesis) with respect to variations in the functional form and data set. Their study

displayed a reversal of the commonly accepted inverted U hypothesis.

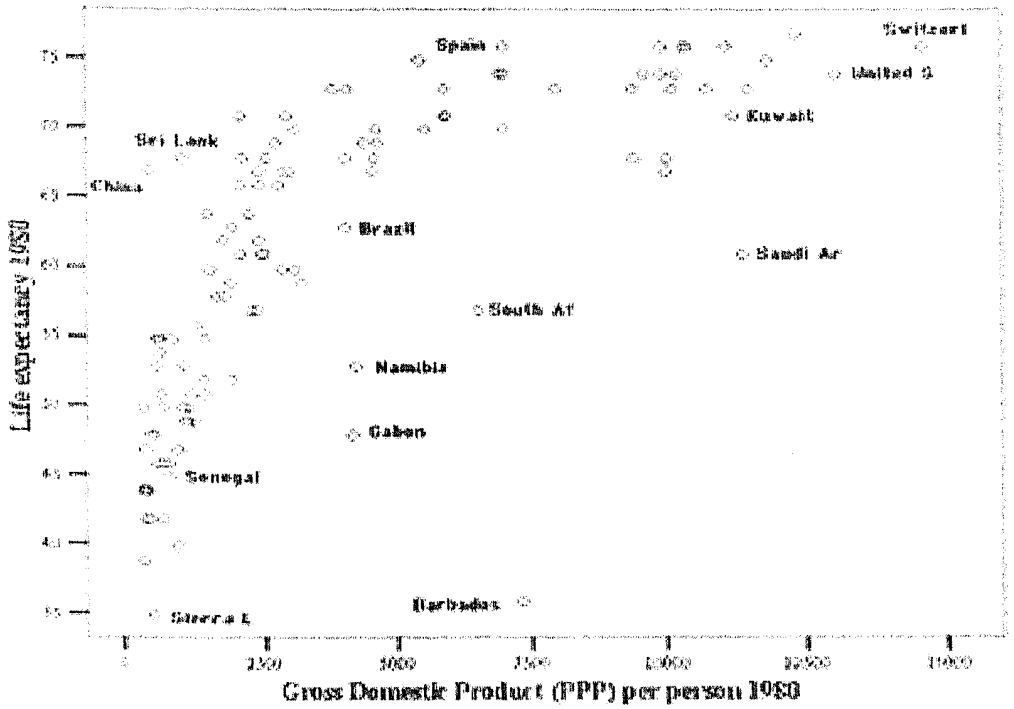
(c) Li and Zhou (1998) and Forbes (2000) find a positive relationship between income inequality and economic growth.

Annexure 6.A
(Correlation between equality and social capital in 50 states of United states)



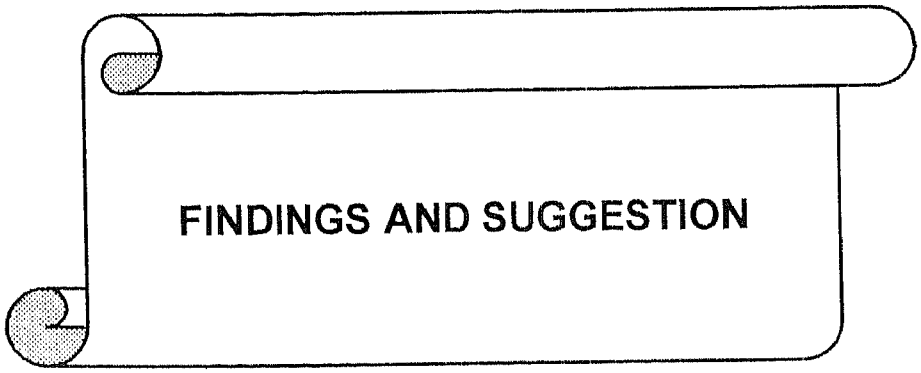
Source: Main article of Wealth concentration log on 'downloadable international distribution of income 1960 – 1987'.

Annexure 6.B
(Association between GDP/Capita (horizontal axis)
and life expectancy (vertical axis).



Source: http://ucatlas.ucsc.edu/glossary.html≠life.

CHAPTER – 7



FINDINGS AND SUGGESTION

The present study is conducted with the use of cross – section data collected through our field surveys. It has been specified that the scope of this study is the estimation of income inequality and to attempt at finding the most appropriate method for estimating income distribution for the state of Mizoram. An indepth study of theoretical literature has enabled us to draw empirical result which emerge from our field work. One must aware of the special problem pertaining to the tribal community of the North East India because of their limited exposure to monetarized economy. They are not in a habit of keeping accounts and they cannot always answer the question of income, saving, investment or expenditure. On account of this, we face a rather baffling problem in compiling our data. The main findings are as presented below:

i) The primary sector contributes 18.52%, secondary sector 19.01%, tertiary sector 59.22% and others – 3.25% respectively of the total income of sampled households during the survey year 2006.

ii) We divide the population into two groups in such a manner that all income units having an income less than the population mean are in the first group and those other income units having more than

population mean are in the second group. Out of the total sampled households, there are 169 (i.e. 66.02%) and 87(i.e.33.98%) households in the first and second group with their mean income of Rs 6,878.69p and Rs 32,737.99p respectively. Again, there are 1,040 (i.e.65.86%) and 539 (i.e. 34.14%) persons with mean income of Rs 1,164.15p and Rs 5,194.78p respectively in the first and second group of the population.

iii) In order to bring about equal distribution of income between the two income classes, it would be required to transfer 37.03% of the total income of the higher income group to the lower group. A numerical calculation from our data showed that the total amount of income that must be parceled out for achieving absolute equality is Rs 10,54,691/-

iv) The length of Robin Hood index in 2006 is 0.3504, which incidentally represents the longest distance between the egalitarian line and Lorenz curve.

v) The distribution of income giving the percentage and decile share of the sampled households is given in the following table No. 7.1.

TABLE NO.7.1
(Distribution of income in Mizoram)

INCOME RECIPIENT	SHARE %	DECILES	DECILE'S SHARE %
Bottom 10%	0.821	First 10%	0.82
Bottom 20%	2.577	Second 10%	1.76
Bottom 30%	4.959	Third 10%	2.38
Bottom 40%	8.540	Fourth 10%	3.58
Bottom 50%	13.571	Fifth 10%	5.03
Bottom 60%	20.678	Sixth 10%	7.11
Bottom 70%	29.764	Seventh 10%	9.09
Bottom 80%	42.378	Eighth 10%	12.61
Top 20%	57.622	Ninth 10%	16.67
Top 10%	41.217	Top 10 %	41.22
Top 5%	27.284	Total	100.26

Source: Our own sample survey.

vi) The percentage share by each group of income y and the percentage of persons receiving income x is linked by cubic model of the form

$Y = -5.3015 + 0.7468x - 0.18x^2 + 0.0002x^3$, with R – square being 99%. All the coefficients are statistically significant.

vii) The 1981 Gini coefficient of Mizoram is 10.11. The Gini coefficient of size income in 2006 stood at 31.27. This finding confirms our third

hypothesis. Undoubtedly, income Gini coefficient was exponentially increasing at an alarming rate.

The income share of the bottom 10%, 40% and top 10% for Mizoram (rural) for the year 1980-81 are 2.96%, 25% and 20.06% respectively. Income distribution become deteriorating rapidly and the corresponding income shares became 0.821%, 8.54% and 41.217% in 2006. This is a sharp warning bell for authorities to take immediate measure to check economic concentration into the elite groups only.

viii) The calculation from our sample data showed that mean income is Rs 2540.03p, median income Rs 1790.51 and modal income Rs 1,524.41p. The Bowley's coefficient of skewness is 0.5 while Karl Pearson's coefficient is 0.26. Our first hypothesis, which postulates that the income distribution in Mizoram is positively skewed, has been proved to be correct at 95% level of confidence. The first, second and third quartile income are Rs 732.0, Rs 1790.51p and Rs 3603.30p respectively with standard deviation of Rs 4470.25p.

ix) The Lorenz curve fitted for Mizoram in the year 2006 is depicted in chapter 5 (page No 10). The Gini coefficient (polygon) and other measures of income inequality, which have close link with Lorenz

curve are summarised in the table No 7.2. There are three methods popularly used for obtaining Gini coefficient viz, Gini Polygon method, Pyatt, et al method and Milanovic method of calculation. Pyatt, et al and Milanovic methods gave a substantially higher value of Gini coefficient, may be due to the fact that they are based on the rank of income and not on the actual value of individual income. Bowley's method is based only on the observed values of the middle 75% of the observations leaving out the extreme values on both ends. The advantage of this is that it is free from effects of outliers and extreme values which may distort the result of statistical analysis. But in the less developed countries, without those extreme values, the real picture of inequality may not be seen at all.

x) As seen in the following table No. 7.2, Mizoram Gini coefficient is 31.27, which is statistically lower than all India Gini co-efficient of 37.8. This confirms the validity of the second hypothesis. There is more equitable distribution of income in Mizoram than in the whole country on average. In terms of an increase in inequality index, relative mean deviation records the highest while Elteto-Frigye's measures records the lowest.

Table No.7. 2

(Calculated value of indices based on Lorenz curve)

	INDICES BASED ON LORENZE CURVE				
Sl No	Measures	Income unit	1981	2006	ncrease %
1	Gini polygon	Mizoram	10.11	31.27	NA
2	Pyatt et al	Mizoram	NA	35.75	NA
3	Milanovic	Mizoram	NA	36.02	NA
4	RMD	Individual	0.1516	0.350	131.10
		Family	NA	0.370	NA
5	Bowley's	Individual	0.2877	0.577	100.87
		Family	NA	0.636	NA
6	:Ilteto -Frigyes	Individual - u'	0.301	0.542	80.066
		Individual - v'	0.465	0.776	66.882
		Individual -w'	0.234	0.511	118.376
		Family - u'	NA	0.561	NA
		Family - v'	NA	0.79	NA
		Family - w'	NA	0.522	NA

Source: Our own survey and estimate.

xi) Those measures that do not relate to Lorenz curve are summarised in table No. 7.3.

TABLE NO.7. 3
(Calculated value of indices not based on Lorenz curve)

	INDICES NOT BASED ON LORENZ CURVE				
Sl. No	Measures	Income Unit	1981	2006	Increase %
1	Range	Family	NA	9.478	
		Individual	1.777	16.280	816.151
2	S.D.	Family	NA	18489.15	
		Individual	220.801	3431.236	1453.995
3	V(Log Y)	Family	NA	0.193	
		Individual	0.037	0.234	525.252
4	V'(Log Y)	Family	NA	0.240	
		Individual	0.117	0.267	128.696
5	S.D of Log Y	Family	NA	0.490	
		Individual	0.194	0.484	150.029
6	C.V.	Family	NA	1.180	
		Individual	0.430	1.351	213.886
7	Theil's	Family	NA	0.204	
		Individual	0.038	0.263	599.201

In terms of percentage increase in inequality, standard deviation measure records the highest percentage while that of V'(Log Y) records the lowest. Range is an absolute measure for it was based on the extreme and mean value only, leaving all other values, so that range is not suitable for measuring the actual income disparity.

All measures based on Logarithm are sensitive to even a small transfer of income from rich to the poor and insensitive to the opposite transfer of income. Among the statistic, standard deviation is useful for further statistical analysis as it facilitates employment of various statistical test of significance.

xii) From the results of curve fitting and the properties of various distributions that we used to fit Mizoram data, lognormal distribution is identified and selected as most suitable distribution for graduating size income distribution for the survey year and the fitted form is –

$$f(x) = \frac{1}{\sqrt{2\pi}(1.126374)} e^{-\frac{1}{2(1.126374)^2}(Logx-7.421242)^2}$$

On the other hand, when the total family income is taken as income unit the fitted form of lognormal distribution is -

$$f(x) = \frac{1}{\sqrt{2\pi}(1.013)} e^{-\frac{1}{2(1.013)^2}(Logx-9.1647)^2}$$

xv) If mean income of the villages/Localities is taken as income unit, there are three distributions that fit well Mizoram data namely, 1)

xiii) Lognormal Distribution with μ = 7.6258 and σ = 0.624876, 2) Wald/Inverse Guassian Distribution with μ = 2533.339 and σ =

5262.443 and, 3) Exponential Distribution with θ = 585.05 and λ = 1948.289. If we take family income as income unit, only 2 distributions fits well Mizoram data, viz, 1) Lognormal Distribution with μ = 9.1647 and σ = 1.013 and 2) Exponential Distribution with θ= 800 and λ = 14866.816. Finally, When the 'monthly income per capita (total family income divided by total family members)' is taken as income unit, only Lognormal distribution fits well with μ = 9.164 and σ= 1.01271

SUGGESTION

In regard to measurement of income growth, it is desirable to introduce a method of measurement, which would take into account the growth rate of per capita income of all sections of the people, so that the new measure will reflect the change of the ***human face*** of the poor people. To justify it let us take a simple example. Suppose there are only 2 people in Mizoram - the first earns Rs.100 and the other nothing. So, the total SDP is Rs.100. Next year, suppose the first one saw his income increase to Rs.120, the other saw no growth. So the total SDP is Rs.120, with 20% growth. Despite the impressive growth, only the first person with positive income got the benefit and the other with zero income got no benefit and

this aspect of individual welfare gain is not reflected by this method of measurement. To be more specific, by April 1, 2005 Mr. 'A' earns Rs 15,947/- per month, while his brother – earns Rs 100 per day. By 2009 March, Mr. 'A"s salary increase to Rs 23,751/- (with a growth rate of 48.95%) while his brother is not entitled to annual increment, dearness allowances, dearness pay, etc and earn Rs 120/- per day, ie, an increase of only 20%. This is the real situation. I have visited many places for my research work to witness the extend of economic inequality in rural and urban areas in Mizoram. In rural areas, the people still follow much of their old traditional lifestyle and are indeed extremely poor, they can enjoy a meat only twice/thrice throughout the year, which an ordinary person in Aizawl can afford to buy every weekend. They attend church service with naked leg, with worn, torn and ten years old shirt. Not even to speak of television, sofa set, etc, they go out in the forest to fill their empty stomach. On the other hand, in Aizawl, if you check the wallet of some school children, you may be surprised to see Rs 1000/1500 or more given by their parents as their pocket money, which some families in the rural poor never see in their whole lifetime. This is the real situation. This is to cite an example that unless some measure is taken to reduce income inequality, higher growth mathematically just means higher growth for the upper layer

or wealthiest group of the people. This type of problem was recognized by Montek Singh Alhuwalia, Dy. Chairman, Planning Commission. Ahluwalia's solution, the Alhuwalia - Chenery Welfare Index, was an alternative measure of income growth, one that gave equal weight to growth of all sections of society[1].

It is desired that the success of development policy have to reflect the fruit of the benefit in each and every human face of the country, especially the weaker section. A development policy that was only reflected in the face of the rich is not at all capable to reduce economic imbalances but only deepens the problem.

Since the solution given by Ahluwalia's solution, the Alhuwalia - Chenery Welfare Index, attached equal weightage i.e. arithmetic mean, to all the quintile of the people it does not reflect the facial appearance of the economically weaker and poorer section of the country. Their measure is bound to generate an overestimated growth rate since the high growth rate of the upper quintile always outweighs all the others. So this measure is of no use for measuring how equitable is the benefit accruing to all sections of the people.

---

[1] Tarun Jain, Univ. of Virginia, India together, Thu 12 Apr 2007,

By considering the income growth as a moving particle of law of inertia, due to Isaac Newton, it is very appropriate to employ another average that will rightly reflect the real performance of economic growth at the grass root level. For the new measure/solution, I believe that using of Geometric mean or Harmonic mean would be more appropriate and appealing than arithmetic mean. However, Geometric mean has some limitation[2] for measuring growth rate and hence Harmonic mean is being suggested to serve the purpose which is defined as -

$$HM = \frac{1}{\frac{1}{n}\sum_{i=1}^{n}\frac{1}{r_i}},$$ i = 1, 2,...5, for quintile, i = 1,2,....10, for deciles, r is the growth rate of income for i^{th} or j^{th} income group.

The advantage of this new measure has been reinforced by its lemmas as presented below.

Lemma 1: It takes into account the growth rate of the weaker section of the people by giving more weightage to them.

Lemma 2: It reflects how the new economic/developmental pie was distributed among various quintiles.

---

[2] Geometric mean fails to operate if any one of the observations is either zero or negative.

Lemma 3: It also reflects how effective it is the performance of poverty alleviation programme.

Lemma 4: It will be very sensitive to transfer of income at lower levels, which makes it particularly applicable to problems in measuring the intensity of poverty.

Lemma 5: It reflects how the 'trickle down effect' works in the economy

In short, the introduction of this specific design will measure whether the economic developmental pie really reaches the rice bowl of the poor or not and for the rich people development may mean a mere enhancement of living standard while it is a basic necessity of life for the poor. This proposed measure may be named "***Human face growth index***" while measuring a rise in GDP/SDP/per capita income. However, we are of the view that it will be most suited to the measurement of 'rise in per capita income'

As an illustration, a simple comparison between the ordinary method, Ahluwalia - Chenery Welfare Index and human face growth index using Mizoram data during the period from 1981 to 2006 is given in the following table No. 7.4.

From table No. 7.4, it appears that Ahluwalia - Chenery Welfare Index appears to overestimate while '***Human Face growth index***' appears

to underestimate as compared to Ordinary Index. But Human Face growth index seems most appropriate to measure the real effective income growth for underdeveloped countries/economy.

Table No.7.4

Increase in income by quintiles from 1981 to 2006

(Prices are in their current year prices)

Sl. No	Quintiles	Average income in		Growth rate per year
		1981	2006	
1	Bottom 20%	230.36	374.40	2.51
2	Next 20 %	357.53	913.26	6.22
3	Middle 20 %	468.25	1835.11	11.68
4	Next 20 %	542.02	3008.31	18.20
5	Top 20 %	745.75	9364.43	46.23
6	Overall	513.00	2540.03	15.81
Income growth rates as generated by 3 measures				
Ordinary measure/index				15.81
Ahluwalia - Chenery Welfare Index				16.96
Human face growth index				6.91

****

to underestimate as compared to Ordinary Index. But Human Face growth index seems most appropriate to measure the real effective income growth for underdeveloped countries/economy.

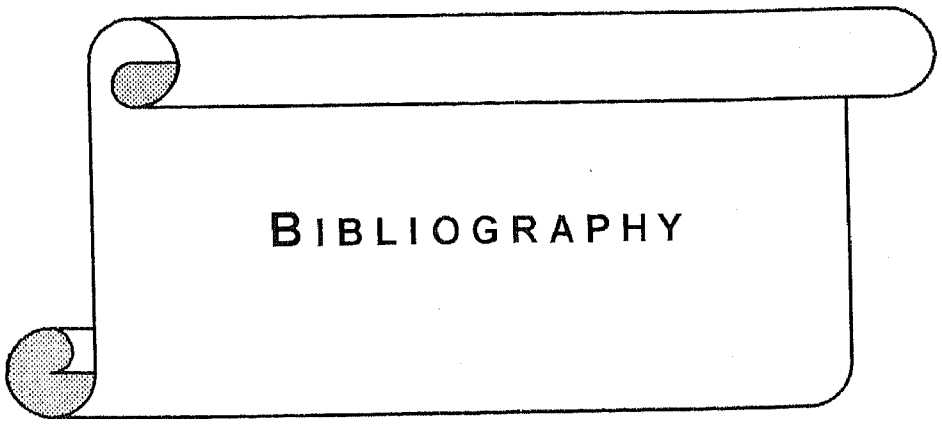
Table No.7.4

Increase in income by quintiles from 1981 to 2006

(Prices are in their current year prices)

Sl. No	Quintiles	Average income in		Growth rate per year
		1981	2006	
1	Bottom 20%	230.36	374.40	2.51
2	Next 20 %	357.53	913.26	6.22
3	Middle 20 %	468.25	1835.11	11.68
4	Next 20 %	542.02	3008.31	18.20
5	Top 20 %	745.75	9364.43	46.23
6	Overall	513.00	2540.03	15.81
Income growth rates as generated by 3 measures				
Ordinary measure/index				15.81
Ahluwalia - Chenery Welfare Index				16.96
Human face growth index				6.91

****


BIBLIOGRAPHY

Adams, FG(1958) "*The Sizes of individual income : Socio Economic Variables and Chance variation*" Review of Economics and statistics, Vol XL. p.390-98

Adelman, I (1963) *"An Analysis of Population"*, American Economic Review, No.53: pp.315-339, (May).

Adelman, I (1975) *"Growth of Income Distribution and Equity oriented Development Strategies"* World Development, No.3, pp.67-76 (February-March).

Adelman, I, (1974), "*An Anatomy of Income Distribution Patterns in Developing Nations: A Summary of Findings*", IBRD Staff Working Paper No.116. 1971

Adelman, I, (1992) "*What is the Evidence on Income inequality and Development?*" in I. Becher and D.J. Savoie (eds.), Essays in Honor of Benjamin Higgins, McGill-Queens University Press, pp.121-146.

Adelman, I and C.T Morris (1973), "*Economic Growth and Social Equity in Development Countries*", Stanford, Stanford University Press.

Adelman, I and C.T. Morris ad S. Robinson (1976) *"Policies for Equitable Growth"*, World Development, No.4(7), pp.561-582.

Adelman, I, and C. Morris. (1971). "*An Anatomy of Patterns of Income Distribution in Developing Nations.*" Part III of the final report (Grant AID/Csd-2236). Evanston, Ill: Northwestern University

Adelman, Irma and Nobuhiko Fuwa (1992), "*Income Inequality and Development During the 1980s*", Indian Economic Review, Special Number, pp.329-345.

Aghion P., Bolton P.(1997), " *A Theory of Trickle-Down Growth and Development*", Review of Economic Studies, No.64:pp.151-172.

Ahluwalia Montek S (1974) *"Inequality, Poverty and Development"*, Journal Development Economics, No.3, pp.307-342.1976b.

Ahluwalia, M.S (1974) "Income Inequality: Some Dimensions of the Problem." In H. Chenery and others, Redistribution with Growth. London: Oxford University Press.

Ahluwalia, M.S. (1976) "Income Distribution and Development: Some Stylized Facts." Papers and Proceedings of the American Economic Association, December 28-30, 1975, Dallas, Texas.

Ahluwalia, M.S. and H.B. Chenery (1974) *"A model of Distribution and Growth"* In H.B. Chenery, et. al., (eds) Redistribution with Growth, London: Oxford University Press, pp.209-235.

Ahluwalia, Montek S,(1976a) *"Income Distribution and Development : Some Stylized Facts"*, American Economic Review, papers and Proceedings, No.66(2), pp.128-135.

Ahluwalia Montek S.(1976b), "*Inequality, Poverty and Development*", Journal Development Economics, No.3, pp.307-342.

Ahuja, B.N. : *"Dictionary of Economics"*, New Delhi : Academic (India) Publishers

Aigner, D.J. and A.J. Heins (1967), "*On the Determinants of Income Equality*", American Economic Review, 51:pp.175-184 (March).

Aigner, D.J, and A.S. Goldberger.(1970) *"Estimation of Pareto's Law from Grouped Observations."* Journal of the American Statistical Association, Vol.65, pp.712-23.

Aigner, D.J., and A.J.Heins (1967). *"A Social Welfare View of the Measurement of Income Equality".* Review of Income and Wealth, vol.13, pp.12-25

Aitchison, J and JAC Brown (1957) *"The lognormal distribution"* Cambridge University Press, Cambridge.

Aitchison, J., and J.A.C.Brown. (1954) *"On Criteria for Description of Income Distribution"* Economica, vol.6, pp.88-107.

Aitken, A.C(1934) *"On Least-Squares and Linear Combination of Observations."* Proceedings of the Royal Society of Edinburgh, vol.55, pp.42-48

Alesina A., Alberto and Dani Rodrik (1994), *"Distributive Politics ad Economic Growth"*, Quarterly Journal of Economic Growth, No.1: pp.189-211

Allen, R.G.D., and A,. L. Bowley. (1935) *Family Expenditure.* London: Staples. Allingham, M.G. 1972. *"The Measurement of Inequality."* Journal of Economic Theory vol.5, pp.163-69

Allingham, M.G., and A.Sandmo(1972)*"Income Tax Evasion: A Theoretical Analysis."* Journal of Public Economics, vol.1, pp.323-38.

Allingham, M.G (1972) *"The Measurement of Inequality."* Journal of Economic Theory, vol.5,pp.163-69.

Anand, S.(1973) *"The Size Distribution of Income in Malaysia."* Part-I Washington, D.C.: Development Research Center, World Bank.

Anand, Sudhir and S.M.R. Kanbur (1984), "*Inequality and Development: A Reconsideration*", in H.P. Nissen (ed.), Towards Income Distribution Policies, EADI Book Series 3, Tilburg, Netherlands, pp.131-167.

Anand, Sudhir (1983) "*Inequality and Poverty in Malaysia: Measurement and Decomposition*", New York: Oxford University Press.

Anand, Sudhir and S.M.R. Kanbur,(1993) "*The Kutznet's Process and the Inequality-Development Relationship*", Journal of Development Economics, No.40(1), pp.25-52 (February).and Statistics vol.54,pp,306-16

Asian Development Bank,(1984) "*Income Distribution and Poverty in Selected Asian Countries*", Asian Development Bank Staff Paper No.22.

Atkinson A.B.(1975) "*The Economics of Inequality*" Oxford University Press,

Atkinson, A.B. (1970), "*On the Measurement of Inequality*", Journal of Economic Theory, No.2: pp.244-63(September).

Atkinson, A.B. (Ed.)(1973)" *Wealth, Income and Inequality*", Penguin London,

Atkinson, A.B. (1973). "How Progressive should Income Tax Be?" In Essays on Modern Economics. Edited by M.Parkin. London. Longman Group Ltd.

Banerjee, V.Abhijit and Esther Duflo (2000), "*A Reassessment of the Relationship Between Inequality and Growth*": Comment, Mimeo, MIT, Department of Economics (December).

Bardhan, P.K. (1970), "*The Pattern of Income Distribution in India: A Review*", in T.N. Srinivasan and P.K. Bardhan (eds.) Poverty and Income Distribution in India, pp.103-137, Calcutta: Statistical Publishing Society.

Barro, Robert,(1991) "*Economic Growth in a Cross Section of Countries*". Quarterly Journal of Economics, No.CVI, pp.407-443.

Beckerman. W. (1966) International Comparision of Real Incomes. Paris: Organization for Economic Cooperation and Development. Processed

Bentzel, R.(1970) "*The Social Significance of Income Distribution Statistics.*" Review of Income and Wealth, series 16, no. 3 (September), pp.253-64.

Bhatty, I.Z.(1974), "*Inequality and Poverty in Rural India*", in Sankhya, Series C, Vol.36, also see in Poverty and Income Distribution in India, (Ed.), T.N. Srinivasan and P.K. Bardhan Statistical Publishing Society, Calcutta 1974.

Bowley, A.L. (1937) "*Elements of Statistics*". New York: P.S. King and Company

Bowman, M.J. (1945). "*A Graphical Analysis of Personal Income Distribution in the United States.* "American Economic Review, vol.35, pp. 607-28.

Brahmananda, PR and VR Panchamukhi (eds),(1987) "*The Development Process of the Indian Economy*", Bombay: Himalaya Publishing House,

Bronfenbrenner, M. (1971) "*Income Distribution Theory.*" Chicago: Aldine-Atherton.

Champernowne, D.G. (1952). "*The Graduation of Income Distributions*" Econometrica, vol.20, pp,

Champernowne, D.G. (1956). "*Discussion on Paper*" by Hart and Prais. Journal of the Royal Statistical Society, part II, vol.119, pp.181-83

Champernowne, D.G. (1973). *Distribution of Income between persons*. Cambridge, England: Cambridge University Press.

Champernowne, D.G. (1974) "*A Comparision of Measures of Inequality of Income Distribution*" Economic Journal, vol.84, pp 787-816

Champernowne, DG (1953) "*A model of income distribution*" Econometrica Journal, Vol LXIII.

Chaubey, P.K,(1996) "*Economic Inequality: Theory of Measurement*", Indian Economic Association Trust for Research and Development, New Delhi

Chenery, H.B and M.Syrquin (1975) *"Patterns of Development, 1950-1970."* London: Oxford University Press.

Chenery, H.B. and others, (1974) *"Redistribution with Growth"* London: Oxford University Press

Chipman, J.S. (1974). "*The Welfare Ranking of Pareto Distribution*" Journal of Economic Theory, vol.9 pp.275-82

Chiswick, B.R. (1968). "*The Average Level of Schooling and the Interregional Inequality of Income: A clarification* " American Economic Review, vol.58, pp.495-501

Chiswick, B.R. (1974) "*Income Inequality: Regional Analysis with a Human-Capital Framework*". New York: National Bureau of Economic Research

Chiswick, Barry (1971), "*Earnings Inequality, Human Capital Accumulation and Economic Performance*", The Economic Journal, Vol.108 (446):pp.44-59.

Cline, W.R (1975) *"Distribution and Development*", Journal of Development of Economic, No.1, pp.359-402.

Cowell, Frank A. (1995) *"Measuring Inequality'*, Prentice Hall (LSE Handbook in Economic Series).

Dalton, H.(1920) *"The Measurement of the Inequality of Incomes*", Economic Journal, No.30, pp, 348-361.

Dalton,H, and Frederick A. Praeger.(1955) "*Principles of Public Finance*". New York

Dantwala, M.L (1973) " *Poverty and Unemployment in Rural India (Unpublished)"* Report of the Study conducted with the Assistance of the International Development Research Centre, Ottawa, Canada.

Dantwala, M.L. (1973) *"Poverty in India, Then and Now: 1870-1970"*, The Macmillan Company of India Ltd. New Delhi,

Das Gupta, P., A.K. Sen, and D.Starr*ett. (1973) "Notes on the Measurement of Inequality.*" Journal of Economic Theory, vol.6 pp 180-87

De Wolff, P., and A.R.D. Van Slijpe. (1972). "*The Relation between Income, Intelligence, Education and Social Background*". Institute of Actuarial Science and Econometrics, University of Amsterdam.

Deininger, Klause and Lyn Squire (1998), "*New Ways of Looking at Old Issues; Inequality and Growth*", Journal of Development Economics, Vol.57, pp.259-287.

Dollar, David and Aart Kray, (2000) "*Growth is Good for the Poor,*" Mimeo, World Bank Development Research Group.

Dreze, Jean and P.V. Srinivasan (2000), "*Poverty and Inequality in India: Evidence from Regional Data*", Journal of Quantitative Economics, Vo.16, No.1(January).

Dutta, Bhaskar,(1978.) *"On the Measurement of Poverty in Rural India*", Indian Economic Review (New Series), Vol.13, No.1,

Elteto, O., and E. Frigyes. (1968). "*New Inequality. Measures as Efficient Tools for Casual Analysis and Planning.*" Econometrica, vol.36,pp.383-96,

Fair, R.C. (1971). "*The Optimal Distribution of Income.*" Quarterly Journal of Economics, vol.85, pp,551-79

Felix, Paukert, Jiri, Sholka and Jef, Manton,(1980) "*Income Distribution by Size, Structure of the Economy and Employment: A Comparative Study of Four Asian Countries*", Industry and Development, No.5, New York,

Feller, W. (1966) "*Introduction to Probability Theory and Its Applications*", vol.11. New York: John Wiley.

Fields, G.S. (1980), "*Poverty, Inequality and Development*", New York: Cambridge University Press.

Fields, G.S. and G.H.. Jakubson (1994), *"New Evidence on the Kuznets Curve"*, Manuscript, Cornell University.

Fields, G.S.(1986) "*Measurement of Inequality Change in an Economy with Income Growth*", 8th World Economic Congress, New Delhi (December).

Fields, G.S., and John C.H. Fei. (1974) "*On Inequality Comparisons*" Economic Growth Center, Yale University, discussion paper No.202

Fishlow, A.(1972). "*Brazilian Size Distribution of Income.*" American Economic Review, vol.62, pp.391-

Fishlow, Albert (1996), "*Inequality, Poverty and Growth: Where Do We Stand?*", in Annual World Bank Conference on Development Economics

Fishlow, Albert, (1972) *"Brazilian Size Distribution of Income,"* American Economic Review, pp.391-402 (May).

Fisk, P.R. (1961b) "*The Graduation of Income Distributions.*" Econometrica, vol.29,pp 171-85

Foster, James,(1985) "*Inequality Measurement*", in H.P. Young (ed.), Fair Allocation, Providence, RI: American Mathematical Society.

Friedman, F.G. (1962) *"Capitalism and Freedom"*. Chicago: University of Chicago Press

Friedman, M.(1953). "*Choice, Chance and Personal Distribution of Income.*" Journal of Political Economyvol.61, pp.277-90.

Galor O, Zeira J. (1993) "*Income Distribution and Macro Economics*", Review of Economic Studies,No.60 pp.35-52.

Gastwirth, and J.T. Smith. (1972) *"A new goodness of fit test."* Proceedings of the American Statistical Association, pp,320-22.

Gastwirth, J.L. (1971). "*A General Definition of the Lorenz Curve and Gini Index*" Review of Economics

Gastwirth, J.L. (1972) "*The Estimation of the Lorenz Curve and Gini Index.*" Review of Economics and Statistics, vol.54-pp,306-16.

Gramer, H. (1946) "*Mathematical Methods of Statistics*" Princeton, N.J. : Princeton University Press.

Gujarati, D,(1995) "*Basic Econometrics*", Third Edition, Tata McGraw Hill.

Gupta SC and VK Kapoor (1999) "*Fundamental of mathematical statistics* " New Delhi: Sultan chand & sons,

Gupta, P, Dass, Sen, A.K., And Strett, D. (1973), "*Notes on the Measurement of Inequality*", Journal of Economic Theory Vol.6.

Gupta, S.(1977) "*A Model for Income Distribution, Employment and Growth: A case Study of Indonesia*". World Bank Staff Occasional Papers, no.24. Baltimore: John Hopkins University Press

Hagen, E.E. and O. Hawrylyshyn,(1969) "*Analysis of World Income and Growth, 1955-65*", Economic Development and Cultural Change, No.18 (October Supplement).

Harman, H. (1976), "*Modern Factor Analysis*", Third Edition, University of Chicago Press.

Hill TP(1959) "*An analysis of the distribution of wages and salaries in Great Britain*" Econometrica, Vol 27.

Houthakker, H (1959) "*The Pareto Distribution and the Cobb-Douglas production function in activity analysis*" the Review of Economics studies, Vol XXIII

Hunter Wade, Robert "*The Rising Inequality of World Income Distribution,*" Finance and Development Vol. 38, no. 4 (December 2001)

IL you Jong (1998), "*Income Distribution and Growth in East Asia*", East Asian Development Perspective, pp.36-65

Indian Institute of Public Opinion,(1979.) "*The Measurement of Deprivation by Degree of Destination in Indian States 1973-74*", Quarterly Report, Vol.24, No1,

Jain, S. (1975). *Size Distribution of Income: A Compilation of Data.* Baltimore: Johns Hopkins University Press.

Jha, Raghbendra (2000), "*Growth, Inequality and Poverty in India: Spatial and Temporal Characteristics*", Economic and Political Weekly, pp.921-928 (May)

Joshi, JM and Rajendra Joshi,(1994) "*Micro-economic theory, An analytical approach:*, Delhi: Wishwa Prakashan, 5th edition,

Johnson, R. and D. Wichem, (1992) *"Multivariate Statistical Methods"*, Third Edition, Prentice Hall.

Kakwani, N.C. (1974) " *A Note on the Efficient Estimation of the New Measures of Income Inequality.*" Econometrica vol.42, pp.597-600.

Kakwani, N.C. (1976) "*On the Estimation of Income Inequality Measures from Grouped Observations*" Review of Economic studies, vol.43, pp.483-92.

Kakwani, N.C. (1977b) "*On the Estimation of Engel Elasticities form Grouped Observations with Application to Indonesian Data.* "Journal of Econometric, vol.6, pp. 1-17.

Kakwani, N.C. (1977c) *"Applications of Lorenz Curves in Economic Analysis."* Econometrica, vo.45, pp.719-27

Kakwani, N.C. (1977d). "*Measurement of Tax Progressively: An International Comparision.*"Economic Journal, vol.87, pp.71-80.

Kakwani, N.C. (1977e) "*Redistribute Effects of Alternative Negative Income Tax Plans* " Public Finance, vol.32, pp. 77-91.

Kakwani, N.C. (1977f). *"On the Estimation of Consumer Unit Scale*" Review of Economics and Statistics, vol.59, pp.507-10.

Kakwani, N.C.(1977a). *"Measurement of Poverty and Negative Income Tax.*" Australian Economic Papers, vol.17, pp.237-48

Klein, LR (1973) "*An introduction to Econometrics*" Prentice - Hall of India Pvt Ltd, New Delhi

Knell, M. (1998), *"Social Comparision, Inequality and Growth",* Mimeo, University of Zurich, (April).

Kravis, I.B. (1960*) "International Differences in the Distribution of Income",* Review of Economics and Statistics, (November).

Krishnamoorthy, D. (1992) "*Economic Development and Income Distribution: An Empirical Study",* New Delhi: Discovery Publishers.

Kumar, Ashutosh (2003) "*Economic development and income distribution"* Deep and Deep Publications, New Delhi

Kuznets, S, (1966) "*Modern Economic Growth",* New Haven: Yale University Press.

Kuznets, S.,(1956-67) *"Quantitative Aspects of Economic Growth of Nations",* Economic Development and Cultural Change (A Series of 10 articles).

Lindeman, M. and Gold (1980), *"Introduction to Bivariate and Multivariate Analysis"*, Scott Foresman and Company, U.S.A.

Loehr, William and John P. Powelson,(1981) "T*he Economics of Development and Distribution*" New York: Harcourt Brace Jovanovich

Lundberg, M and L. Squire (2001), "*The Simultaneous Evaluation of Growth and Inequality*", the World Bank Mimeo (April).

Lyndall, HF (1959) "*The distribution of Employment income*" Econometrica, Vol 27.

Mal, D.K. (1975) "*Distribution of Income and Wealth during Plans*", Firma KLM Pvt. Ltd.

Mandelbrot, B (1960) *"The Pareto - Levy law and the distribution of income*" International Economic Review,

Meier, G.M. (1977) (ed.), *"Leading Issues in Economic Development"*, London: Oxford University Press.

Milanovic, Branko (1998), "*Explaining the Growth and Inequality During the Transition*", World Bank Policy Research Department

Misra, SK and Puri VK (1995), *"Economics of Development and Planning"*, Bombay: Himalaya Publishing House, sixth edition,

Nagar, AL & RK. Das; *Basic Statistics*, (New Delhi: Oxford University Press, 11th impression-1994)

Nageswara Rao, K (Ed) (2005) "*Poverty in India, Global and Regional dimensions"* (New Delhi: Indian Economic Association

Newbery, D.M.G.,(1970) "*A Theorem on the Measurement of Inequality*", Journal of Economic Theory, Vol..2,

Nissen (ed.), "*Towards Income Distribution Policies*", EADI Book Series 3, Tilburg, Netherlands, pp.131-167

Ojha, P.D.(1970), "*A Configuration of Indian Poverty: Inequality and Levels of Living*", Reserve Bank of India Bulletin, January,

Ojha, P.D., and Bhatt, v.v. (1963) "*Pattern of Income Distribution in India, 1953-54 to 1956-57*", Reserve Bank of India, Bulletin, Vol.17.

Oshima, H. (1962), "*The International Comparision of Size Distribution of Family Income with Special Reference to Asia*", Review of Economics and Statistics (November).

Papanek, G.S. and O. Kyn (1985) "*The effect of Income Distribution on Development, the Growth Rate and Economic Strategy*", Journal of Development Economics, Vol.23, pp.55-56.

Paukert, Felix (1973), "I*ncome Distribution at Different Levels of Development: A Survey of Evidence*", International Labour Review, 108 (2-3), 41, pp.153-71 (Aug-Sept).

Perotti, R.(1992), "*Income Distribution, Politics and Growth*", American Economic Review, AEA Papers and Proceedings, pp 311-316

Persson, T. and Tabellini, G,(1994) *"Is inequality Harmful for Growth*", American Economic Review, No.84(3):pp. 600-621,

Pettinato, Stefano (2001), *"Inequality: Currents and Trends Background"* Paper to the Human Development Report.

Prakash, BA (2004) *"Kerala's Economic Development"* New Delhi, Sage Publication, Second edition,

Raja Raman, Indira,(1975) "*Poverty, Inequality and Economic Growth Rural Punjab 1960-61 to 1970-71*", Journal of Development Studies, Vol.2 No.4, July,

Ram, Rati,(1988) "*Economic Development and Income Inequality: Further evidence on the U-Curve Hypothesis*", World Development, pp.371-376 (November),

Ray, D (2001) " *Development Economics*" Oxford University Press, New Delhi

Rudra, Ashok, (1974) "*Minimum Level of Living-A Statistical Examination*", in Poverty and Income Distribution in India (Ed.), T.N. Srinivasan and P.K. Bardhan, Statistical Publishing Society, Calcutta

Sastry, S.A.R..(1980), "*A Survey of Literature on Poverty, Income Distribution and Development*", Artha Vijnana, Vol.22, No.1, March.

Sen, A.K., Poverty (1973), "*Inequality and Unemployment: Some Conceptual Issues in Measurement*", Economic and Political Weekly August. Also reported in Poverty and Income Distribution in India (Ed.), T.N. Srinivasan and P.K. Bardhan Statistical Publishing Society, Calcutta, 1974.

Sen, Amartya (1973a), "*on Economic Inequality*", Delhi: Oxford University Press.

Sen, Amartya (1973b), "*Poverty, Inequality and Unemployment: Some conceptual issues in Measurement*", Economic ad Political Weekly, Special Number (August).

Sen, Amartya (1976), "*An Ordinal Approach to Measurement*", Econometrica, 44(2), pp. 219-223.

Sen, Amartya (1997), "*Poor Relatively Speaking*", In S. Subramaniam (ed.), The Measurement of Inequality and Poverty, Oxford University Press, pp.159-179.

Sen, Amartya, (1973b) "*Poverty, Inequality and Unemployment: Some conceptual issues in Measurement*", Economic and Political Weekly, Special Number (August).

Sen, Amartya, (1992) "*Inequality Reexamined*", New York: Russell Sage Foundation and Oxford: Clarendon Press

Sen, Pranab Kumar (1999), *Utility - Oriented Simpson-Type Indexes and Inequality measures,* Calcutta Statistical Association Bulletin Vol 49, March & June

Shalan, Vardana (ed)(2007) "*Globalization and Income Inequality*" Hyderabad: Icfai University Press

Sharma, L.R.(1982), "*Poverty and Inequality in the Rural Sector of Himachal Pradesh*", Economic Affairs, Vol.27, Nos.7-9, Calcutta,

Sheshinski, E., "*Relation Between a Social Welfare Function and the Gini Index of Inequality*", Journal of Economic Theory, Vol.4, 1972.

Simon, HA (1955) "*On a class of skewed distribution functions*" biometrica Vol 42.

Singer, Hans, W.(1977), "*Poverty, Income Distribution and Levels of Living :Twenty Five Years of Changes in Thinking about Development*", The Seoul National University Economic Review, Vol.11 No.1, December

Singh Daroga and FS Chaudhari(1986) "Theory of analysis of sample survey designs" Wiley eastern , New Delhi.

Srinivasan, T.N. and Bardhan, P.K. (ed.)(1974), *"Poverty and Income Distribution in India"*, Statistical Publishing Society. Calcutta.

Srinivasan, TN and Pranab K Bardhan (ed) (1988), "*Rural poverty in South Asia"*, Delhi,

Subramaniam, S. (ed.) (1997), *"Introduction: The Measurement of Inequality and Poverty"*, Oxford University Press,

Sundrum, R.M. (1987), "*Growth and Income Distribution in India, Policy and Performances since Independence"*, New Delhi, Sage Publications

Thakur, Dilip S (1985), "*Poverty, Unemployment and Inequality in rural India*" New Delhi: BR. Publishing corporation.

Vaidyanathan, A. (1974), "*Some Aspects of Inequalities in Living Standards I Rural India*" Sankhya, Series C,. Vol.30, 1974. Also in Poverty and Income Distribution in India (Ed.), T.N. Srinivasan and P.K. Bardhan Statistical Publishing Society, Calcutta

Vanhaudt, Patric (1998), *"An Assessment of the Macroeconomic Determinants of Inequality"*, Working Paper Series in Economics & Finance No.271, Stockholm School of Economics, Sweden.

Wedderburn, Dorothy (Ed.)(1974), *"Poverty Inequality and Class Structure"*, Cambridge University Press,

Weisskoff, Richard (1970), "*Income Distribution and Economic Growth in Puerto Rico, Argentina and Mexico"*, The Review of Income and Wealth (December).

World Bank (2001), *"Global Economic Prospects and the Developing Countries, 2001"*, Washington, D.C.