Chapter II

PERSONAL INCOME DISTRIBUTION

An attempt is made in this Chapter to derive the size distribution of Personal Income for rural and urban areas for the years 1964-65, 1968-69 and 1975-76. Further, it is also attempted to estimate the corresponding consumer expenditure for all the income brackets. Section I reviews the studies on Personal income distribution. Section II explains the procedure followed in our study and Section III presents the summary and limitations.

I

Review of the Studies on Personal Income Distribution

Unlike the developed countries, data on size distribution of income in India are not available, inspite of several attempts made from time to time on this subject. The available estimates do not serve much purpose for our study. However, in what follows, a review of various studies is made, from the point of view of better perspective. Broadly speaking, the various studies made so far may be grouped into two categories:

(a) estimates of individual scholars and

(b) estimates of National Council of Applied Economic Research (N.C.A.E.R.)

Among the individual estimates on Size distribution of personal income in India, the most important estimates are those of P.D. Ojha and V.V. Bhatt 1/, K.R. Ranadive 2/, Mahafooz Ahmed 3/, M. Ahmed and N. Bhattacharya 4/ and N.S. Iyengar and Lila Ram Jain 5/. Every estimate has its own methodology and limitations too.

P.D. Ojha and V.V. Bhatt estimated the size distribution of Personal income in India for the years 1953-1955 and 1963-1965. The method followed by them is

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1/ Ojha P.D. and Bhatt V.V. "Distribution of income in the Indian Economy : 1953-54 - 1956-57" Reserve Bank of India Monthly Bulletin, September, 1962, pp 1348-1363.

Also see Ojha P.D. and Bhatt V.V. "Pattern of income distribution in under developed economies — A case study of India" American Economic Review September, 1964 and December, 1965.

2/ Ranadive, K.R. "Distribution of Income - Trends since Planning" Paper presented to Seminar on Income Distribution, Indian Statistical Institute, New Delhi 1971 (mimeo).

Ranadive, K.R. "The inequality of income in India" "Bulletin of the Oxford Institute of Economic and Statistics, Vol XXVII No:27, May 1965, pp 119-134.

3/ Ahmed, Mahfooz "Size Distribution of Personal income in India" in N.S.R. Sastry et al (eds) Papers relating to National Income and Associated Topics (P.N.I.A.T.), Vol III, Asia Publishing House, Bombay, 1965 pp 23-32.

4/ Ahmed, Mahfooz and Bhattacharya N. "Size Distribution of Per capita personal income in India" 1955-56; 1960-61 and 1963-64" Economic and Political Weekly (Special number) Vol VII No: 31-33; 1976, pp 1581-88.

5/ Iyengar, N.S. and Jain Lila Ram "A method of estimating income distributions" Economic and Political Weekly Vol IX No:51, December 21, 1974, pp 2103-2108.

roughly the same for both the estimates [6]. Broadly they have divided the households into three broad categories namely (a) households with an annual income equal to or below Rs 3,000/- (b) households with an annual income between Rs 3,001/- – Rs 25,000/- and (c) households with an annual income having income above Rs 25,000/-. Their main objective was to find out the degree of inequality among different sections of the population. They have used the national income data of the Central Statistical Organisation (C.S.O.), Census data, Income tax data, Consumer expenditure data of the National Sample Survey and data on household savings furnished by the Reserve Bank of India (R.B.I.). The aggregate house hold consumption expenditure has been calculated by subtracting from the C.S.O's national income aggregate amounts of corporate taxes, direct taxes and house hold savings. They have attributed zero savings to the house holds, having household annual income below Rs.3,000/- and the entire savings of the house-hold sector have been attributed exclusively to the higher income classes.

The main weakness of their method is that they have not divided the households into certain reasonable size brackets of income. One can see that the bracket

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6/ In their second estimates, relating to the period 1963-65, they have taken 'Individual' as the income recipient unit instead of 'household' which they have taken as the income recipient unit in their first estimates (relating to the period 1953-55).

having annual household income from Rs. 3,001/-- Rs.25,000, is unusually a big one. Also, they have not considered the possibility of negative savings by the poor people having annual household income below Rs. 3,000/-[7]. Therefore, according to P.K. Bardhan[8] and K.R. Ranadive the estimates of Ojha and Bhatt understated the income inequality between different sections of the population. Further, the procedure followed by them in estimating income distribution by size, has not been explained very clearly. For this lapse Prof S. Swamy has gone to the extent of saying that they are 'guilty' of their method[9].

Another important work is that of K.R. Ranadive [10]. She has estimated for three separate years, 1953-54, 1956-57 and 1961-62. She estimated the size distribution of income in terms of selected decile groups. In doing so, she took the total consumption expenditure, as furnished by the

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7/ According to the various surveys conducted by the National Council of Applied Economic Research (NCAER) there is dissaving on the part of lower expenditure classes. See National Council of Applied Economic Research (NCAER) "Urban Income and Saving" New Delhi, 1962. pp 76-79.

See also N.C.A.E.R. "All India Rural Household Survey" Vol II, New Delhi 1965, p 96.

8/ Bardhan Pranab K. "Pattern of Income Distribution in India - A Review" in Bardhan P.K. and Srinivasan T.N. (Eds) "Poverty and Income Distribution in India" Statistical Publishing Society, Calcutta, 1974, pp 106-107.

Also see Ranadive K.R. "The equality of Incomes in India" Bulletin of Oxford University Institute of Economics and Statistics, Vol 27, May 1965 pp 119-134.

9/ Swamy S. "The Distribution of Income in India" in J.C. Sandesara (Ed) "Papers and Proceedings of the Golden Jubilee Seminar of Bombay University" Bombay University Publications, 1974 (Economic Series No:23) pp 141-161.

10/ Ranadive K.R. "Distribution of Income-Trends since Planning" Paper presented to Seminar on Income Distribution, Indian Statistical Institute, New Delhi, 1971.

National Income series and allocated it to different expenditure classes in accordance with population proportions, derived from the consumer expenditure of the National Sample Survey (N.S.S.). Next, she estimated the saving of the total household sector and allocated it to different expenditure classes in accordance with the proportion of consumer expenditure of various classes, furnished by the National Sample Survey. In other words, she assumed that saving distribution was in the same proportions as that of consumer expenditure distribution. She also made another assumption that the evaded tax payments were either fully reflected in consumption or they were not reflected at all. One can find that she uses more or less the same data sources as Ojha and Bhatt 11/. As rightly criticised by P.K. Bardhan 12/, "the robustness of these estimates obviously depends to a large extent on the plausibility of the largely arbitrary assumptions about size — class wise allocation of savings and dissavings (and estimated tax evasion). Her assumption that in the saving groups, total saving is distributed in proportion to consumer expenditure is also questionable". For as Simon Kuznets puts it the distribution of savings will be more unequal than the distribution of consumer expenditure 13/

11/ See reference number 1.

12/ P.K. Bardhan op cit, p 108

13/ Kuznets, Simon Shares of upper Income groups in Income and Savings National Bureau of Economic Research, New York, 1950, pp 52-58.

Next is the work of Mahfooz Ahmad 14/. His estimates are based on the procedure developed previously by Lydall, who attempted to connect the N.S.S. data on consumer expenditure with income tax returns. Such an integration of N.S.S. data on consumer expenditure with income tax data is necessary because the former excludes the population included in the latter and the latter excludes the population included in the former 15/. Ahmed estimates the size distribution of income for the year 1956-57 16/

The procedure adopted by Ahmed is that he has taken the the monthly per capita consumer expenditure data, from the N.S.S. and assumed that N.S.S. consumer expenditure distribution is lognormal 17/. He has taken the income tax data and assumed that the distribution of assessees across the various income tax brackets follows a Pareto ~~follows a Pareto~~

14/ Ahmed Mahfooz, op cit.

15/ Lydall H.F. "The Inequality of Indian Incomes" Economic Weekly (Special number) Vo. XII Nos.23, 24 and 25, June 1960, pp 873-874.

16/ Ahmed Mahfooz, on cit, pp 23-32.

17/ The statistical property of the normal distribution is widely used to explain the distribution of a random variable. If the distribution of the logarithmic values of the variable follows a normal distribution, it is called lognormal distribution. The N.S.S. consumer expenditure is believed to follow such a lognormal distribution. For details on lognormal distribution, please see Appendix A.II

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distribution [18]. The cumulated number of persons are plotted on a double log paper against the upper limits of the N.S.S. expenditure groups. Similarly, on another sheet of a graph paper, the cumulated number of persons are plotted against the upper income per capita, based on the income tax data. A concave curve has been obtained on the first sheet, while a straight line has been obtained on the second sheet. Later, it has been assumed that the straight line, so obtained, could be extrapolated backward so as to form a tangent with the curve of expenditure distribution, derived earlier on the first sheet from the N.S.S. data. For this purpose, the second sheet has been super-imposed on the first sheet and made consistent with the horizontal scale and then adjusted vertically so as to achieve the tangency condition. The

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[18] Pareto law explains the relation between a certain level of income and the number of persons earning that income or more. It is generally shown by the formula

$$N_y = \frac{A}{Y^{\alpha}}$$ Where A and α are the statistical parameters of the Pareto law. Y denotes the income level and N_y, the number of persons, earning that income level or more. The law explains that N_y decreases as we choose a higher Y(i.e., higher income level). Pareto studied the income tax data of many countries as conforming to the above relationship. For further details on Pareto law, please see Appendix B.II.

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point of tangency, shows a situation where per capita expenditure is equal to per capita income. Income line below the point of tangency is assumed to be negative. The cumulative number of persons, are then read off, from the income and expenditure curves, and on decumulation the size distribution of income has been estimated.

The statistical device adopted by Mahfooz Ahmed basically rests on two important assumptions (a) that pareto law applies to income tax data and (b) that the N.S.S. consumer expenditure data follows a lognormal distribution. Both these assumptions are questionable in the sense that they are not suited to Indian conditions. Prof S. Swamy is of the opinion that pareto law does not suit to Indian Income tax data 19/ Also, another point of criticism against this method is that the graphical integration of N.S.S. Consumer expenditure distribution (the curve obtained on the graph) with that of the Pareto law based on income tax distribution (the straight line obtained on the graph) may involve subjective element.

Next work of Mahfooz Ahmed and N. Bhattacharya 20/ is slightly an improvement over the earlier one. Their estimates correspond to the years 1956-57; 1960-61 and

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19/ Swamy S, Op cit, p 242.

20/ Ahmed, Mahfooz and Bhattacharya N. Op cit

1963-64. They have fitted the income tax data to a Pareto equation of the form $\log y^i = \log A - \alpha \log x^i$, to the distribution of income tax assessees by the usual least squares method. x^i denotes assessed income and y^i, the number of assessees earning x^i or more. A and α are the constants. They have used the N.S.S. data on consumer expenditure and fitted the same into a three parameter lognormal distribution (of which one is the 'thresh hold' Parameter). They have noticed that Pareto equation could be fitted satisfactorily for incomes above Rs. 20,000/- per year. After drawing the N.S.S. based lognormal distribution on a graph paper, they obtained a curve which is concave to the origin. Later, the pareto line (based on income tax data) was adjusted to become tangent to the fitted expenditure curve (drawn on the basis of N.S.S. consumer expenditure data). Then, the size distribution of income has been estimated from the graphs.

In the words of P.K. Bardhan "Ahmed - Bhattacharya estimates rests on the validity of two important assumptions (a) that pretax income equals consumer expenditure in the lower ranges of consumer expenditure distribution (covering nearly 75% of the total population) and (b) the distribution of percapita pre-tax personal income is asymptotically paretoan for high values of percapita income and has the same slope as

the distribution of assessees by size of incomes before tax.[21] Their estimates understates the income inequality, among different sections of the population as the authors have not allowed for any dissavings on the part of lower expenditure classes. Also, it can be noticed, as in the case of the earlier work of Mahfooz Ahmed [22] that their estimates are exposed to some element of subjectiveness in the graphical integration of N.S.S. based consumer expenditure data with the income tax data.

Still another study, recently done, is that of N.S. Iyengar and Lila Ram Jain [23] on the size distribution of income for the years 1961-62 and 1964-65. In estimating the same, they have postulated an exact linear relationship between annual household income (Y) and the consumption (c) per capita. It is a relationship of the Keynesian variety $C = \alpha + \beta Y$ where C = Consumption, Y = income and α, β are the parameters. They used the N.S.S. data on consumer expenditure and assumed the same as 'lognormal'. They have followed a method, in which they integrated a time series

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21/ Bardhan P.K. "Pattern of income Distribution in India A Review" in T.N. Srinivasan and P.K. Bardhan (Eds) Poverty and Income Distribution in India Statistical Publishing Society, Calcutta, December, 1974, p.110

22/ Ahmed Mahfooz op cit

23/ Iyengar N.S. and Jain Lila Ram op.cit.

macro aggregate data with that of a cross section data. The main weakness of their method is that they have used a macro time series data to the cross section. If the relationship between income and consumption is linear, the propensity to consume will be the same for all the income brackets. But propensity to consume (C/Y) will differ for different classes of people. Therefore, the estimates worked out by them may not be correct.

Next comes the estimates of the National Council of Applied Economic Research (N.C.A.E.R.). On the basis of nationawide surveys conducted, the N.C.A.E.R. estimated the size distribution of personal income for the year 1964-65 24/. According to its estimates, bottom 20% of the population has only 7.5% of the total disposable income, while the top 20% of the population enjoys about 47.5% of the total disposable income. The N.C.A.E.R. estimates have been criticised on the ground that the size of the sample taken by the surveys was rather small for a country of India's size. The problem of response error is more serious, particularly since income tends to be

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24/ National Council of Applied Economic Research (NCAER) "All India consumer expenditure survey", New Delhi, 1966.

See also N.C.A.E.R.. "All India Rural Household Survey 1962 - A Summary Statement on Income Distribution" (occasional paper No.13) New Delhi, 1965.

under reported. Also, the N.C.A.E.R. surveys do not have the full coverage of the population of the country 25/ Therefore, the estimates understate the income of the people. The N.C.A.E.R. estimates relate to the year 1964-65 only. It does not provide similar data for the years 1968-69 and 1975-76. Our present study refers to 1964-65, 1968-69 and also 1975-76 (The year 1975-76 is the latest year for which the 'Accounts' figures are available).

Thus, it is seen that every estimate has some weakness or the other. However, for a study of measuring tax burden by income class, it is imperative that we should have the size distribution of personal income. Therefore, we have to follow one of the methods discussed above to derive the size distribution of income. As said earlier, the N.C.A.E.R. estimates relate to the year 1964-65 only and similar data for the years 1968-69 and 1975-76, are not available. It would be better if we follow a uniform procedure for all the years of our study. Also, it can be seen that the various estimates, discussed so far, mainly aimed at finding out the 'inequalities' in the distribution of income. The authors, never bothered of associating the size distribution of income with corresponding

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25/ For criticism on the N.C.A.E.R. estimates see P.K.Bardhan op.cit. p.196.

See also Ojha and Bhatt "Pattern of income Distribution in an under developed economy - A case Study of India - A Reply" American Economic Review - LV December, 1965 P. 1185 - 1187.

consumer expenditure. For our study, we require, not only a size distribution of personal incomes but also a corresponding consumer expenditure distribution, as otherwise it would not be possible to allocate the indirect taxes imposed on different goods and services, which are consumed by the various income brackets. Keeping all these aspects in view, we have chosen the method followed by Mahfooz Ahmed[26] because he has integrated the income tax data with that of N.S.S. Consumer expenditure data, by a statistical device, to derive the size distribution of income.

II

Our Method

As stated above, our method closely follows that of Mahfooz Ahmed in estimating the size distribution of personal incomes for the period covered by our study [27]. Like most of the studies of our type, we have assumed (a) that consumer expenditure follows a lognormal distribution and (b) the pareto

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26/ Ahmed Mahfooz Op cit

27/ Mahfooz Ahmed used two graph papers for integrating the N.S.S. consumer expenditure data with the income tax data. But we have used only one graph paper, the upper portion of it for fitting the N.S.S. based consumer expenditure (lognormal distribution) and the lower portion of the graph has been used to fit the Pareto straight line, based on the income tax data.

law applies to the higher groups of income tax data [28]/ Further, in order to estimate the corresponding consumer expenditure of each and every income group, a new device is followed which is described in the subsequent paragraphs. The main sources of data used by us, are (a) consumer expenditure data, furnished by N.S.S. and (b) income tax data, furnished by the income tax department. We have assumed that N.S.S. data on consumer expenditure hold good for the corresponding financial year also [29]/ Out of the three years under reference, we do not have consumer expenditure data of N.S.S. for 1975-76. Therefore, we have taken the latest N.S.S. data on consumer expenditure for 1973-74[30]/ and assumed that the same data hold good for the year 1975-76 also.

28/ Lydall H.F. "Theories of the Distribution of Earnings" in Atkinsen A.B. (ed) "The Personal distribution of incomes" (Royal Economic Society) George Allen and Unwin Ltd., London, 1976, Chapter I, p 15-17.

Also see Planning Commission "A Technical Note on the approach to the V Plan of India, 1974-79" Govt. of India Publications, April 1973, p.27. The Planning Commission's note assumes that Consumer expenditure as 'Lognormal'

Also see Ahmed Mahfooz and Bhattacharya N. "Size Distribution of Per capita Personal income in India" : 1955-56, 1960-61, and 1963-64" Economic and Political Weekly Vol VII No:31-33 (Special Number) 1976 pp.1581-88.

Also see Cramer "Empérical Econometrics" Amesterdam, North-Holland, 1969, p.53. He mentions that Pareto law applies to high income groups.

29/ Such an assumption is not without Precedent. See Ojha and Bhatt 'Distribution of Income in the Indian Economy: 1953-54 - 1966-67" Reserve Bank of India Bulletin, September 1962, pp 1350-1363.

30/ National Sample Survey "Tables with notes on Consumer expenditure - 28th round: October, 1973 - June 1974" Govt. of India Publications, 1978.

The National Sample Survey (N.S.S.) provides data on consumer expenditure, by monthly per capita expenditure classes for different periods in their various rounds 31/. The 19th round corresponds to the data on consumer expenditure for the period July 1964 to June 1965 while the 23rd round corresponds to the period June 1968 to July 1969. The latest N.S.S. data on consumer expenditure is the 28th round which pertains to the period October 1973 to June 1974. The income tax statistics, showing the distribution of the assessees by assessed income brackets are furnished by the "All India Income Tax Statistics" (AIITS) published by the Directorate of Inspection, New Delhi 32/. Our study relates to finding out the tax burden by income classes for the period

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31/ N.S.S. "Tables with notes on consumer expenditure: 19th round July, 1964 - June 1965" Government of India Publication, 1971.

Also see N.S.S. "Tables with notes on consumer expenditure: 23rd round - June 1968 - July 1969" Government of India Publication, 1976.

Also see N.S.S. "Tables with notes on consumer expenditure 28th round - October 1973 - June 1974" Government of India Publication, 1978.

32/ Directorate of Inspection (Research, Statistics and Publication) "All India Income tax Statistics: 1964-65" Government of India, New Delhi, 1968 (mimeo)

Also see Directorate of Inspection (Research, Statistics and Publication) "All India Income tax Statistics, 1968-69" Government of India, New Delhi, 1972 (Mimeo)

Also see Directorate of Inspection (Research, Statistics and Publication) "All India Income tax Statistics, 1975-76" Government of India, New Delhi, 1977 (mimeo)

1964-65, 1968-69 and 1975-76. The method adopted for the derivation of size distribution of personal income as well as the consumer expenditure is the same for all the years of our study.

In accordance with the assumptions stated above, we have assumed that N.S.S. consumer expenditure data of July, 1964 to June 1965 hold good for the financial year of 1964-65; the data of June 1968 to July 1969 hold good for the financial year 1968-69, and the data of October 1973 to June 1974 hold good for 1975-76 33/ It is possible to suspect the applicability of N.S.S. data of 1973-74 to the financial year 1975-76. But we feel, our assumption may not give incorrect picture in view of relative constancy of consumption during short period. Moreover, we do not have any data on the distribution of consumer expenditure by various classes for the year 1975-76. However, as far as "tax burden" is concerned, the consumer expenditure, shown against each income bracket, has been corrected for price changes as well as for changes in the growth rate of consumption, during the period 1973-74 and 1975-76.

Given the N.S.S. consumer expenditure data and income tax data for a particular year (be it 1964-65 or 1968-69 or 1975-76), the procedure followed to derive the size distribution of income and also finding out the corresponding consumer expenditure of each income bracket, is detailed below:

33/ See reference number 29.

First, we have taken the consumer expenditure data furnished by the N.S.S. and assumed it to be lognormal. According to the lognormal distribution, if Z = log X, where X is the expenditure level, X is lognormally distributed and correspondingly, 'Z' is normally distributed[34]. The distribution of 'X' is completely specified by the two parameters, namely the mean and the variance. The parameters of the density function are symbolically termed as μ and λ and they have been calculated by the method of moments M1 and M2 [35] The N.S.S. provides data on consumer expenditure for 13 classes by monthly per capita expenditure. On the basis of this data, we have calculated M1 and M2, the first and second moments, by using the following formulae

$$M1 = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$$

$$M2 = \frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i}$$

34/ For a detailed discussion on lognormal Distribution, please see Aitchson and Brown "Lognormal Distribution" Cambridge University Press, 1957.

35/ See Appendix Tables A II.1, AII.2, AII.3, AII.4, AII.5 and AII.6.

Where x_i indicates the per capita expenditure of the $_i$th expenditure class; f_i indicates the number of persons in the $_i^{th}$ expenditure class. i = 1;2;.....n indicates the number of classes for which the N.S.S. consumer expenditure data are provided. (i.e. Rs. 0-8, 8-11 ..... upto 'above 75' monthly per capita expenditure classes). Having calculated M1 and M2, the parameters of the density function of the distribution have been worked out by using the formulae shown below:

$$\lambda^2 = \log M2 - 2\log M1$$

$$\mu = 2\log M1 - \frac{\log M2}{2}$$

We have calculated μ and λ separately for the urban as well as rural areas on the basis of the consumer expenditure data of the relevant year provided by the N.S.S.[36/] Thereafter, we have calculated the cumulated number of persons as against each per capita expenditure level, with the help of the parameters μ and λ .

'Actual and Fitted' distribution of persons by monthly per capita expenditure for the N.S.S. based consumer expenditure for the years 1964-65, 1968-69 and 1975-76 may be seen from table II.1.

36/ See reference No.31.

TABLE II.1

Actual and Fitted Distribution of Persons by Monthly Per capita Household Expenditure for the N.S.S. based Consumer Expenditure

(Cumulative Percentages of Population)

Monthly Per capita Expenditure (Rs.x)	(1964-1965)				(1968-1969)				(1975-76)*			
	Rural		Urban		Rural		Urban		Rural		Urban	
	Actual	Fitted	Actual	Fitted	Actual	Fitted	Actual	Fitted	Actual	Fitted	Actual	Fitted
8	1.42	3.92	0.47	2.17	0.79	1.29	0.70	0.30	-	-	-	-
11	6.14	10.93	2.40	6.06	2.85	4.75	0.90	1.43	-	-	-	-
13	11.51	17.11	5.04	9.68	5.37	8.38	1.75	2.87	0.33	0.69	0.04	0.84
15	18.66	23.89	9.54	13.79	9.46	12.92	3.57	4.95	0.69	1.43	0.14	1.54
18	30.44	34.09	18.34	20.90	18.41	20.61	7.89	10.03	1.76	3.22	0.42	3.07
21	43.23	44.04	27.72	28.10	28.62	29.12	14.00	14.23	3.79	5.94	0.91	5.26
24	55.05	53.19	36.80	35.20	38.27	37.45	21.07	20.05	6.74	9.68	2.20	7.93
28	67.41	63.31	48.51	44.04	51.13	48.01	31.83	28.43	12.08	15.62	5.12	12.30
34	80.16	74.54	62.17	55.96	65.68	61.41	45.53	40.90	23.44	26.11	12.26	19.77
43	89.99	85.54	74.14	69.15	80.58	75.49	62.53	56.75	42.42	42.07	27.22	31.92
55	95.34	92.92	83.94	80.78	90.32	86.86	75.52	72.57	63.06	60.26	46.74	47.21
	98.16	97.67	92.17	90.82	95.64	95.15	87.28	87.29	83.09	80.23	69.38	66.64

The actual values are close to the fitted values at many expenditure levels. Therefore, the fitted lognormal distribution is fairly good, in all the three years of our study. Later, the cumulated number of persons are plotted against the upper limits of the N.S.S. expenditure classes on a double logarithmic graph, 37/ and then obtained a curve which is concave to the origin. In other words, this curve represents the lognormal distribution of the consumer expenditure.

A word about the treatment meted out to pareto distribution. On the basis of income tax data, we have fitted the pareto distribution in respect of incomes above Rs. 20,000/- per year. In doing so, we have assumed that each assessee represents a household which consists of an average size of 3.5 persons 38/. Next we have estimated

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37/ We have converted the actual values into logarithmic values and plotted them on an ordinary graph paper. It is the same thing as using a logarithmic graph paper.

38/ Though the assumption seems to be arbitrary, such an assumption was made by Mahfooz Ahmed also.

See Ahmed, Mahfooz "Size Distribution of Personal Income in India" in N.S. Sasthry et al (eds) Papers relating to National Income and Associated Topics Vol.III, Asia Publishing House, 1965, pp 23-32.

(with the help of computer) the statistical parameters A and α in the pareto equation of the form $\log Y' = \log A - \alpha \log X'$, where X' denotes upper income per capita and Y' denotes the cumulated number of persons earning income X' or more. A and α are the constants. Table II.2 shows the estimated parameters, A and α and also the co-efficient of determination R^2 for the paretoan distribution of income tax data for all the three years:

TABLE II.2

Estimated Parameters of Pareto Fits

Income range	Estimated Parameters (A)	(α)	Co-efficient of determination (R^2)
(1)	(2)	(3)	(4)
	1964-65		
Rs.20,000/- and above	10.86	2.02	0.9982 (.02834)
	1968-69		
Rs.20,000/- and above	5.36	2.08	0.9969 (.03825)
	1975-76		
Rs.20,000/- and above	11.94	2.25	0.9978 (0.03485)

NB:- Figures in Parentheses are the standard errors of α in the pareto equation of the form $\log Y' = \log A - \alpha \log X'$

Source : Calculated on the basis of All India Income Tax Statistics (AIITS) for 1964-65, 1968-69 and 1975-76.

In this connection, it may be mentioned that, of the two parameters A and α, the value of A is not important [39]. But the value of 'α' (which is also called the Pareto's constant) is very important to explain the income distribution by size. The value of 'α' obtained by us for the year 1964-65, is very close to the value of it obtained by Mahfooz Ahmed and N. Bhattacharya [40] for the year 1963-64. As one cannot, normally, expect drastic changes in the size distribution of income, in a span of one year, it is obvious that the value of 'α' remains more or less the same for the years 1963-64 and 1964-65. The co-efficient of determination (R^2) is highly significant for all the fits. Further, the observed (i.e., actual) and expected greater than type, cumulated number of persons for the pareto fits for the years covered

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39/ The fact is well explained by Jan Pen in his book "Income Distribution". To quote his language "Here A is not particularly important constant. It is concerned with the units in which income is expressed. But α is important".

See Jan Pen "Income Distribution" Allen Lane, the Penguine Press, 1971, Chapter VI, p 235.

40/ Ahmed, Mahfooz and Bhattacharyya N. op cit p. 170. The year 1964-65 is very next to 1963-64. The value of 'α' obtained by us for 1964-65 is 2.02, whereas the value of it, obtained by Mahfooz Ahmed and N. Bhattacharya for 1963-64 is 2.187.

by our study, show that the fits are fairly good. Table II.3 shows the actual and expected values of the pareto fits.

TABLE II.3

Observed and Expected Greater than Type Cumulative Frequencies for the Pareto Fits

(Persons in millions)

Income (Rs.'000)	1964-65		1968-69		1975-76	
	Actual	Fitted	Actual	Fitted	Actual	Fitted
1	2	3	4	5	6	7
20	0.191	0.179	0.400	0.383	.538	.499
25	0.132	0.125	0.282	0.262	.357	.331
30	0.072	0.069	0.148	0.143	.181	.171
40	0.043	0.044	0.092	0.090	.105	.105
50	0.028	0.030	0.060	0.061	.068	.070
70	0.019	0.022	0.042	0.045	.046	.049
100	0.009	0.010	0.019	0.021	.020	.022
200	0.002	0.002	0.005	0.005	.004	.005
300	0.001	0.001	0.002	0.002	.002	.002
400	0.0007	0.0007	0.001	0.001	.001	.001
500	0.0004	0.0004	0.001	0.001	0.0007	.0005

Source : All India Income Tax Statistics (AIITS), New Delhi. 1964-65, 1968-69 and 1975-76.

We have plotted, the cumulated number of persons as against the upper income per capita (based on the pareto equation) and then obtained a straight line, which is the pareto line. Later, we have assumed that if the pareto line is extrapolated backwards, it becomes tangent to the expenditure curve, which has already been drawn on the same graph, using the N.S.S. expenditure data. Thus, the pareto line is extrapolated so as to achieve the tangency condition. At the point of tangency, the per capita expenditure level equals the per capita income level 41/ The persons falling below the point of tangency, are assumed to be the 'lower income groups' while those falling beyond the point of tangency are assumed to be the 'upper income groups'. We have drawn the graphs, as explained above, for urban and rural areas in respect of all the three years separately. (See Figures II.1, II.2, II.3, II.4, II.5, II.6).

In this connection, it is to be carefully noted that the lognormal expenditure curve, can explain the expenditure distribution of the lower income groups (i.e., the population covered upto the point of tangency), and the income distribution of these income groups cannot be explained by the pareto line. Similarly, the pareto line will explain the income distribution of the upper income classes and the expenditure distribution of these groups will not be given by the lognormal expenditure curve. Therefore, the actual problem is: (a) to find out the income distribution for those people falling upto and below the point of tangency, given

41/ Ahmed, Mahfooz op cit pp 29-30

Fig. II. I

Interration of N.S.S. based consumer expenditure with Pareto Line. 50

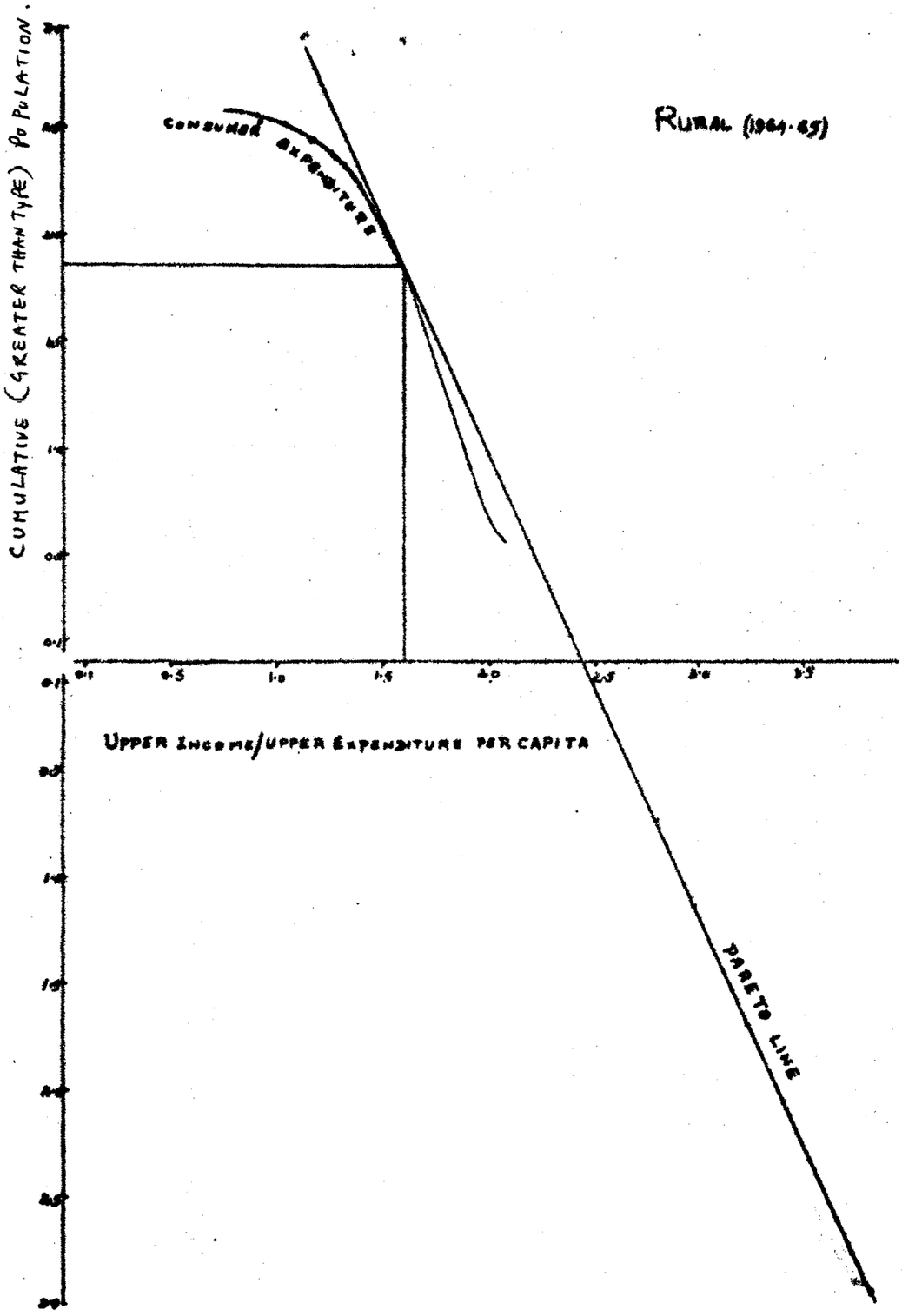

Fig.II. 2

Integration of N.S.S. based consumer expenditure with Pareto Line.

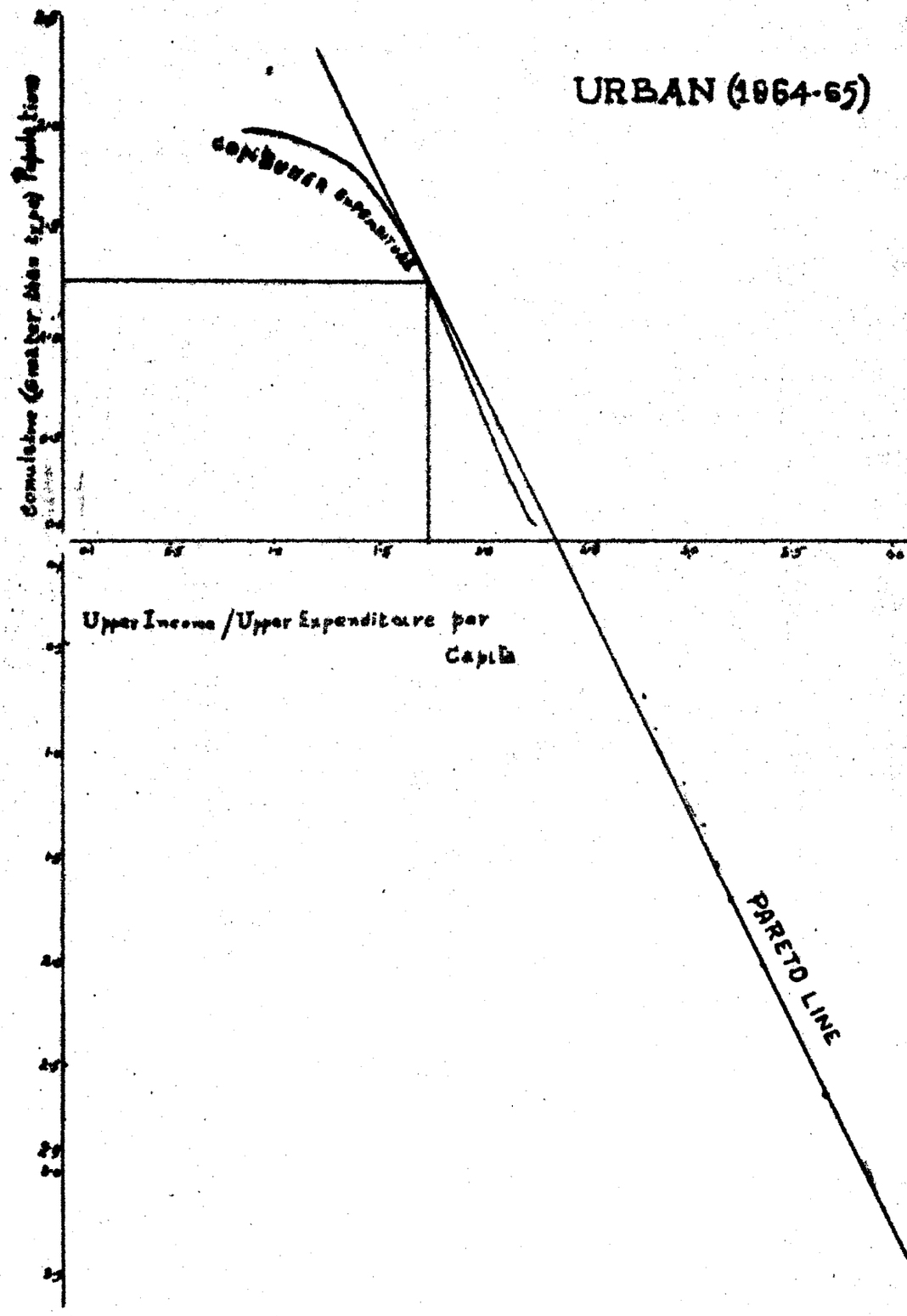

Fig.II. 3

Integration of N.S.S. based consumer expenditure with Pareto Line.

52

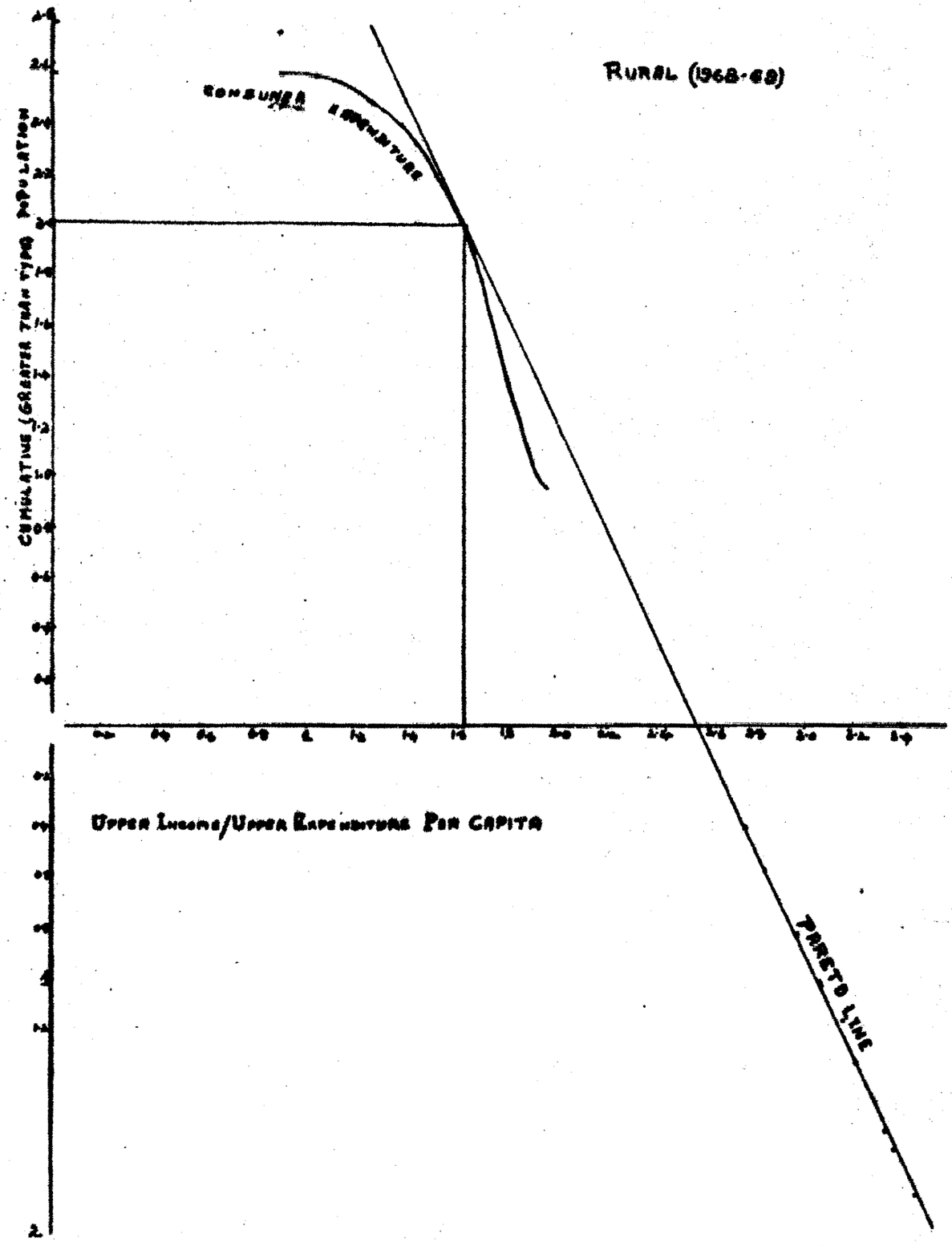

Fig.II.4

Integration of N.S.S. based consumer expenditure with Pareto Line.

53

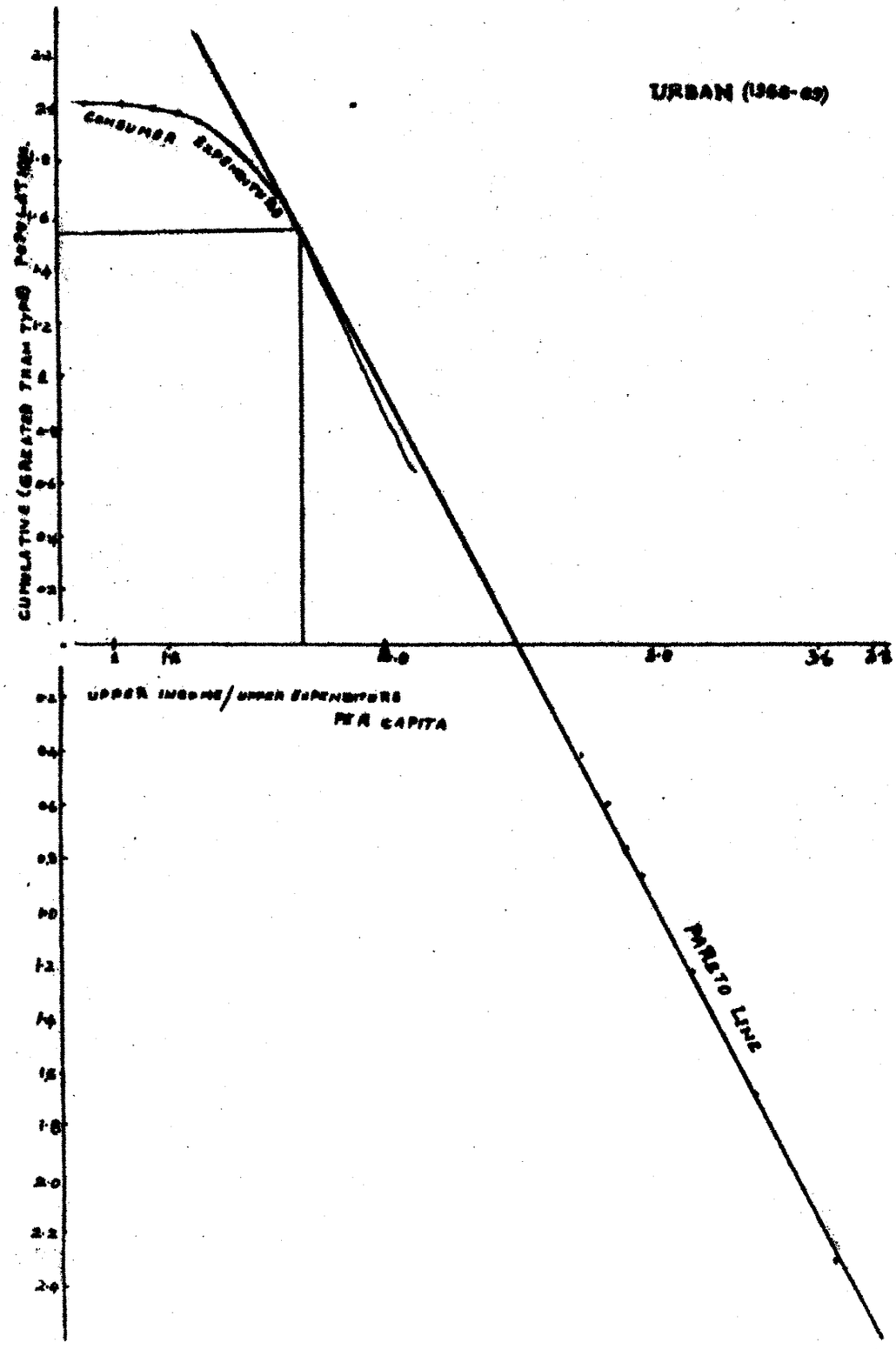

Fig.II.5

Integration of N.Sz. based consumer expenditure with Pareto Line.

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RURAL 1975-76

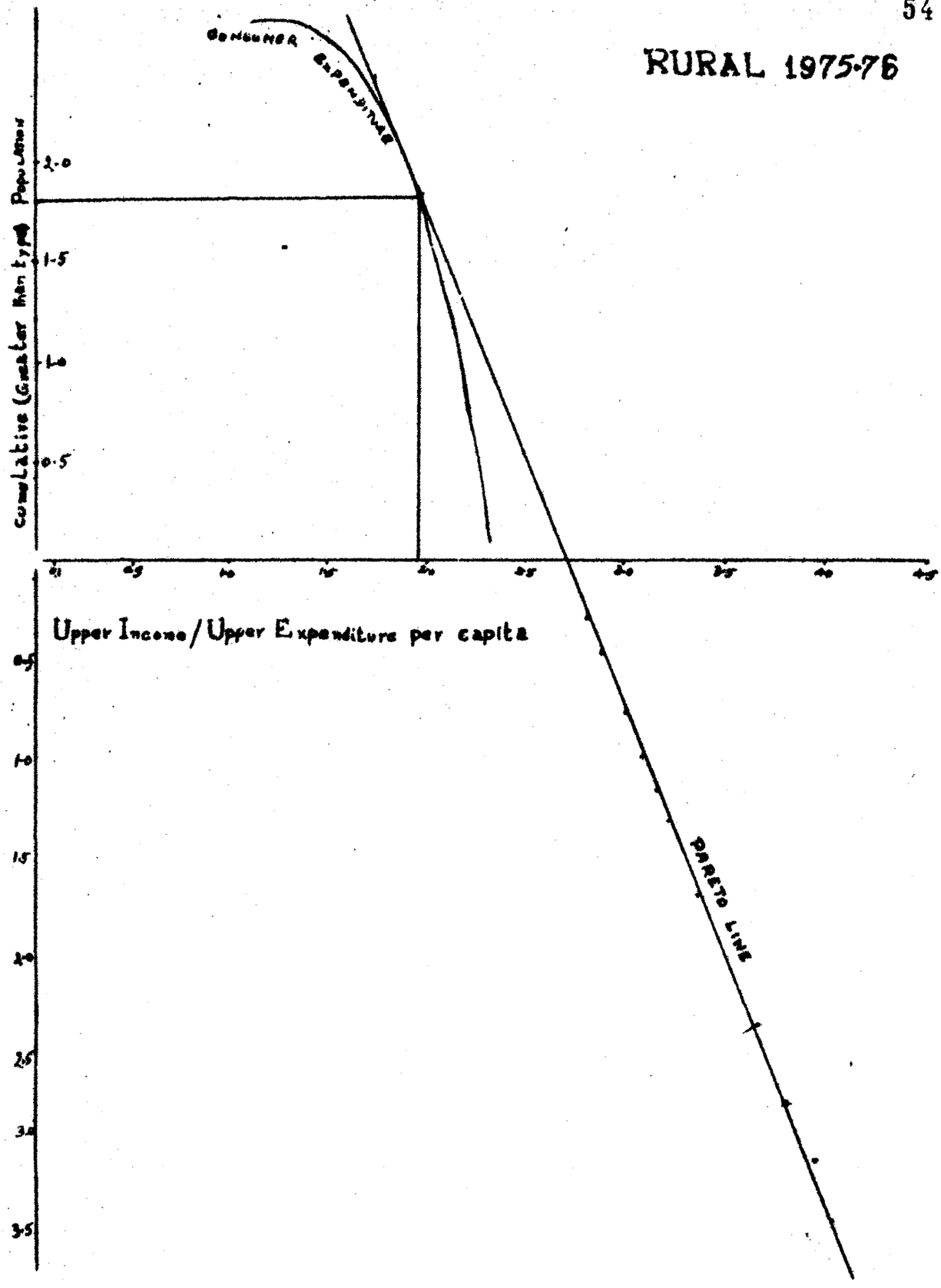

Fig.II.6

Integration of N.S.S. based consumer expenditur with Pareto Line.

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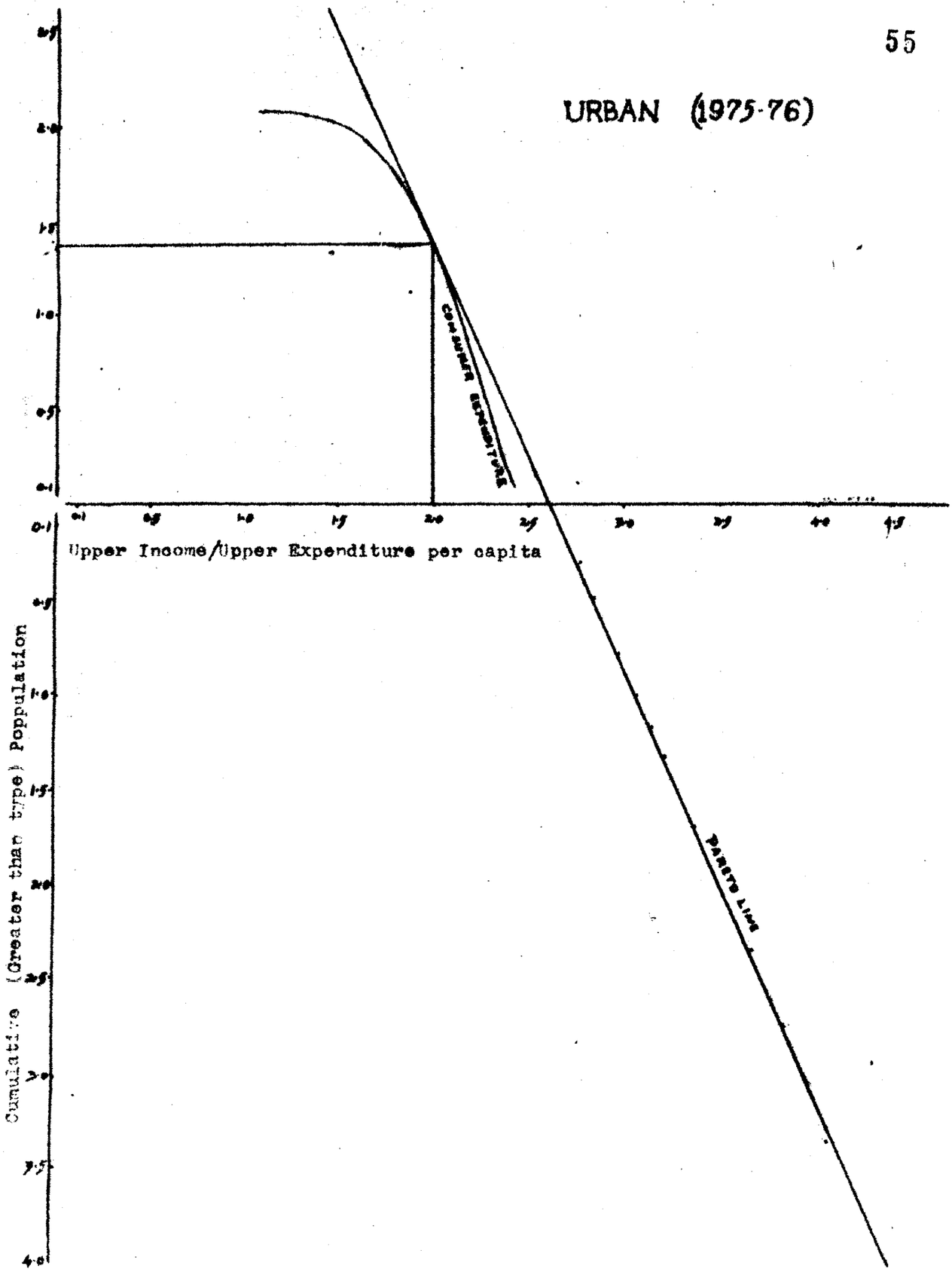

the expenditure distribution, by the lognormal curve and (b) to find out the expenditure distribution for those people falling beyond the point of tangency, given the income distribution by the Pareto line. In the earlier works attempted by some authors 42/ the expenditure distribution of the lower income groups has been treated as the income distribution, assuming that there is zero savings on the part of these groups and also assuming that these classes do not pay any direct taxes. But as far as our study is concerned, we have allowed disaavings on the part of lower income groups. Therefore, we assumed that in rural areas, households having annual income upto Rs. 1,000/-, do have negative savings. How much negative savings they would have, has been estimated based on the data furnished by the NCAER 43/. The C/Y ratio for the households having annual income less than Rs. 1,000/- (i.e., income bracket Rs. 0-1000) has been calculated as 1.06. In other words, the expenditure bracket Rs. 0-1060 corresponds to the income bracket Rs. 0-1000. For the other households in the rural area, falling below the point of tangency, we have assumed that their income equals their expenditure.

42/ See Ojha and Bhatt op cit See also Ahmed Nahfooz and Bhattacharya, N op cit.

43/ N.C.A.E.R. "The All India Rural Household Survey" Vol. II (Income, Investment and Saving)", New Delhi, 1965, p 96.

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Similarly, we have assumed that the urban households having an annual income upto and below Rs. 2,000/- do possess negative savings. The C/Y ratio has been calculated from the N.C.A.E.R. data 44/ and it comes to 1.20. It means that Rs. 0-1200 expenditure bracket corresponds to Rs.0-1000 income bracket of the urban household and Rs. 1201-2400 of the expenditure bracket corresponds to Rs.1001-2000 income bracket of the urban household. For the remaining households, falling below the point of tangency, we have assumed that income will be equal to expenditure. In this way, we have adjusted the income brackets with corresponding expenditure brackets for the households covered by the population, below and upto the point of tangency.

However, we explain in detail the derivation of size distribution of income for one year for understanding of the method followed by us. The year 1964-65 is chosen for this purpose:

1964-65

At first, the logarithmic values of the cumulated number of persons are plotted against the logarithmic values of the upper limits of the N.S.S. expenditure classes (Tables A II.7, A II.8, A II.9, A II.10, A II.11, A II.12, Columns 3 and 6) on a graph

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44/N.C.A.E.R. "Urban Income and Saving", New Delhi, 1962, pp 76-79.

and obtained a curve which is concave to the origin. Then, the income tax data of 1964-65 has been fitted into a paretoan distribution, for all incomes above Rs. 20,000/-. (The co-efficient of determination R^2 is highly significant, its value being 0.9982). We assumed that the paretoan distribution of income tax data applies to urban and rural incomes. The pareto equation worked out by the computer for the income tax data of 1964-65 is log Y' = 10.86 - 2.02 log X'. Where X' is the monthly upper income per capita, while Y', the cumulated number of persons earning income X' or more. Further, we have plotted on the same graph paper (on which the expenditure curve has been drawn earlier), the cumulated number of persons as against the monthly upper income per capita, based on the pareto equation, thus obtained. On the basis of this, we found that many points lie on a straight line, forming the pareto line. On the assumption that the pareto line, if extraploted backwards, becomes a tangent to the expenditure curve 45/, we have extrapolated and adjusted the straight line, so that it becomes a tangent to the N.S.S. - based consumer expenditure curve, drawn earlier on the same graph. The point of tangency is very close to monthly per capita expenditure level of Rs.30 in the case of 'rural' areas, while in the case of urban areas,

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45/ Ahmed, Mahfooz, op cit

it corresponds to Rs. 39/-. The actual values read out from the graphs are Rs. 30.08 and Rs. 39/- respectively for rural and urban areas. At the point of tangency, the per capita expenditure is equal to the per capita income.

In the case of rural area, the per capita expenditure level of Rs. 30.08, corresponds to annual household expenditure (or income) of Rs. 2200 per year 46/. The population covered upto the point of tangency in the rural area is 288.60 million. We have assumed that persons falling below the point of tangency belong to the 'lower income groups' and the persons falling beyond the point of tangency belong to 'upper income groups'. We have also assumed that in rural area, households with an annual household income upto Rs. 1,000/- have negative savings. How much negative savings is made by the households whose annual income is less than Rs. 1,000/- has been approximately worked out with the help of saving-income-ratios furnished by the N.C.A.E.R. 47/.

46/ Household expenditure per annum =

Per capita expenditure (monthly) X A.H.S. X 12

(Where A.H.S = Average household size, given by the N.S.S. Data).

At the point of tangency, the household expenditure equals the household income. Therefore, the bracket ends with Rs. 2200 expenditure or income of the households.

47/ See reference number 43.

According to the N.C.A.E.R., the C/Y ratio for the income class Rs. 0-1000 in rural areas is 1.06. We have assumed that the same C/Y ratio (1.06) will hold good for all the years of our study for the annual household income bracket Rs. 0-1000.

Distribution of Persons by Income Class upto the Point of Tangency:

It may be known now that the fitted expenditure curve furnishes information with regard to the distribution of persons, by expenditure class for the lower expenditure brackets only, covering the population upto the point of tangency. It does not provide information on the distribution of persons, by income class for these persons. Further, the pareto line, corresponding to the lower expenditure brackets, also does not furnish information for the distribution of these persons by income classes 48/. Therefore, in order to find out the distribution of persons by income class for those covered upto the point of tangency (i.e., 288.60 million), we have adjusted savings to the expenditure brackets. In doing so, we have assumed that the households covered upto the point of tangency do not pay any direct taxes

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48/ Pareto law applies to higher income groups. See reference number 28.

directly 49/. As we have postulated negative savings for the households in rural area, having Rs. 0-1000 annual household income, the corresponding expenditure bracket will be Rs. 0-1060 (given the C/Y ratio as 1.06 from the NCAER estimates). Therefore, first we have worked out the number of persons falling upto annual household expenditure limit of Rs. 1,060, from the expenditure curve of the graph and it comes to 204.69 million. Obviously, the population, covered by the income bracket Rs. 0-1000 is also 204.69 million (because the expenditure bracket Rs. 0-1060 corresponds to Rs. 0-1000 income bracket as explained above). Thus, we are left with 83.91 million of people (288.60 - 204.69 = 83.91), yet to be distributed among income and expenditure brackets, covered upto the point of tangency. For them, we have assumed that their income and expenditure are the same. The income and expenditure brackets upto the point of tangency are arranged in table II.4.

49/ The lower income classes do not pay direct taxes directly, but if the incidence of a direct tax is shifted on them by other classes of people, who pay directly direct taxes, it amounts to paying direct taxes indirectly. For example, a shifted corporation tax etc.

TABLE II.4

Association of Household Income and Expenditure brackets Upto the Point of Tangency

RURAL (1964-65)

	Income bracket	Expenditure bracket
(A)	Rs. 0 - 1000	Rs. 0 - 1060 (Due to Dissaving)
(B)	Rs. 1001 - 2000	Rs. 1061 - 2000 (Income-Expenditure)
(C)	Rs. 2001 - 2200	Rs. 2001 - 2200 (Income-Expenditure)

Case A: Represents an income bracket Rs.0-1000, for which we have postulated negative savings by the households. The corresponding expenditure bracket is Rs.0-1060.

Case B: Represents the income bracket Rs.1001 - 2000. The corresponding expenditure bracket starts from Rs.1061. But we have assumed that the income of this bracket is equal to its expenditure. So, the corresponding expenditure bracket ends with Rs.2000/-.

Case C: Represents the income bracket from Rs.2001-2200. As income is equal to expenditure, the corresponding expenditure bracket is also Rs. 2001-2200.

The number of persons falling in the above three lower expenditure brackets could be found from the expenditure curve. Thus, the population of 288.60 million falling upto the point of tangency in the graph (i.e. upto Rs. 2200 household

expenditure or income limit) [50/] has been distributed among expenditure/income brackets.

Distribution of Persons by Income Class Beyond the Point of Tangency:

Next, we are left with the problem of distribution of the remaining population in the rural area, falling in the upper income brackets (i.e., beyond the point of tangency). For our study, we have taken the following annual household income brackets, beyond the point of tangency:- i.e., from D to L as shown below (for 1964-65 rural area)

Income brackets

D. Rs. 2201 - 3000
E. Rs. 3001 - 4000
F. Rs. 4001 - 5000
G. Rs. 5001 - 7000
H. Rs. 7001 - 10000
I. Rs. 10001 - 15000
J. Rs. 15001 - 20,000
K. Rs. 20001 - 30,000
L. Rs. Above 30,000.

50/ Please see reference 46.

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In all we have 12 income brackets (A to L) for the distribution of the entire rural population of 1964-65. We have read out directly from the extrapolated pareto line, the cumulative number of persons falling within the required income limit (i.e., in respect of income brackets from D to L). On decumulation, we have found the number of persons, falling in each of the income brackets. So far, we have estimated the number of persons falling in all the 12 income brackets for the year 1964-65 (rural area).

A word about the derivation of income bracket-wise personal income along with the corresponding consumer expenditure distribution is necessary in this context as the latter category is essential for the allocation of indirect tax burden.

Income Bracket-wise Personal Income and Consumer Expenditure

The consumer expenditure has been found out first, for all the income brackets. In doing so, the N.S.S consumer expenditure data has been made use of to form a lorenz curve, showing on one axis, the cumulative percentage distribution of population and on the other axis, the cumulative consumer expenditure percentages. Since we have already derived, the distribution of persons, by the selected income brackets (i.e., A to L income brackets), it was easy for us to work out, the cumulative percentage distribution of persons for these income brackets. We have, then, read

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out from the Lorenz curve, the corresponding percentage of consumer expenditure for each of the income brackets. (See Table II.5, col 2 and 3). Now, as we knew the total N.S.S. consumer expenditure, it was possible to work out the consumer expenditure, as against each income bracket, for all the income brackets (see lorenz curves in Fig II.7, Fig II.8, Fig II.9, Fig II.10, Fig II.11 and Fig II.12.

TABLE II.5

Cumulative Percentage Distribution of Population by Income Class and the Corresponding Cumulative Percentage Distribution of Consumer Expenditure

RURAL (1964-65)

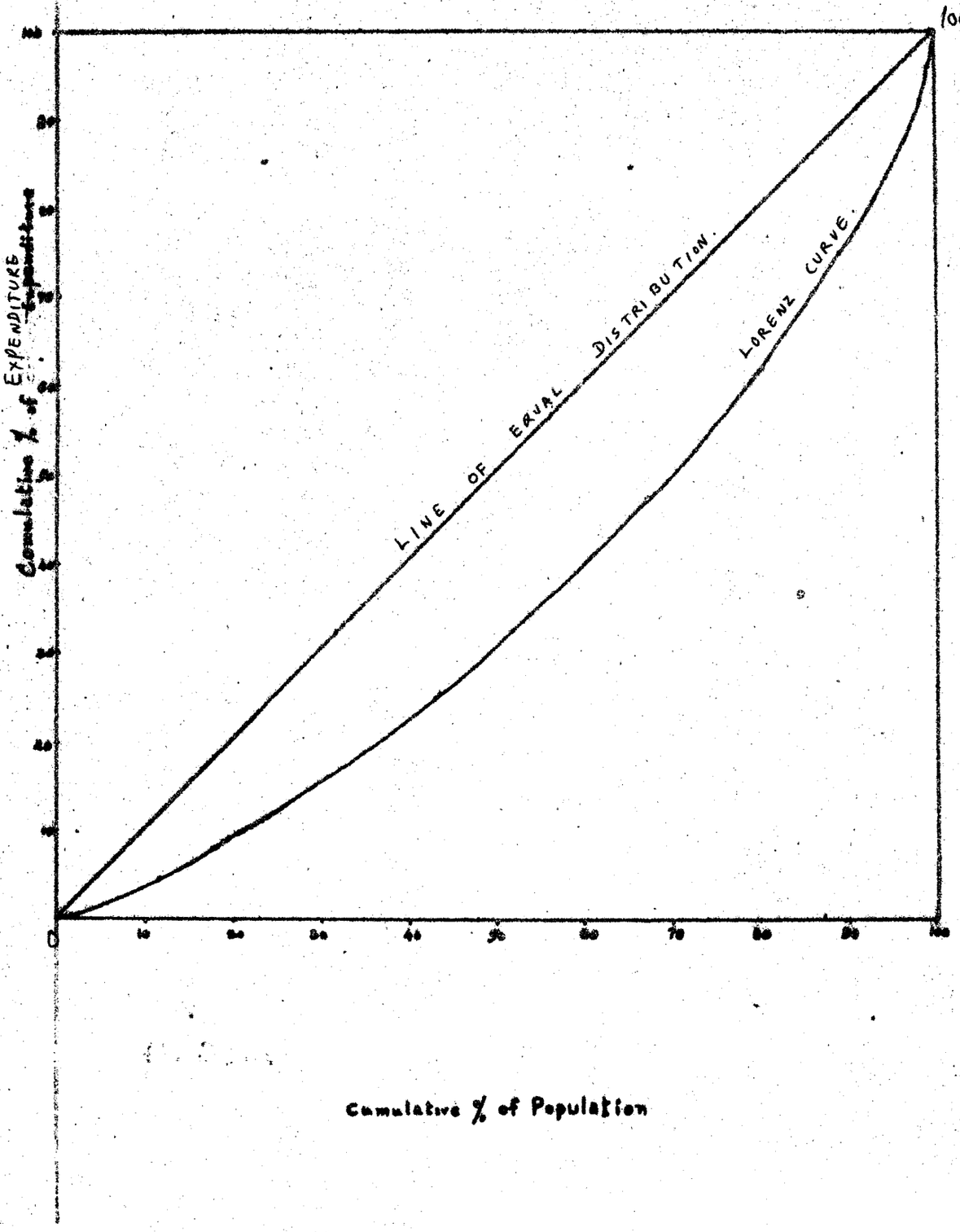
Income Class (Rs)	Cumulative per cent of population	Cumulative per cent Consumer expenditure *
1	2	3
0 - 1000	53.98%	34%
1001 - 2000	70.88%	51%
2001 - 2200	76.10%	56.90%
2201 - 3000	93.06%	81%
3001 - 4000	97.04%	89.20%
4001 - 5000	98.22%	92.2%
5001 - 7000	99.07%	94.4%
7001 - 10000	99.62%	96.60%
10001 - 15000	99.82%	97.80%
15001 - 20000	99.91%	98.60%
20001 - 30000	99.96%	99.40%
Above 30000	100.00	100.00
Total	100%	100%

(* Reading taken from the Lorenz Curve - Fig II.7)

Fig.II.7

LORENZ CURVE FOR N.S.S. BASED CONSUMER EXPENDITURE. 66

Rural (1964-65)



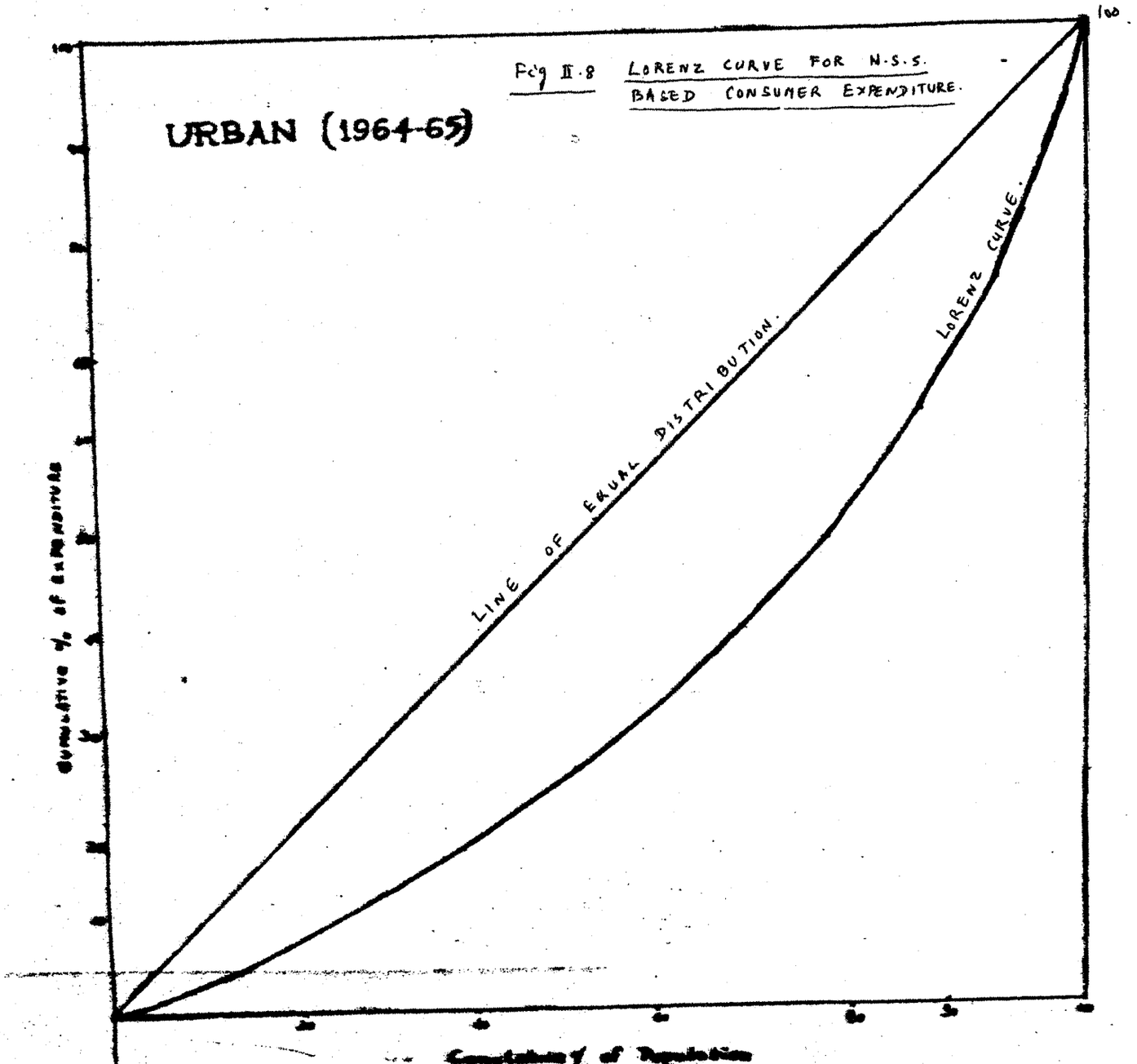
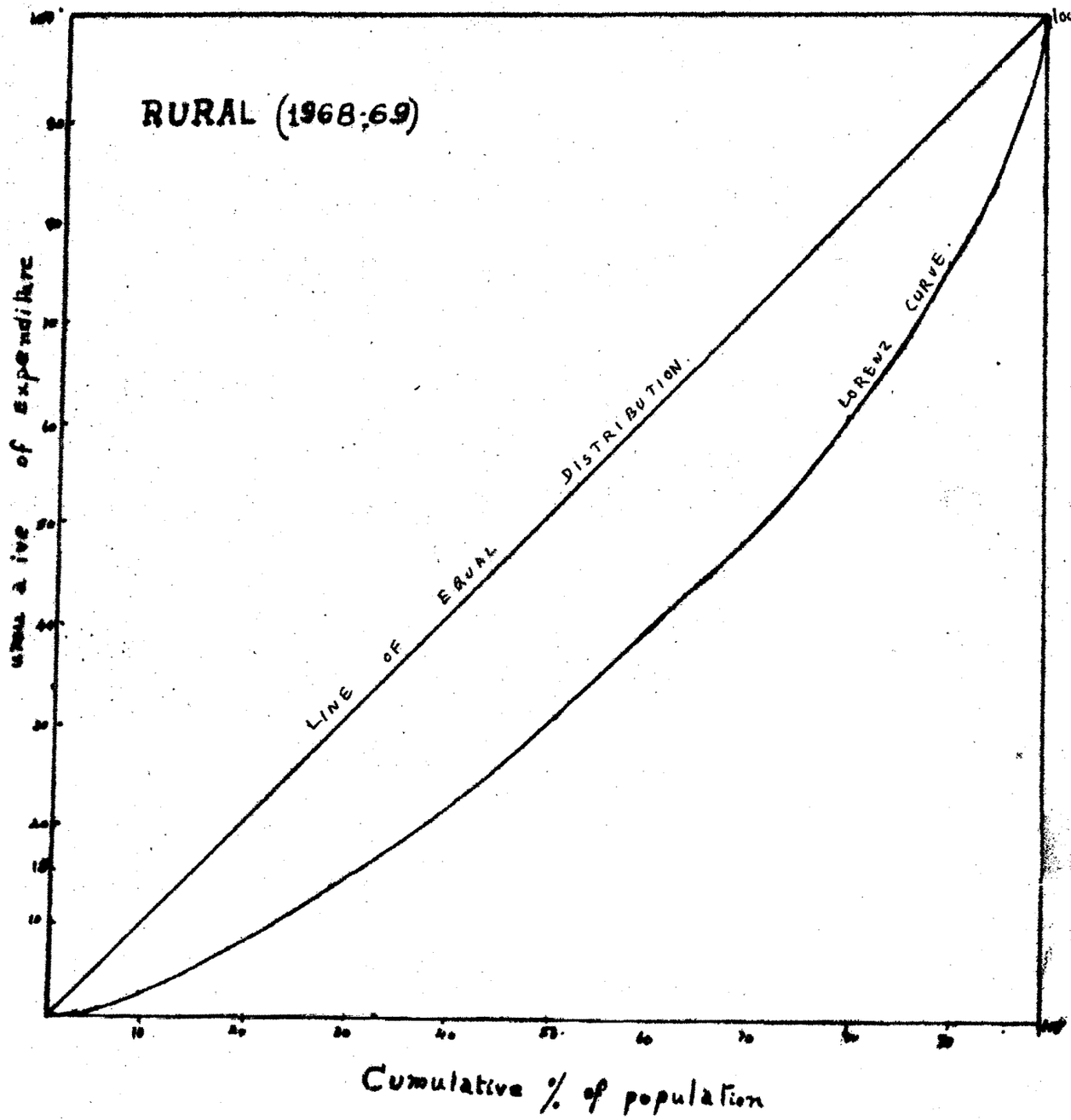


Fig II·8 LORENZ CURVE FOR N.S.S. BASED CONSUMER EXPENDITURE.

Fig.II.9

LORENZ CURVE FOR N.S.S. BASED CONSUMER EXPENDITURE. 68



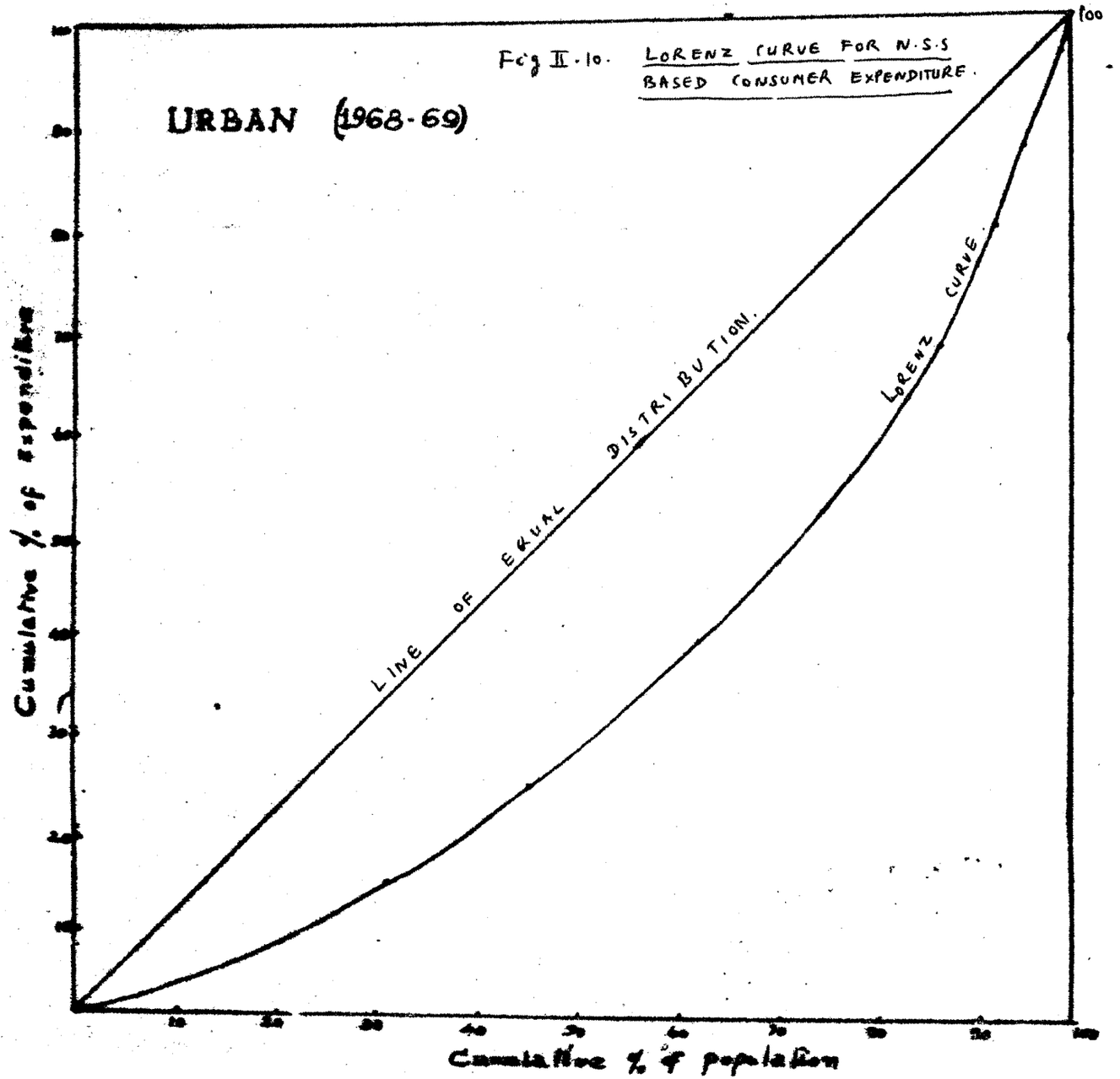


Fig II.10. LORENZ CURVE FOR N.S.S BASED CONSUMER EXPENDITURE.
URBAN (1968-69)
LINE OF EQUAL DISTRIBUTION.
LORENZ CURVE
Cumulative % of expenditure
Cumulative % of population
100

Fig.II.11

LORENZ CURVE FOR N.S.S.
BASED CONSUMER EXPENDITURE.

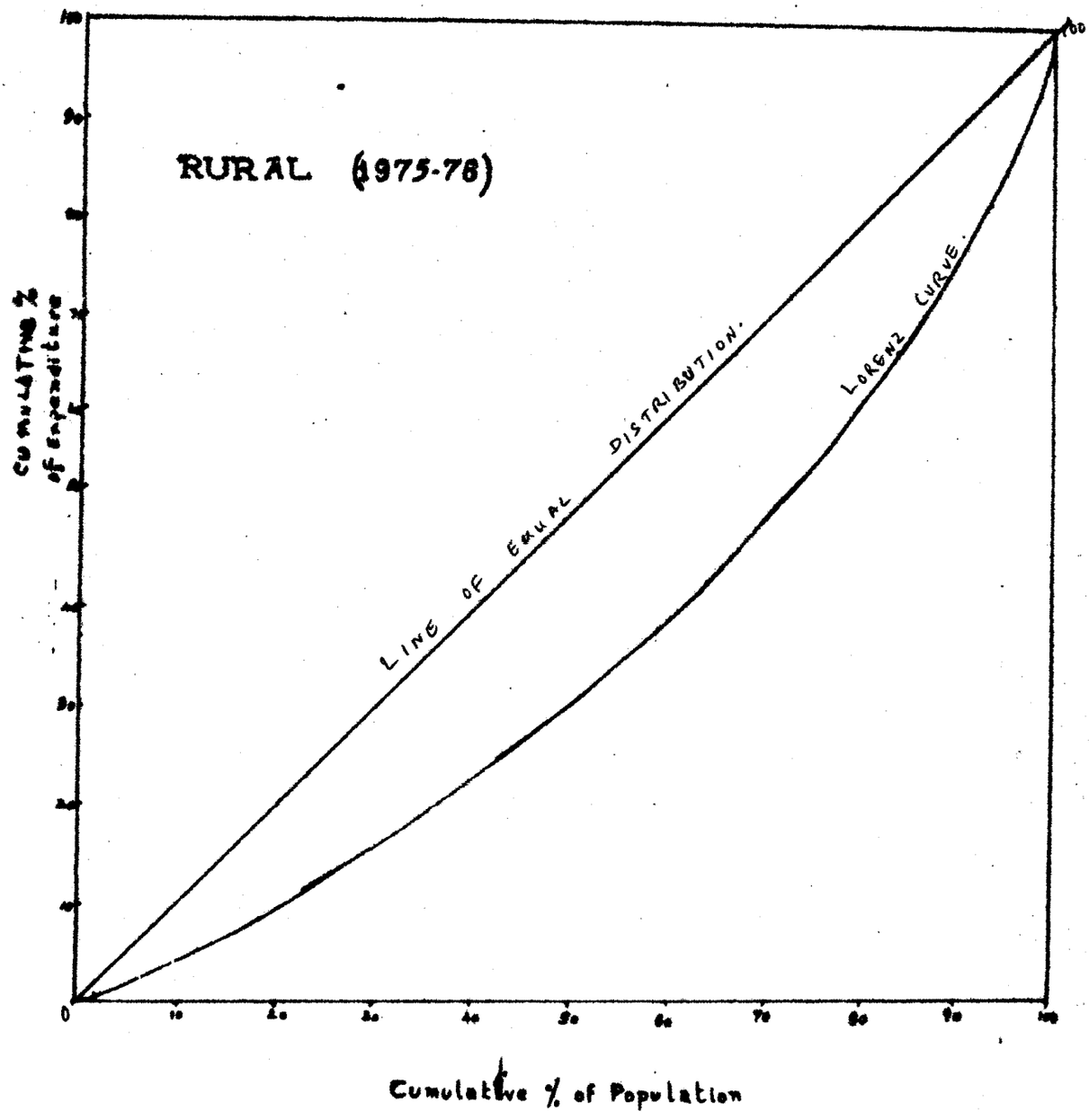
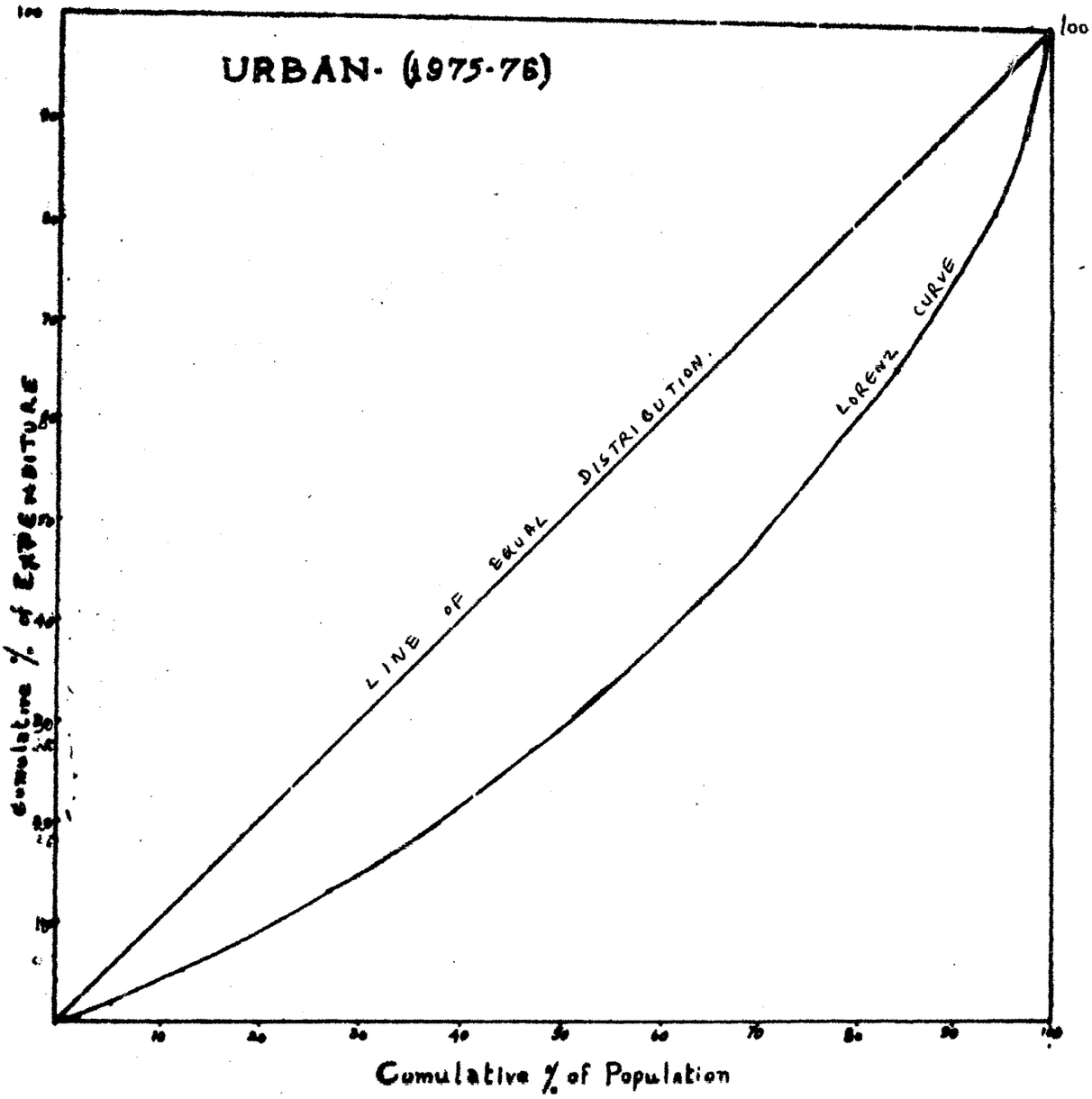


Fig.II.12

LORENZ CURVE FOR N.S.S.
BASED CONSUMER EXPENDITURE.



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Next we attempted to estimate the personal income of the persons, falling in the various income brackets (i.e. A to L) of 1964-65 (rural area). As for the lower income, brackets (A, B, C), we could find their personal income, from the consumer expenditure, already derived. For the income bracket Rs.0-1000 (i.e., Case A) we have already postulated negative savings. So, using the C/Y ratio as 1.06 51/ for this bracket, we have worked out the personal income of it. It is obvious that the personal income of this bracket is lesser than its consumer expenditure due to dissaving. Now, for the income brackets Rs. 1001 - 2000 and Rs. 2001 - 2200 (case B and C), we have already assumed that their income is equal to their consumer expenditure. As we have already derived the consumer exoenditure (as explained in the above paragraph), we have treated the same as the personal income of these income brackets. In regard to the personal income of the upper income groups, (i.e., the income brackets beyond the point of Tangency - D, E, F, G, H, I, J, K, and L) it has been calculated by finding out the mean per capita income as derived from the graph. The number of persons of the bracket are multiplied by the mean per capita income to derive the personal income of that bracket.

51/ See N.C.A.E.R. The All India Rural Household Survey Vol II (income, investment and saving) New Delhi, 1965 p 96.

TABLE II.6

Cumulative Distribution of Population by Income Class and the Corresponding Cumulative Percentage distribution of Consumer Expenditure

Thus, the personal income as well as the consumer expenditure for all the income brackets (A to L) of 1964-65 (rural area) are derived.

For the urban distribution also, we have followed the same method. In the case of urban area, we have assumed that households having annual income below Rs.2000/- do possess negative saving, the C/Y ratio worked out from the N.C.A.E.R. data, being 1.20. The N.S.S data on consumer expenditure relating to urban area has been made use of to construct a lorenz curve and from it, the corresponding percentage of consumer expenditure for each of the income bracket, has been derived (See Table II.6). The All India position of cumulative percentage of persons along with the cumulative percentage of consumer expenditure is shown in Table II.7. For the other years also - 1968-69, 1975-76 - we have adopted the same procedure of 1964-65. Individual graphs are drawn for the rural and urban areas separately to estimate the distribution of persons among various income brackets, along with the bracket-wise personal income and consumer expenditure. (See Fig II.1, II.2, II.3, II.4, II.5 and II.6 and tables II.8 to II.16). The description of the e r l t l for he e r therefore is redund nt

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TABLE II.7

Cumulative Distribution of Population by Income Class and Corresponding Cumulative Percentage distribution of Consumer Expenditure

All India (1964-65)

Income Class (Rs)	Cumulative % of Population	Cumulative % of Consumer expenditure
1 - 1,000	46.65	26.80
1001 - 2,000	68.44	46.05
2001 - 3,000	91.72	76.52
3001 - 4,000	96.9	87.54
4001 - 5,000	98.09	90.70
5001 - 7,000	99.0	93.37
7001 - 10,000	99.55	95.78
10,001 - 15,000	99.75	96.98
15,001 - 20,000	99.89	98.64
20,001 - 30,000	99.95	99.47
Above 30,000	100.00	100.00

Source: Calculated on the basis of Tables II.5 and II.6.

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TABLE II.8

Size Distribution of Personal Income and Corresponding Consumer Expenditure

Rural (1964-65)

S.No.	Income Class (in Rupees)	Population (in million)	Personal income (in lakhs of Rupees)	Consumer expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	204.69	388833.73	412348.21
2.	1001 - 2000	64.09	206174.11	206174.11
3.	2001 - 2200	19.82	71554.54	71554.54
4.	2201 - 3000	64.30	362806.32	292282.11
5.	3001 - 4000	15.08	139194.43	99448.69
6.	4001 - 5000	4.46	56463.60	36383.66
7.	5001 - 7000	3.21	53773.92	26681.35
8.	7001 - 10000	2.07	49059.00	26681.35
9.	10001 - 15000	0.78	27069.12	14553.46
10.	15001 - 20000	0.35	17173.80	9702.31
11.	20001 - 30000	0.22	15261.84	9702.31
12.	Above 30000	0.13	74365.20	7276.73
	TOTAL	379.20	1461729.60	1212788.80

Notes : The sum total of income classes may not add up to total due to rounding off.

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TABLE II.9

Size Distribution of Personal Income and Corresponding Consumer Expenditure

Urban (1964-65)

S. No.	Income class (in Rupees)	Population (in million)	Personal income (in lakhs of Rupees)	Consumer Expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	16.46	22830.02	27412.54
2.	1001 - 2000	39.20	95647.85	114789.98
3.	2001 - 2500	20.13	94230.59	94230.59
4.	2501 - 3000	6.14	43566.98	41975.44
5.	3001 - 4000	9.48	104772.96	81380.96
6.	4001 - 5000	1.16	20337.12	15419.56
7.	5001 - 7000	1.08	25051.68	17132.83
8.	7001 - 10000	0.56	18352.32	12849.62
9.	10001 - 15000	0.18	8633.52	5139.85
10.	15001 - 20000	0.26	17656.08	9423.06
11.	20001 - 30000	0.08	7677.12	3854.88
12.	Above 30000	0.07	23671.20	4723.52
	Total	94.80	482427.43	428320.84

Note : The sum total of income classes may not add up to total due to rounding off.

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TABLE II.10

Size Distribution of Personal Income and Corresponding Consumer Expenditure

All India (1964-65)

S.No.	Income class (in Rupees)	Population (in million)	Personal income (in lakhs of Rupees)	Consumer expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	221.15	411663.75	439760.75
2.	1001 - 2000	103.29	301821.96	320964.09
3.	2001 - 3000	110.39	572158.42	500042.68
4.	3001 - 4000	24.56	243967.39	180829.65
5.	4001 - 5000	5.62	76800.72	51803.22
6.	5001 - 7000	4.29	78825.60	43814.18
7.	7001 - 10000	2.63	67411.32	39530.97
8.	10001 - 15000	0.96	35702.64	19693.31
9.	15001 - 20000	0.61	34829.88	19125.37
10.	20001 - 30000	0.30	22938.96	13557.19
11.	Over 30,000	0.20	98036.40	12000.25
	Total	474.0	1944157.00	1641109.60

Note : The sum total of income classes may not add up to total due to rounding off.

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TABLE II.11

Size Distribution of Personal Income and Corresponding Consumer Expenditure

Rural (1968-69)

S.No.	Income class	Population (in million)	Personal income (in lakhs of Rupees)	Consumer expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	50.14	65522.40	69450.00
2.	1001 - 2000	168.62	459726.00	459726.00
3.	2001 - 2580	94.07	330637.20	330637.20
4.	2581 - 3000	25.71	141024.00	127200.00
5.	3001 - 4000	47.02	340011.60	297643.20
6.	4001 - 5000	16.25	177840.00	152272.80
7.	5001 - 7000	5.98	94579.20	82678.80
8.	7001 - 10000	3.59	82066.80	60312.00
9.	10001 - 15000	1.70	56181.60	35700.00
10.	15001 - 20000	0.60	27403.20	16536.00
11.	20001 - 30000	0.43	28353.60	12120.00
12.	Above 30000	0.29	240746.40	9331.20
	Total	414.40	2044092.00	1653574.80

Note : The sum total of income classes may not add up to total due to rounding off.

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TABLE II.12

Size Distribution of Personal Income and Corresponding Consumer Expenditure:

Urban (1968-69)

S.No.	Income Class (Rs.)	Population (in million)	Personal income (in lakhs of Rupees)	Consumer Expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	5.34	7197.60	8637.60
2.	1001 - 2000	37.44	83986.80	100784.40
3.	2001 - 3000	23.59	109423.20	109423.20
4.	3001 - 4000	21.01	155457.60	149113.20
5.	4001 - 5000	8.98	105303.60	83532.00
6.	5001 - 7000	3.26	55276.80	46072.80
7.	7001 - 10000	1.99	47640.00	28656.00
8.	10001 - 15000	1.04	35992.80	18720.00
9.	15001 - 20000	0.35	17110.80	8640.00
10.	20001 - 30000	0.34	23476.80	10455.60
11.	Above 30000	0.26	87921.60	11904.00
	Total	103.60	728787.60	575913.60

Note : The sum total of income classes may not add up to total due to rounding off

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TABLE II.13

Size Distribution of Personal Income and Corresponding Consumer Expenditure

All India (1968-69)

S.No.	Income Class (Rs)	Population (in million)	Personal income (in lakhs of Rupees)	Consumer Expenditure (in lakhs of Rupees)
1.	0 - 1000	55.48	72720.00	78087.60
2.	1001 - 1000	206.06	543712,80	560510.40
3.	2001 - 3000	143.37	581084.40	567260.40
4.	3001 - 4000	68.03	495469.20	312554.40
5.	4001 - 5000	25.23	283143.60	235804.80
6.	5001 - 7000	9.24	149856.00	128751.60
7.	7001 - 10000	5.58	129706.80	88968.00
8.	10001 - 15000	2.74	92174.40	54420.00
9.	15001 - 20000	0.95	44514.00	25176.00
10.	20001 - 30000	0.77	51830.40	22575.60
11.	Above 30000	0.55	328668.00	21235.20
	Total	518.00	2772879.60	2229488.40

Note : The sum total of income classes may not add up to total due to rounding off.

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TABLE II.14

Size Distribution of Personal Income and Corresponding Consumer Expenditure

Rural (1975-76)

S.No.	Income class (Rs)	Population (in million)	Personal income (in lakhs of Rupees)	Consumer Expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	6.51	10268.62	10884.73
2.	1001 - 2000	67.13	221322.81	221322.81
3.	2001 - 3000	135.17	689366.16	689366.16
4.	3001 - 4000	127.04	856265.32	856265.32
5.	4001 - 5000	84.74	856265.32	856265.32
6.	5001 - 7000	48.35	744336.55	736533.12
7.	7001 - 10000	5.57	147957.19	112475.53
8.	10000 - 15000	2.66	103569.39	90706.07
9.	15001 - 20000	0.64	35294.23	25397.70
10.	20001 - 30000	0.42	33040.22	18141.22
11.	Above 30,000	0.25	210947.71	10884.73
	Total	478.48	3908633.20	3628242.90

Note : The sum total of income classes may not addup to total due to rounding off.

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TABLE II.15

Size Distribution of Personal Income and Corresponding Consumer Expenditure

URBAN 1975-76

Sl. No.	Income Class Rs.	Population (in million)	Personal income (in Lakhs of Rupees)	Consumer expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	10.20	32292.16	38750.58
2.	1001 - 2000	6.29	25228.21	30273.86
3.	2001 - 3000	17.92	104142.07	104142.07
4.	3001 - 4000	30.16	226448.44	226448.44
5.	4001 - 5000	29.70	308793.34	308793.34
6.	5001 - 5230	3.01	38750.53	38750.53
7.	5231 - 7000	18.16	339813.97	296683.80
8.	7001 - 10000	2.62	91191.72	90821.57
9.	10000 - 15000	0.92	46840.03	44805.31
10.	15001 - 20000	0.30	21646.79	15742.40
11.	20001 - 30000	0.19	19373.27	10898.59
12.	Above 30000	0.14	62279.39	4843.81
	Total	119.62	1316799.60	1210954.30

Note: The sum total of income classes may not add up to total due to rounding off.

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TABLE II.16

Size Distribution of Personal Income and Corresponding Consumer Expenditure

All India (1975-76)

Sl. No.	Income class Rs.	Population (in million)	Personal income (in lakhs of Rupees)	Consumer expenditure (in lakhs of Rupees)
1	2	3	4	5
1.	0 - 1000	16.71	42560.78	49635.31
2.	1001 - 2000	73.42	246551.02	251596.67
3.	2001 - 3000	155.09	793508.23	793508.23
4.	3001 - 4000	157.20	1082713.70	1082713.70
5.	4001 - 5000	114.44	1165058.60	1165058.60
6.	5001 - 7000	69.52	1122901.00	1071967.40
7.	7001 - 10000	8.19	239148.91	203297.10
8.	10000 - 15000	3.58	150409.42	135511.38
9.	15001 - 20000	0.94	56941.02	41140.10
10.	20001 - 30000	0.61	52413.49	29039.81
11.	Above 30000	0.39	273227.09	15728.54
	Total	598.10	5225432.80	4839197.20

Note : The sum total of income class may not add up to total due to rounding off.

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III

SUMMARY AND LIMITATIONS

As the data on size distribution of income as well as consumer expenditure are not available as required for our study, we have estimated the size distribution of income by integrating the N.S.S based consumer expenditure with that of the paretoan distribution of income tax data. The National Sample Survey data on consumer expenditure has been used to construct lorenz curves and from them we have worked out the bracket wise consumer expenditure for all the household income brackets in rural and urban areas for all the years covered by our study.

The estimates relating to (a) distribution of persons among the various income brackets, (b) personal income for each income bracket and (c) consumer expenditure for each income bracket are calculated on the basis of the following assumptions.

(1) The distribution of assessees given by the income tax data for the higher income groups follows the Pareto law.

(2) Savings in the lower income class upto Rs. 1,000/- household income per year in the rural India and Rs. 2,000/- in the urban India are negative.

(3) The saving-income ratios given by the N.C.A.E.R. for rural and urban India for the year 1963-64 apply to all the years of our present study.

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(4) Except the households specified in (2) above, all the households covered upto and below the point of tangency have income which is equal to their expenditure (i.e., C = Y)

(5) The Paretean distribution of income tax applies to rural and urban areas.

(6) N.S.S. expenditure distribution is very close to lognormality.

(7) The N.S.S based consumer expenditure data apply to the corresponding financial years in respect of 1964-1965 and 1968-1969 years. N.S.S. Consumer expenditure data of 1973-1974 apply to the financial year 1975-1976.

(8) The persons falling upto and below the point of tangency do not pay any direct taxes.

(9) There is uniform distribution of income and expenditure among the households within each income or expenditure bracket.

(10) Each assessee of the income tax data represents a household, consisting of 3.5 persons on average, and the same average size applies to all the years of our study.

(11) Income or expenditure brackets are continuous, in the sense that there are no gaps in the distribution of persons across the income or expenditure classes.

These assumptions are conventionally made in a study of this type, due to data constraints 52/. We feel that these

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52/ For example, some of the eminent writers in this area like M. Mukherjee, Y. Huang and K.W. Roskamp have assumed in the same way. M. Mukherjee made many arbitrary assumptions to estimate the size distribution of personal income in India for the years 1953-54; 1956-57 and 1960-61. To quote some of them in the words of M. Mukherjee

"First, we have assumed dissaving rates of 20,15,10 and 5 per cent respectively in the four lowest expenditure brackets, making a conservative estimate of these rates notionally but taking some cognizance of the findings of the N.C.A.E.R. The aggregate dissaving together with the aggregate saving in the household sector has been distributed to the top most and the next expenditure class in the ratio of 9:1 again arbitrarily. In addtion, we have inflated the per capita consumer expenditure by one third in the topmost bracket arbitrarily" -

Please see M. Mukherjee "Distribution of consumption expenditure and personal income by size" in "National Income of India: Trends and Structure" Statistical publishing Society, Calcutta, 1969 p.315.

Also see Y. Huang "Distribution of the Tax Burden in Tanzania"

The Economic Journal 86 (March 76) pp 73-86

Prof. Huang uses the household budget survey of 1969 to study the tax burden of 1971. Income Distribution in each income bracket was adjusted upwords 20% arbitrarily as an estimate of size distribution of income for 1971.

Also See Karl. W. Roskamp. "Distribution of Tax Burden in West Germany in 1950" National Tax Journal Vol.XVI No:1, march, 1963. Karl W. Roskamp derives the household distribution by size brackets of income, assuming a percentage differential of two income distributions as 'constant' which he expresses by a formula - X = (a-b) and applies to the year 1950.

APPENDIX A.II

EXPLANATORY NOTE ON LOGNORMAL DISTRIBUTION

The Statistical Property of the normal distribution is widely used to explain the distribution of a random variable. If the distribution of the logarithmic values of a random variable follows a normal distribution it is called lognormal distribution. The distribution of the random variable is specified by two Parameters, namely the mean and the variance. The area occupied under the normal curve at different limits of the variable is found by what is called the 'density function' which is specified by the two parameters μ and λ . The parameters of the density function (μ, λ) are determined by the mean and variance of the given distribution. Let us suppose M_1 and M_2 are the first and second moments of a given distribution. By using the following formula, the parameters of the density function are determined.

$$\mu = 2 \log M_1 - \frac{\log M_2}{2}$$

$$\lambda = \sqrt{(\log M_2 - 2 \log M_1)}$$

After calculating μ and λ , (i.e. the parameters of the density function of the normal curve) the cumulative area occupied by the random variable at any required limit can be found out. An example, makes this point clear. Let us suppose that we want to know, say,

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the area occupied by a random variable x, at a limit of Rs.8. It can be found by using the following integral formula

Limit 0-8 = Cumulative area occupied by the random variable, x between 0-8 = $\int_{0}^{8} \frac{\log 8 - \mu}{\lambda} \phi x \cdot dx$

As μ and λ having already estimated, the cumulative area occupied by the random variable, x, from 0 to 8 is found out.

Now, in our study, the technique of lognofmal distribution has been adopted with respect to N.S.S based consumer expenditure. We have calculated μ and λ for the N.S.S. based consumer expenditure, with the help of the of the formulae explained above. We have plotted the cumulative number of persons as against the upper expenditure per capita and obtained a curve which is cancave to the origin. This curve is the fitted lognormal curve for the N.S.S. - based consumer expenditure. For the years 1964-65, 1968-69 and 1975-76, which are covered by our study, the fitted and actual values are very close at many expenditure limits, indicating that the lognormal fits are good.

Appendix tables A II.1, A II.2, A II.3, A II.4, A II.5 and A II.6 show the estimation of μ and λ for the NSS based consumer expenditure for the years 1964-65, 1968-69 and 1975-76. Tables A II.7 to A II.12 show the cumulative (greater than type) population at different upper per capita expenditure levels for 1964-65, 1968-69 and 1975-76.

Estimation of Densit Parameters and of Lo normal Distributi

for the N.S.S. based Consumer Expenditure

URBAN (1964-65)

Monthly Per capita Expenditure class (Rs)	Per capita Expenditure x_i (Rs.)	No. of Persons f_i	$\sum_{i=1}^{n} f_i x_i$	x_i^2
1	2	3	4	5
0-8	6.27	214.20	1343.03	39.31
8-11	9.65	877.80	8470.77	93.12
11-13	12.12	1196.16	14497.46	146.89
13-15	14.08	2043.44	28771.64	198.25
15-18	16.51	3997.50	65998.73	272.58
18-21	19.50	4262.08	83110.56	380.25
21-24	22.48	4126.14	92755.63	505.35
24-28	25.97	5319.00	138134.43	674.44
28-34	30.84	6207.30	191433.13	951.10
34-43	38.07	5436.60	206971.36	1449.33
43-55	48.50	4450.16	215832.76	2352.25
55-75	63.50	3740.75	237537.63	4032.25
Above 75	119.69	3554.70	425462.04	14325.70

$\sum_{i=1}^{n} f_i = 45425.83$ $\quad \sum_{i=1}^{n} f_i x_i = 1710349.17$

$$M_1 = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i} = 37.66$$

$$M_2 = \frac{\sum_{i=1}^{n} f_i x^2{}_i}{\sum_{i=1}^{n} f_i} = 2186.$$

Estimation of ensi arame ers an o o norma is ri i i

for the N.S.S. based Consumer Expenditure

URBAN (1968-69)

Monthly Per capita Expenditure class (Rs)	Per capita Expenditure x_i (in Rupees)	No. of Persons f_i	$\sum_{i=1}^{n} f_i x_i$	x_i^2	$\sum_{i=1}^{n} f_i x_i^2$
1	2	3	4	5	6
0-8	5.45	24.29	132.40	29.70	721.41
8-11	9.59	350.35	3359.86	91.97	32221.69
11-13	12.17	346.62	4218.36	148.11	51337.88
13-15	14.08	784.80	11049.98	198.25	155586.60
15-18	16.62	1781.98	29616.51	276.22	492218.51
18-21	19.59	2635.34	51626.31	383.77	1011364.43
21-24	22.62	3153.92	71341.67	511.66	1613734.71
24-28	25.91	4914.86	127344.02	671.33	3299492.96
28-34	31.07	6288.60	195386.80	965.34	6070637.12
34-43	38.34	7911.04	303309.27	1469.95	11628833.25
43-55	48.70	5936.15	289090.50	2371.70	14078766.95
55-75	63.84	5252.00	335287.68	4075.55	21404788.60
Above 75	115.48	5622.24	649256.27	13335.63	74976112.41

$\sum_{i=1}^{n} f_i = 44925.50$ $\quad \sum_{i=1}^{n} f_i x_i = 2068370.00$ $\quad \sum_{i=1}^{n} f_i x_i^2 = 134815816.$

$$M_1 = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i} = 46.04 \qquad M_2 = \frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i} = 300$$

Appendix Table A II.5

Estimation of Density Parameters μ and λ of Log normal Distribution for the N.S.S. based Consumer Expenditure

RURAL (1975-76)

Monthly Per capita Expenditure class (Rs)	Per capita Expenditure x_i (in Rs.)	No. of Persons f_i	$\sum_{i=1}^{n} f_i x_i$	x_i^2	$\sum_{i=1}^{n} f_i x_i^2$
1	2	3	4	5	6
0-13	10.57	272.25	2877.68	111.72	30752.28
13-15	14.04	287.63	4038.33	197.12	56698.09
15-18	16.81	874.35	14697.82	282.58	247070.41
18-21	19.67	1653.76	32529.46	386.91	639854.46
21-24	22.45	2397.84	53831.51	504.00	1208517.35
24-28	26.03	4351.45	113268.24	677.56	2948372.38
28-34	30.98	9255.33	286730.12	959.76	8882899.22
34-43	38.38	15456.00	593201.28	1473.02	22767065.13
43-55	48.56	16810.20	816303.31	2358.07	39639688.83
55-75	68.56	16315.20	1118570.10	4700.47	76689166.88
75-100	85.31	8008.80	683230.72	7277.80	58286413.41
100-150	119.42	4284.50	511654.99	14261.14	61101837.19
150-200	169.85	948.60	161119.71	28849.02	27366182.27
Above 200	284.69	526.05	149761.17	81048.40	42635508.72
		$\sum_{i=1}^{n} f_i$ = 81423.96	$\sum_{i=1}^{n} f_i x_i$ = 4541814.44		$\sum_{i=1}^{n} f_i x_i^2$ = 342500026.
			$\sum f_i x_i$		$\sum f.x^2$

URBAN (1975-76)

Per capita Expenditure x_i (in Rs.)	No. of Persons f_i	$\sum_{i=1}^{n} f_i x_i$	x_i^2	$\sum_{i=1}^{n} f_i x_i^2$
2	3	4	5	6
8.47	16.74	141.79	71.74	1200.94
13.56	37.70	511.21	183.87	6932.03
17.01	104.20	1772.44	289.34	30149.24
19.58	186.42	3650.10	383.38	71469.03
22.77	468.10	10658.64	518.47	242697.16
26.19	1102.08	28863.47	685.91	755934.42
31.18	2697.50	84108.05	972.19	2622489.00
38.51	5649.40	217558.39	1483.02	8378173.75
48.91	7375.90	360755.27	2392.19	17644540.21
64.04	8549.61	547517.02	4101.12	35062990.24
85.94	5450.00	468373.00	7385.68	40251975.62
107.60	3846.01	413830.68	11577.76	44528180.74
171.82	1279.58	219857.44	29522.11	38277780.50
287.82	991.20	285287.18	82840.35	82111357.30

$\sum_{i=1}^{n} f_i = 37754.44$ $\quad \sum_{i=1}^{n} f_i x_i = 2642884.69$ $\quad \sum_{i=1}^{n} f_i x_i^2 = 269985870.18$

$$M_1 = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i} = 70.00 \qquad M_2 = \frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i} = 7151.10$$

Appendix Table A II.7

Cumulative (greater than type) Population at Different Upper Per capita Expenditure Levels

Rural (1964-65)

Monthly per capita Expenditure class (Rs.)	Upper Per capita expenditure (x) (Rs.)	Log (x)	Proportion of area under the normal curve	Cumulative Population (greater than type) (in million) (y)	Log (y)
1	2	3	4	5	6
0-8	8	0.9031	0.0392	364.39	2.5616
8-11	11	1.0414	0.0701	337.80	2.5286
11-13	13	1.1139	0.0618	314.36	2.4975
13-15	15	1.1761	0.0678	288.65	2.4605
15-18	18	1.2553	0.1020	249.97	2.3892
18-21	21	1.3222	0.0995	212.24	2.3267
21-24	24	1.3802	0.0915	177.54	2.2492
24-28	28	1.4472	0.1012	139.16	2.1436
28-34	34	1.5315	0.1123	96.57	1.9848
34-43	43	1.6335	0.1100	54.85	1.7392
43-55	55	1.7404	0.0738	26.86	1.4291
55-75	75	1.8751	0.0475	8.34	0.9465
Above 75	-	-	0.0283	-	-
Total	-	-	1.0000	-	-

Note : For sources and methodology, please see text.

Appendix Table A II.8

Cumulative (Greater than type) Population at Different Upper per capita Expenditure Levels

Urban (1964-65)

Monthly per capita expenditure (Rs.)	Upper per capita Expenditure (x) (Rs)	Log (x)	Proportion of area under the normal curve	Cumulative population (Greater than type) in million (y)	Log (y)
1	2	3	4	5	6
0-8	8	0.9031	0.0217	92.78	1.9675
8-11	11	1.0414	0.0389	89.09	1.9498
11-13	13	1.1139	0.0362	85.65	1.9238
13-15	15	1.1761	0.0411	81.75	1.9125
15-18	18	1.2553	0.0711	75.01	1.8752
18-21	21	1.3222	0.0720	68.18	1.8336
21-24	24	1.3802	0.0710	61.45	1.7886
24-28	28	1.4472	0.0884	53.07	1.7249
28-34	34	1.5315	0.1192	41.77	1.6208
34-43	43	1.6335	0.1319	29.26	1.4663
43-55	55	1.7404	0.1163	18.23	1.2608
55-75	75	1.8751	0.1004	8.71	0.9400
Above 75	-	-	0.0918	-	-
Total	-	-	1.0000	-	-

Note : For sources and methodology, please see text.

Appendix Table A II.9

Cumulative (greater than type) Population at different Upper Per capita Expenditure Levels

Rural (1968-69)

Monthly Percapita Expenditure class (Rs)	Upper Per capita expenditure (x) (Rs.)	Log (x)	Proportion of area under the normal curve	Cumulative (greater than type) Population (in million) (y)	Log (y)
1	2	3	4	5	6
0-8	8	0.9031	0.0129	409.06	2.6117
8-11	11	1.0414	0.0346	394.72	2.5963
11-13	13	1.1139	0.0363	379.68	2.5793
13-15	15	1.1761	0.0454	360.87	2.5691
15-18	18	1.2553	0.0769	329.00	2.5172
18-21	21	1.3222	0.0851	293.74	2.4679
21-24	24	1.3802	0.0833	259.22	2.4136
24-28	28	1.4472	0.1056	215.46	2.3334
28-34	34	1.5315	0.1340	159.93	2.2039
34-43	43	1.6335	0.1408	101.58	2.0064
43-55	55	1.7404	0.1137	54.46	1.5361
55-75	75	1.8751	0.0829	20.11	1.3034
Above 75	-	-	0.0485	-	-
Total	-	-	1.0000	-	-

Note: For sources and methodology, please see text

Appendix Table A II.10

Cumulative (greater than type) Population at Different Upper Per capita Expenditure levels

Urban (1968-69)

Monthly Percapita Expenditure Class (Rs)	Upper Per capita expenditure (x) (Rs.)	Log(x)	Proportion of area under the normal curve	Cumulative (greater than type) Population (in million) (y)	Log (y)
1	2	3	4	5	6
0-8	8	0.9031	0.0030	103.24	2.0136
8-11	11	1.0414	0.0113	102.07	2.0086
11-13	13	1.1139	0.0144	100.58	2.0021
13-15	15	1.1761	0.0208	98.43	1.9931
15-18	18	1.2553	0.0508	93.17	1.9696
18-21	21	1.3222	0.0420	88.82	1.9485
21-24	24	1.3802	0.0582	82.80	1.9180
24-28	28	1.4472	0.0838	74.12	1.8699
28-34	34	1.5315	0.1247	61.20	1.7868
34-43	43	1.6335	0.1585	44.78	1.6511
43-65	55	1.7404	0.1582	28.39	1.4532
55-75	75	1.8751	0.1472	13.16	1.1191
Above 75	-	-	0.1271	-	-
Total	-	-	1.0000	-	-

Note: For sources and methodology, please see text.

Appendix Table AII.11

Cumulative (greater than type) Population at Different Upper Per Capita Expenditure Levels

Rural (1975-76)

Monthly Per capita Expenditure Class (Rs.)	Upper Per capita Expenditure (x) (Rs.)	Log(x)	Proportion of area under the normal curve	Cumulative Population (greater than type) (in Million) (y)	Log(y)
1	2	3	4	5	6
0-13	13	1.1139	0.0069	475.18	2.6769
13-15	15	1.1761	0.0074	471.64	2.6735
15-18	18	1.2553	0.0179	463.07	2.6656
18-21	21	1.3222	0.0272	450.06	2.6533
21-24	24	1.3802	0.0374	432.16	2.6357
24-28	28	1.4472	0.0594	403.74	2.6061
28-34	34	1.5315	0.1049	353.55	2.5484
34-43	43	1.6335	0.1596	277.18	2.4428
43-55	55	1.7404	0.1819	190.15	2.2790
55-75	75	1.8751	0.1997	94.60	1.9759
75-100	100	2.0000	0.1154	39.38	1.5953
100-150	150	2.1761	0.0669	7.37	0.8674
150-200	200	2.3010	0.0119	1.67	0.2240
Above 200	-	-	0.0035	-	-
Total	-	-	1.0000	-	-

Note: For sources and methodology, Please see text.

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Appendix Table A II.12

Cumulative (greater than type) Population at Different Upper Per capita Expenditure Levels

Urban (1975-76)

Monthly Per capita expenditure Class (Rs)	Upper Per capita expenditure (x) (Rs)	Log(x)	Proportion of area under the normal curve	Cumulative (Greater than type) Population (in millions)	Log(y)
1	2	3	4	5	6
0-13	13	1.1139	0.0084	118.62	2.0742
13-15	15	1.1761	0.0070	117.78	2.0712
15-18	18	1.2553	0.0153	115.95	2.0641
18-21	21	1.3222	0.0219	113.33	2.0542
21-24	24	1.3802	0.0267	110.13	2.0418
24-28	28	1.4472	0.0437	104.91	2.0207
28-34	34	1.5315	0.0747	95.97	1.9821
34-43	43	1.6335	0.1215	81.44	1.9108
43-55	55	1.7404	0.1529	63.15	1.8003
55-75	75	1.8751	0.1943	39.91	1.6011
75-100	100	2.0000	0.1469	22.33	1.3489
100-150	150	2.1761	0.1249	7.39	0.8688
150-200	200	2.3010	0.0390	2.73	0.4357
Above 200	-	-	0.0228	-	-
Total	-	-	1.0000	-	-

Note: For sources and methodology, please see text.

APPENDIX B.II

EXPLANATORY NOTE ON PARETO LAW AND ITS USE IN OUR STUDY

At the end of the last century, Pareto studied the income tax data of many countries, such as Britain, Prussia etc. He observed that there was certain regularity in the curves, showing the income level and the persons, enjoying that level of income or more. This regularity has been reduced to a law which is called 'Pareto Law'. The basic idea is that there is a fixed relation between a certain income and the number of persons earning that income or more. Let us call the income level 'Y'. Let us call the number of persons, earning the income level 'Y' or more as 'N_y'. Acc ording to Pareto Law, N_y decreases as we choose a higher Y. The extent to which this happens is shown by the Pareto's Law as follows:

$$N_y = \frac{A}{y^{\alpha}}$$ A and α are the Parameters.

'A' is not particularly important, because it is concerned with the units in which income is expressed. But 'α' is important. It explains the relationship between N_y and Y. The form of the function of the Pareto Law is $\log Y' = \log A - \alpha \log x'$ where Y' = Number of persons earning income x' or more, x' = income level, A and α are constants. In our study, we have used the income tax data to fit the Pareto equation. The values of log A, α, R^2 and standard error of α have been worked out with the help of computer. For all the three years covered by our study, the observed and fitted values are very close. (see Table II.3 in the text). We have plotted the cumulative number of persons

(greater than type) as against the upper income per capita for the incomes greater than Rs. 20,000 and we obtained a straight line. Many points have been found to lie on the straight line, which is also known as 'Pareto line'. Later, the Pareto line has been extrapolated and adjusted so as to become tangent to the NSS based expenditure curve, (already drawn on the same graph paper). At the point of tangency, it is obvious that the per capita expenditure equals the per capita income.
