ON THE EFFECT OF DIFFERENTIALS IN CONSUMER PRICE INDEX ON MEASURES OF INEQUALITY[1]

By N. S. IYENGAR and N. BHATTACHARYA

Indian Statistical Institute

SUMMARY. For comparing the inequalities of two expenditure distributions[2] differing in time,[3] one should bring the later distribution to the prices of the earlier. This does not arise if the consumer price index, for the later period with the earlier as base, does not change with the level of expenditure; but where this index increases (or decreases) monotonically with expenditure, the current price distribution for the later period shows greater (or less) inequality than the corresponding constant price distribution. Analogous results have also been proved for the concentration curves[4] of expenditure on specific commodities. These results are numerically illustrated from the National Sample Survey data.

1. Introduction

1.1. The present note arose out of an investigation (Bhattacharya and Iyengar, 1961) into the changes over time in the inequality of the all-India expenditure distributions thrown up by the different "rounds" of the Indian National Sample Survey (NSS). It was felt that the comparison of inequalities of two expenditure distributions relating to different time periods is conceptually somewhat difficult. Given two expenditure distributions, one for the 'base' period and the other for the 'current' period, it is necessary to bring both the distributions to some common set of prices, before any measure of inequality is calculated. The natural step would be to bring the current period distribution to the prices prevailing in the base period, the base period distribution remaining unchanged. This means finding out, with the help of consumer price indices, the (real) expenditure y at base period prices which is equivalent to each expenditure-figure x involved in the current period distribution, and obtaining the distribution of the y's. The measures of inequality calculated for the base period distribution should be compared with those for this distribution of y's and not with those for the x-distribution. In other words, the comparison should be carried out *at constant prices.*

1.2. This adjustment, necessitated by price variations over time, is hardly ever carried out in practice. The function $\pi(y) = x/y$ defining the consumer price indices is not always known, even approximately, in the form of a series of consumer price indices, each index relating to a particular range of y. Most often the inequality measures calculated for the x-distribution are compared with those for the 'base' distribution.

[1] This is a slightly expanded version of a paper which was read at the Second Econometric Conference held at Waltair during 23-20 June 1961.

[2] Distributions of persons by total consumer expenditure at current prices are being referred to as expenditure distributions.

[3] The ideas contained in this note are also applicable to the problems of comparing expenditure distributions differing in space.

[4] For the definition and properties of such curves, vide Roy, Chakravarti and Laha (1960).

1.3. Now, most of the known measures of inequality are unaffected by scalar transformations of the variate. Thus, if $\pi(y)$ were constant over the whole range of x or y, the distributions of x and y would be essentially the same for purposes of measurement of inequality. If, however, $\pi(y)$ varies with x or y, that is to say, if the consumer price index varies with the level of living, the inequality measures will be different for these two variates. In such cases, the measures for y should alone be compared with those for the base distribution.

1.4. It will be proved below that if $\pi(y)$ is a monotone increasing function of y, the distribution of x exaggerates the true extent of inequality (which is shown by the y-distribution); the Lorenz curve for x will lie uniformly below the Lorenz curve for y. If, on the other hand, $\pi(y)$ is a monotone decreasing function of y, the Lorenz curve for x will lie uniformly above the curve for y. Section 2 proves this result for the theoretical distributions of x and y, assuming only that x is a non-negative variate with a distribution of the continuous type. Section 3 proves the same results for the grouped case.

1.5. Section 4 considers the need of adjustments for concentration curves for individual commodities. No adjustment is found to be necessary for such curves based on quantitative consumption. For concentration curves for expenditure, however, results analogous to those stated in para 1.4 have been proved. Only, instead of $\pi(y)$, the function expressing the consumer price index *for the commodity* as a function of y, is involved.

1.6. Section 5 shows the results of such adjustments on some Lorenz and concentration curves obtained from the Indian National Sample Survey. Suitable deflators used were specially constructed for the purpose. The results of price adjustment do not seem to alter the basic conclusions substantially.

2. Ungrouped distributions of the continuous type

2.1. We first compare the inequalities of the ungrouped theoretical distributions of x and y which are assumed to be of the continuous type.

2.2.. We start by examining a model, which, although simple, seems to be fairly illuminating. Let x be lognormally distributed with relative standard deviation (inequality parameter) λ_x, and let $\pi(y) = \alpha y^{\beta}$ where α and β are constants. Then we have $x = y\pi(y) = \alpha y^{\beta+1}$ so that (i) $\beta > -1$, and (ii) y is also lognormally distributed, with its inequality parameter λ_y given by

$$\lambda_x = (\beta+1)\lambda_y. \quad \dots \quad (1)$$

Thus we have

(I) $$\lambda_y < \lambda_x \text{ if } \beta > 0 \quad \dots \quad (2)$$

(II) $$\lambda_y > \lambda_x \text{ if } -1 < \beta < 0. \quad \dots \quad (3)$$

2.3. Now the Lorenz curve for a log-normal expenditure distribution is defined by the equation

$$t_Q = t_P - \lambda \qquad \dots \quad (4)$$

where Q is the proportion of total expenditure incurred by the poorest $100P\%$ of the population, t_P, t_Q the corresponding standard normal deviates, and λ the relative standard deviation.[5] It follows from this equation that the Lorenz curve for a log-normal distribution having a greater value of λ is uniformly below the Lorenz curve for any log-normal distribution with a smaller value of λ. Obviously, all measures of inequality (e.g. the Lorenz ratio) would be increasing functions of λ. That the Lorenz ratio increases with λ can also be seen from the relation

$$L = 2\phi\left(\frac{\lambda}{\sqrt{2}}\right) - 1 \qquad \dots \quad (5)$$

where ϕ denotes the normal probability integral.

2.4. Now case (I) with $\beta > 0$ corresponds to a situation where the consumer price index is higher for the rich than for the poor; in this case, $\lambda_y < \lambda_x$, so that the Lorenz curve of x (current expenditure) exaggerates the true extent of inequality (which is always given by the Lorenz curve of y). In case (II), on the other hand, $\beta < 0$, which implies a higher consumer price index for the poor than for the rich; in this case, the Lorenz curve of x understates the true extent of inequality.

2.5. The above results can be shown to hold good even in the general case. It is sufficient to assume that x is a non-negative variate with a distribution of the continuous type, and that π is a monotone function of y taking positive values. (For the sake of definiteness, we shall suppose that π is monotone increasing.) It follows that y is also non-negative and has a distribution of the continuous type.

2.6. Let $F_1(P)$ and $F_2(P)$ be the functions defining the Lorenz curves of x and y respectively, P being the incomplete probability integral (i.e. the abscissa). Clearly, these functions will be continuous and differentiable throughout (0, 1).

2.7. The derivative of $F_1(P)$ with respect of P is given by

$$F_1'(P) = \frac{x_P}{E(x)} \qquad \dots \quad (6)$$

where x_P is the value of x having incomplete probability integral P, and $E(x)$ denotes the expected value of x.[6] Similarly, the derivative of $F_2(P)$ with respect to P is

$$F_2'(P) = \frac{y_P}{E(y)} \qquad \dots \quad (7)$$

the notation being perfectly analogous. We thus have

$$\frac{F_1'(P)}{F_2'(P)} = \frac{x_P}{y_P} \cdot \frac{E(y)}{E(x)} = \pi(y_P)\,\frac{E(y)}{E(x)}. \qquad \dots \quad (8)$$

Since $E(x)$ and $E(y)$ are constants, this shows that the l.h.s. of (8) is a monotone increasing function of y_P or P.

[5]See Iyengar (1960).

[6]See Roy, Chakravarti and Laha (1960).

2.8. We may now note that the function $F(P) = F_2(P) - F_1(P)$ has zeros at $P = 0$ and at $P = 1$. It must therefore have one or more extremums in (0, 1). These should satisfy the condition that

$$F'(P) = F_2'(P) - F_1'(P) = 0 \qquad \ldots \quad (9)$$

Now if this holds for $P = P_0$ then

$$\frac{F_1'(P_0)}{F_2'(P_0)} = 1 \qquad \ldots \quad (10)$$

and (9) cannot hold for any other value of P since $F_1'(P)/F_2'(P)$ is monotone function of P. There is, thus, only one extremum of $F(P)$ in the interval (0, 1). Therefore,

$$F_1'(P) < F_2'(P) \quad \text{for all} \quad P < P_0 \qquad \ldots \quad (11)$$

$$F_1'(P) > F_2'(P) \quad \text{for all} \quad P > P_0 \qquad \ldots \quad (12)$$

2.9. The derivative of $F_1'(P)/F_2'(P)$ with respect to P is

$$\frac{F_2'(P)\, F_1''(P) - F_1'(P)\, F_2''(P)}{(F_2'(P))^2} \qquad \ldots \quad (13)$$

and this must be positive for all P as the ratio $F'_1(P)/F'_2(P)$ is a monotone increasing function of P. We thus have

$$\frac{F_1''(P)}{F''(P)} > \frac{F_1'(P)}{F_2'(P)} \quad \text{for all } P. \qquad \ldots \quad (14)$$

In particular, for $P = P_0$ we have, in virtue of (10)

$$\frac{F_1''(P_0)}{F_2''(P_0)} > 1, \qquad \ldots \quad (15)$$

which means that $F''(P_0) = F_2''(P_0) - F_1''(P_0)$ is negative. Thus, the single extremum at $P = P_0$ is a maximum of $F(P) = F_2(P) - F_1(P)$. As $F(P)$ is zero at $P = 0$ and $P = 1$, this also shows that $F(P)$ is positive throughout (0, 1).

2.10. We may put these results into words as follows : The Lorenz curve for y is uniformly above that for x, the vertical distance between the curves reaching a maximum for that value of P for which

$$\pi(y_P) = \frac{E(x)}{E(y)} \qquad \ldots \quad (16)$$

Below this value of P, the slope of the curve for x is less than the slope for the curve for y, the inequality being reversed for $P > P_0$. The slopes are equal at $P = P_0$.

2.11. As the Lorenz curve for y is uniformly above that for x the Lorenz measure of inequality will satisfy the inequality $L_x > L_y$. This follows from the geometrical interpretation (or definition) of the Lorenz ratio. The entire position will be reversed (e.g. L_y will be greater than L_x) if $\pi(y)$ is a monotone decreasing function of y.

3. The case of grouped distributions

3.1. Consider now the situation where the x-distribution is specified by $\{p_i, x_i\}$ $(i = 1, 2, \ldots, g)$ where p_i is the proportion of population in the i-th expenditure class, and x_i, average expenditure of all persons in this class, there being in all g expenditure classes. This case deserves special mention because here (i) x need not be strictly continuous, and (ii) the y-distribution is obtained only approximately by using a single deflator for all x's within the i-th expenditure class $(i = 1, 2, \ldots, g)$.

3.2. The broken Lorenz curve of x is obtained by joining the points (P_i, Q_i) $(i = 1, 2, \ldots, g)$

where

$$\left.\begin{aligned} P_i &= \sum_{j=1}^{i} p_j \\ Q_i &= \Big(\sum_{j=1}^{i} p_j x_j\Big) \Big/ \Big(\sum_{j=1}^{g} p_j x_j\Big) = \Big(\sum_{j=1}^{i} a_j\Big) \Big/ \Big(\sum_{j=1}^{g} a_j\Big) \end{aligned}\right\} \quad \ldots \quad (17)$$

where $a_j = p_j x_j$. The curve for y is obtained by plotting the points (P_i, Q_i') where

$$Q_i' = \Big(\sum_{j=1}^{i} \frac{a_j}{\pi_j}\Big) \Big/ \Big(\sum_{j=1}^{g} \frac{a_j}{\pi_j}\Big). \quad \ldots \quad (18)$$

3.3. Multiplying the numerator of Q_i by the denominator of Q_i' and the denominator of Q_i by the numerator of Q_i' and comparing the coefficients of all the $a_j a_j$'s it can be easily seen that

$$Q_i < Q_i' \quad \text{if} \quad \pi_1 < \pi_2 < \ldots < \pi_g \quad \ldots \quad (19)$$

and

$$Q_i > Q_i' \quad \text{if} \quad \pi_1 > \pi_2 > \ldots > \pi_g \quad \ldots \quad (20)$$

This means that the Lorenz curve for x is below that for y if the π's are monotone increasing, and above the curve for y if the π's are monotone decreasing. Conclusions regarding the two Lorenz ratios follow obviously from this.

3.4. The case where the distribution of x is specified in g fractile groups, with the group means $x_1, x_2, \ldots, x_g$ (and the Lorenz curve based on such data), is but a special case of the above. The proof of the above results is very similar but slightly simpler for this case.

3.5. The broken Lorenz curve defined by (17) leads to the following formula for the Lorenz ratio

$$L_x = 1 - \sum_{i=1}^{g} (P_i - P_{i-1})(Q_i + Q_{i-1}) \quad \ldots \quad (21)$$

which simplifies to

$$L_x = \frac{g-1}{g} - \frac{2}{g}\Big(\frac{x_1 + \ldots + x_{g-1}}{x_g}\Big) \quad \ldots \quad (22)$$

if the x-distribution is specified in g fractile groups, where $x_i = \sum_{j=1}^{i} x_j$. The formulae for L_y are analogous. The inequalities regarding the two Lorenz ratios can be directly proved from these formulae.

4. The effect on concentration curves

4.1. The concentration curve[7] of any commodity shows the percentage $100Q$ of the total consumption of the commodity which is consumed by the poorest $100P\%$ of the population. In most cases, however, the actual quantity consumed is not considered for such curves, but only the consumer expenditure incurred on the commodity, so that the curve shows the percentage $100Q$ of total consumer expenditure on the commodity incurred by the poorest $100P\%$ of the population.

4.2. Consider the concentration curves of any commodity for the base and the current periods, and consider the problem of adjusting the current period curve so as to bring it to base period prices for carrying out comparisons in real terms. It is obvious that the ranking of persons according to total consumer expenditure is preserved by price changes, so that the concentration curve of the quantity of any commodity does not require any adjustment at all.

4.3. Let x denote total consumer expenditure of individuals and y the expenditure on any given commodity, both at current period prices; x' and y' the equivalents of x and y at base period prices; $E(y|x)$ the conditional expectation of y for a given value of x, and $E(y)$ the unconditional expectation or average of y, with $E(y'|x')$ and $E(y')$ as their analogues; and lastly, $Q(P)$ and $Q'(P)$ the ordinates of the two concentration curves.

4.4. It has been shown by Roy, Chakravarti and Laha (1960) that

$$\frac{dQ}{dP} = \frac{E(y|x)}{E(y)}. \qquad \ldots \quad (23)$$

We have similarly

$$\frac{dQ'}{dP} = \frac{E(y'|x')}{E(y')}. \qquad \ldots \quad (24)$$

Thus

$$\frac{\frac{dQ}{dP}}{\frac{dQ'}{dP}} = \frac{E(y')}{E(y)} \cdot \frac{E(y|x)}{E(y'|x')} \qquad \ldots \quad (25)$$

$$= c\pi(y|x), \quad \text{say}$$

where

$$c = \frac{E(y')}{E(y)}. \qquad \ldots \quad (26)$$

The first factor on the right hand side is a constant, and the second is the consumer price index (for the item) for the current period expressed as a function of x. Equation (26) is completely analogous to equation (8) of Section 2, so that results similar to those proved in Section 2 can be proved for the two concentration curves.

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[7] See Roy, Chakravarti and Laha (1960).

5. Some illustrations

5.1. Table 1 presents the unweighted averages of the cost of living indices (CLI) for 23 towns and cities of West Bengal published by the State Statistical Bureau, West Bengal. The average CLI is seen to increase with the level of household expenditure in the years 1954 and 1955. This trend began to be reversed thereafter; in 1956, the CLI rose very little with the level of household expenditure, and from 1957 onwards, it actually fell with rising expenditure levels. The indices with 1954 as base would show even greater variation in CLI with the level of household expenditure. Actually, during the period covered in this table, the CLI was more sensitive at the lower levels of household expenditure, showing greater deviations from 100 in either direction.

TABLE 1. AVERAGE OF COST OF LIVING INDICES FOR 23 TOWNS AND CITIES OF WEST BENGAL, BY LEVELS OF MONTHLY HOUSEHOLD EXPENDITURE

(Base : November 1950 = 100)

monthly household expenditure (Rs.)	average cost of living index						August 1960
	1954	1955	1956	1957	1958	1959	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1 — 100	91.2	89.2	96.1	102.2	107.4	107.7	112.4
101 — 200	92.6	90.6	96.4	101.8	107.0	107.4	112.0
201 — 350	93.8	91.7	96.3	101.0	105.8	106.6	110.6
351 — 700	95.0	93.2	96.7	100.7	105.6	106.7	110.3
701 and above	96.2	94.3	96.9	100.5	105.2	106.6	109.6

Source : *Monthly Statistical Digest*, West Bengal, November 1960.

5.2. Similar features were also observed in the corresponding indices for the food group which are published separately.

5.3. It is sometimes stated that in recent years in India, the CLI has increased more rapidly for the poorer classes of the population. Table 1 lends some support to this statement. If this were true in general, the stability over time of inequality measures of all-India expenditure distribution at current prices (observed by Bhattacharya and Iyengar (1961)) would really mean an increasing inequality in the corresponding distributions at *constant* prices. The idea is clearly of considerable importance; but data on consumer price indices by levels of living are scanty and/or unreliable, so that this line of thought could not be pursued successfully.

5.4. Recently in a study just completed, Iyengar, Chatterjee and Sarkar (1964) constructed some new series of consumer price indices fractilewise for rural West Bengal entirely from the National Sample Survey materials. These indices have been calculated separately for food items, non-food items as well as for all items, for the year 1957-58 taking 1952-53 as the base year. Two sets of price deflators have been worked out in twenty fractile groups from two interpenetrating sub-samples of the National Sample Survey. Their main results are reproduced in the Tables 2 and 3.

TABLE 2. AVERAGE MONTHLY PER CAPITA EXPENDITURE BY FRACTILE GROUPS, RURAL WEST BENGAL, 1952-53 AND 1957-58

per cent of population	1952-53						1957-58					
	food		non-food		all items		food		non-food		all items	
	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
bottom 5 p.c.	2.46	3.12	1.17	1.16	3.63	4.28	5.31	6.80	0.78	1.67	6.09	8.47
5— 10 ,,	3.60	3.98	1.27	1.29	4.87	5.27	7.59	8.35	0.91	1.26	8.50	9.61
10— 15 ,,	4.65	4.41	1.25	1.73	5.90	6.14	7.92	9.09	1.75	1.64	9.67	10.73
15— 20 ,,	4.82	5.04	1.81	1.95	6.63	6.99	9.80	10.04	1.08	1.57	10.88	11.61
20— 25 ,,	5.17	5.36	1.94	1.98	7.11	7.34	10.28	9.94	1.62	2.33	11.90	12.27
25— 30 ,,	5.97	5.61	1.92	2.55	7.89	8.16	10.51	10.64	2.14	2.08	12.65	12.72
30— 35 ,,	6.04	6.32	2.26	2.59	8.30	8.91	11.03	11.22	2.18	2.48	13.21	13.70
35— 40 ,,	6.61	6.55	2.01	2.78	8.62	9.33	10.75	11.90	3.16	2.50	13.91	14.40
40— 45 ,,	6.50	7.29	2.54	3.26	9.04	10.55	12.51	10.96	2.22	3.92	14.73	14.88
45— 50 ,,	6.62	7.75	3.38	3.17	10.00	10.92	11.57	11.87	3.36	3.48	14.93	15.35
50— 55 ,,	6.95	7.58	3.88	4.26	10.83	11.84	12.72	12.67	3.11	3.32	15.83	15.99
55— 60 ,,	7.51	9.06	4.03	3.56	11.54	12.62	13.79	13.35	3.15	3.09	16.94	16.44
60— 65 ,,	8.97	8.50	3.68	5.03	12.65	13.53	14.82	13.34	3.36	4.85	18.18	18.19
65— 70 ,,	9.83	9.28	3.91	5.35	13.74	14.63	15.74	15.34	3.66	4.06	19.40	19.40
70— 75 ,,	9.40	9.51	6.43	5.58	15.83	15.09	16.78	16.86	3.60	4.59	20.38	21.45
75— 80 ,,	10.74	10.69	6.21	6.06	16.95	16.75	18.03	16.45	4.56	6.62	22.59	23.07
80— 85 ,,	11.82	11.40	6.26	7.60	18.08	19.00	17.04	20.48	8.86	5.74	25.90	26.22
85— 90 ,,	11.51	11.77	8.68	9.56	20.19	21.33	20.94	22.16	8.71	6.47	29.65	28.63
90— 95 ,,	11.29	13.76	14.04	10.01	25.33	23.77	22.52	23.23	11.86	7.77	34.38	31.00
95—100 ,,	19.28	17.27	26.06	17.62	45.34	34.89	23.63	23.47	20.92	13.93	44.55	37.40
0—100 ,,	7.94	8.13	5.19	4.95	13.13	13.08	13.70	13.94	4.60	4.27	18.30	18.21

TABLE 3. CONSUMER PRICE INDEX IN 1957-58 WITH BASE : 1952—53 = 100 (RURAL WEST BENGAL)

per cent of population	food		non-food		all items	
	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2	sub-sample 1	sub-sample 2
(1)	(2)	(3)	(4)	(5)	(6)	(7)
bottom 5 p.c.	122.41	113.90	111.62	119.46	119.57	115.07
5— 10 ,,	121.01	123.55	117.01	94.43	120.32	118.23
10— 15 ,,	138.74	120.54	136.83	112.08	138.30	118.63
15— 20 ,,	138.21	115.54	120.73	119.32	134.76	116.37
20— 25 ,,	141.95	108.12	112.06	99.04	135.57	100.26
25— 30 ,,	121.13	107.00	114.36	112.71	119.62	108.47
30— 35 ,,	115.24	130.56	109.73	114.04	114.03	120.90
35— 40 ,,	114.74	110.31	120.87	100.48	116.09	115.02
40— 45 ,,	109.18	94.05	127.63	113.21	113.47	98.09
45— 50 ,,	114.59	116.71	124.18	102.46	117.32	113.23
50— 55 ,,	103.97	119.01	114.00	99.91	107.04	113.84
55— 60 ,,	111.43	88.75	117.06	99.52	113.41	91.33
60— 65 ,,	103.06	85.73	125.21	104.40	108.25	91.47
65— 70 ,,	101.72	87.74	104.64	110.14	102.51	95.10
70— 75 ,,	100.02	114.45	120.62	106.84	111.92	111.91
75— 80 ,,	94.57	119.03	122.14	118.34	103.32	118.82
80— 85 ,,	103.76	108.19	123.63	112.11	109.75	109.57
85— 90 ,,	101.87	102.75	126.87	115.66	111.42	108.07
90— 95 ,,	104.19	89.88	123.13	116.80	114.10	100.16
95—100 ,,	107.79	102.18	121.97	124.08	115.58	112.06
0—100 ,,	110.49	102.08	117.90	115.35	113.11	106.83

5.5. Table 2 provides estimates of the distributions of total consumer expenditure as well as those of the relative distributions of food and nonfood expenditures; Table 3 gives the corresponding differential price deflators.

5.6. In order to see the possible effects of ignoring the price differentials on measures of inequality some calculations were made on the above data. Lorenz ratios and specific concentration coefficients were calculated for the base year 1952-53; these calculations were also extended to undeflated and deflated distributions of 1957-58 using the formulae of Section 3. The main results are summarised in Table 4, in which the pooled estimates are shown in columns (4), (7), and (10): the pooled estimates were, of course, obtained by taking simple average of sub-sample estimates.

TABLE 4. CONCENTRATION RATIOS FOR THE DISTRIBUTION OF TABLE 2

item	1952-53			1957-58					
				undeflated			deflated		
	sub-sample 1	sub-sample 2	pooled	sub-sample 1	sub-sample 2	pooled	sub-sample 1	sub-sample 2	pooled
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
food	0.2435	0.2306	0.2370	0.1997	0.1943	0.1970	0.2225	0.2073	0.2149
non-food	0.4730	0.3896	0.4313	0.4463	0.3477	0.3970	0.4687	0.3352	0.4020
all items	0.3333	0.2899	0.3116	0.2676	0.2259	0.2468	0.2842	0.2370	0.2606

5.7. From the fractile graphs constructed for the price index series of Table 3, it appears that the overall consumer price index is a slightly decreasing function of the level of living. This is true, even to a larger extent, of the food index which in general is seen to be higher for the lower income groups than for the higher groups. The differentials in non-food prices suggest a small increasing trend which may not be statistically important. These graphs would indicate that in rural areas of West Bengal the price rise during 1952-53 to 1957-58 was higher for the poorer sections of the population, especially for foodgrains. This would indirectly suggest that the coarser varieties of foodgrains consumed by them became more expensive.

5.8. The number of sample households in rural West Bengal during 1952-53 (fourth and fifth rounds of the National Sample Survey) was about 400 in each half-sample, and only about 100 in each half-sample in 1957-58 (thirteenth round of the National Sample Survey). Hence the precision of the estimates may not be very high. Also, no attempt was made to smooth the figures in any way.

5.9. From Table 4 it will be seen that the effect of price adjustment is not quite negligible. The adjustment tends to inflate the Lorenz ratio as well as specific concentration coefficients; price adjusted specific concentration ratio for food, for example, is about 4 per cent higher than the uncorrected. For total consumption, the adjusted Lorenz ratio exceeds the original by 6 per cent.

5.10. Now, if the distributions of 1952-53 are compared with those of 1957-58 the picture is one of reduction in inequality of food and non-food consumption by 9 per cent and 7 per cent respectively. The distribution of total consumption in rural West Bengal seems to have become appreciably more egalitarian (16 per cent in the Lorenz ratio) during the five year period. The picture portrayed in this study should be extremely encouraging since, simultaneously with a reduction in disparity of levels of living, there is also a clear separation (Mahalanobis, 1960) between the 1952-53 fractile graphs and the deflated 1957-58 graphs constructed for average consumer expenditures.

5.11. The above conclusion may be true of other States as well. It would therefore be interesting to construct consumer price indices by levels of living, with rural-urban break-down, for all the Indian States, and with some break-down by items of expenditure. This project has been taken up in the Indian Statistical Institute on the basis of National Sample Survey data.

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