ASSESSING THE POVERTY BIAS OF GROWTH METHODOLOGY AND AN APPLICATION TO ANDHRA PRADESH AND UTTAR PRADESH

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SUMMARY

Despite widespread agreement that economic policy in developing countries should promote pro-poor growth, there is relatively little consensus regarding the definition of pro-poor growth. This paper draws upon recent work on poverty decompositions to develop two simple measures of the extent to which growth is biased towards or away from the poor – that is – the poverty bias of growth. The measures are illustrated by application to grouped household data from two Indian states. This shows that growth between 1973 and 1989 in Andhra Pradesh was pro-poor whilst growth in Uttar Pradesh was biased against the poor.

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1 INTRODUCTION

Economic growth can be biased towards or away from the poor. The idea of encouraging 'pro-poor' growth has been a central theme in development economics for at least quarter of a century. The 'importance of increasing the rates of growth of income in poverty groups' was emphasised in Chenery *et al.*'s seminal work on 'Redistribution with Growth' (Chenery *et al.* 1974). It was also the central idea behind the concept of 'broad-based growth' advanced in the World Development Report of 1990 (World Bank 1990). In recent years, major bilateral donors such as the Department for International Development in the UK have explicitly committed themselves to the 'encouragement of economic growth which benefits the poor' (Department for International Development 1997). Yet beyond frequently repeated statements concerning the need for economic growth to be labour intensive and employment generating (since labour is the poor's most abundant asset), concentrated in rural areas (where the bulk of the poor people live), or concentrated on those activities/products that are most important to the poor's living standards, relatively little is still known about what constitutes pro-poor growth. This paper seeks to provide a clear and simple definition of pro-poor growth which draws upon the latest work on poverty decompositions. It will show how the poverty bias of growth can be measured by comparing the change in the actual distribution of per capita incomes (or consumption expenditure) between any two periods with the hypothetical case in which all individuals experience the same proportionate increase in their incomes or consumption expenditure. An application to grouped data from two Indian states demonstrates how this methodology can be used to assess whether past growth has been pro-poor or anti-poor.

2 DECOMPOSING CHANGES IN POVERTY INTO GROWTH AND INEQUALITY COMPONENTS

Datt and Ravallion (1992) and Kakwani (1993) have shown that the change in poverty between any two periods can be decomposed into a component due to the change in mean income or expenditure (keeping the shape of the distribution constant) and a component due to the change in inequality (keeping the mean constant). Well defined poverty measures (such as the headcount, poverty gap and squared poverty gap), can be written as a function of mean income (μ), the poverty line (z) and a set of parameters of the Lorenz curve (Ψ): [1]

$$P = P\left(\frac{\mu}{z}, \Psi\right) \tag{1}$$

Simple rules of total differentiation show that, if the poverty line is fixed:

[1] The decomposition does not have to be performed using income: any cardinal welfare measure may be used. In our empirical application, we will use the distribution of consumption expenditure, but for clarity we maintain the usual convention of using "income" to represent the welfare measure.

$$dP = \frac{\partial P}{\partial \mu} d\mu + \frac{\partial P}{\partial \psi} d\psi \tag{2}$$

Thus the evolution of the income distribution over time can be thought of as a journey along a path in (μ, ψ) space, the n-dimensional space which has the mean income as one dimension and the parameters of the Lorenz curve as the other dimensions. The starting point of this journey is the point A = (μ_1, ψ_1) corresponding to the initial mean and distribution and the end point is the point B = (μ_2, ψ_2) corresponding to the final mean and distribution. The change in poverty between period 1 and 2 is then given by the line integral along the path between A and B:

$$P(\mu_2, \psi_2) - P(\mu_1, \psi_1) = \int_A^B \frac{dP}{ds} ds = \int_A^B \left[\frac{\partial P}{\partial \mu} \frac{d\mu}{ds} + \frac{\partial P}{\partial \psi} \frac{d\psi}{ds} \right] ds = \int_A^B \frac{\partial P}{\partial \mu} \frac{d\mu}{ds} ds + \int_A^B \frac{\partial P}{\partial \psi} \frac{d\psi}{ds} ds \tag{3}$$

where μ_i and ψ_i represent mean income and the parameters of the distribution in period *i*, and *s* is a parameter indicating the distance travelled between A and B. [2] This equation mirrors the decomposition for the instantaneous change in poverty in equation (2), with the first integral on of the right hand side of equation (3) representing the component due to changes in mean income, and the second integral representing the component due to the change in the distribution.[3]

Unfortunately, the evaluation of the two integrals is not possible since the values of μ and ψ between their initial and final values are unknown. Datt and Ravallion (1992) suggested that the 'natural' way to approximate the 'true' decomposition in equation (3) is to choose the initial mean and distribution as reference points yielding:

$$P(\mu_2, \psi_2) - P(\mu_1, \psi_1) = \underbrace{[P(\mu_2, \psi_1) - P(\mu_1, \psi_1)]}_{\text{growth component}} + \underbrace{[P(\mu_1, \psi_2) - P(\mu_1, \psi_1)]}_{\text{inequality component}} \tag{4}$$

$$+ \underbrace{[\,[P(\mu_2, \psi_2) - P(\mu_1, \psi_2)] - [P(\mu_2, \psi_1) - P(\mu_1, \psi_1)]\,]}_{\text{residual}}$$

However, this decomposition yields a residual component due to the choice of period 1 as the reference period. Note that this residual component is essentially due to an 'index number problem', and is equal to the difference between the growth components measured at the final and initial distributions.[4]

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[2] More precisely, *s* is the arc length of the curve between A and B.

[3] In fact the first integral is the sum of the instantaneous changes in poverty due to changes in the mean evaluated at each point in the path actually taken between the initial mean and distribution and the final mean and distribution. Similarly the second integral is the sum of the instantaneous changes in poverty due to the changes in the distribution evaluated at each point in the path.

[4] Equivalently it is equal to the difference between the inequality components measured at the final and initial means. Note also that the residual in the Datt and Ravallion decomposition exists whenever the poverty measure is not separable between μ and ψ and is neither an 'econometric' residual nor is it related to the 'quality of the data'.

Kakwani (1997) has proposed a decomposition which takes the average of the growth components measured at the initial and final distributions, and the average of the inequality components measured at the initial and final means. This results in an exact breakdown of the change in poverty into growth and inequality components, thereby eliminating the need for a residual term:

$$P(\mu_2, \psi_2) - P(\mu_1, \psi_1) = \underbrace{\tfrac{1}{2}\left[[P(\mu_2, \psi_1) - P(\mu_1, \psi_1)] + [P(\mu_2, \psi_2) - P(\mu_1, \psi_2)] \right]}_{\text{growth component}} + \underbrace{\tfrac{1}{2}\left[[P(\mu_1, \psi_2) - P(\mu_1, \psi_1)] + [P(\mu_2, \psi_2) - P(\mu_2, \psi_1)] \right]}_{\text{inequality component}} \quad (5)$$

which can be written as:

$$\Delta P = \Delta P_{\mu} + \Delta P_{\psi} \quad (6)$$

where

ΔP_{μ} = growth component: the average change in a poverty measure due to changes in mean income holding inequality constant at both the initial and final distributions and

ΔP_{ψ} = inequality component: the average change in a poverty measure due to changes in inequality holding mean income constant at both its initial and final values.

Like all exact decompositions of changes in poverty, Kakwani's approach involves an arbitrary allocation of the residual component between the growth and inequality components. By the same token, however, Kakwani's choice of an average of the two components is as 'natural' a choice of reference period as Datt and Ravallion's choice of period 1.

The growth and inequality components of a change in poverty may either reinforce or counteract each other. Thus growth in mean income may reduce poverty (ΔP_{μ} negative), while a fall in inequality reinforces its impact (ΔP_{ψ} negative). Conversely, growth in mean incomes might be accompanied by an increase in inequality (ΔP_{ψ} positive), and thus counteract the poverty reducing impact of rising incomes. Whether a poverty measure rises or falls between two periods clearly depends on the signs and absolute magnitudes of the growth and inequality components. However, regardless of whether poverty has risen or fallen overall, it seems intuitively reasonable to say that growth has been biased against the poor whenever it coincides with an increase in inequality – since a greater reduction in poverty would have occurred if the distributional shift had not happened. More precisely, if the actual reduction in poverty is less than the reduction which would have occurred with distributionally neutral growth, then growth has an anti-poor bias. Conversely, if the actual reduction in poverty between two periods is greater than the reduction which would have occurred with distributionally neutral growth, then growth has a pro-poor bias.

We therefore propose that a simple and intuitive measure of the poverty bias of growth (PBG) between two periods can be calculated as:

PBG = Poverty reduction with distributionally neutral growth – Poverty reduction which actually occurred (7)

$$= \Delta P_{\mu} - \Delta P$$

$$= -\Delta P_{\psi}$$

If the PBG is positive, this indicates a pro-poor bias to growth. If it is negative, growth has an anti-poor bias.[5]

The PBG measure above gives a good indication of the change in poverty resulting from the bias of growth between any two periods. However, clearly the magnitude of the unadjusted PBG will depend upon the length of time between the two periods in question. It would be useful to construct a measure which distinguishes between an anti-poor bias of growth of, say, 2 per cent over five years (a very strong anti-poor bias) and an anti-poor bias of growth of 2 per cent over 20 years (which, although undesirable, constitutes a much less severe bias against the poor).

One approach is simply to divide the PBG by the number of years between the two periods. However, this assumes that the reduction in poverty has been uniform between the two dates in question, which is unlikely to be the case. Another approach would be to assume that changes in poverty follow an exponential growth path. However, if this assumption is wrong, standard growth accounting adjustments will not be appropriate. A third approach is to calculate the poverty bias of growth as a proportion of the change which would have occurred with distributionally neutral growth. Since the sign of the growth component changes depending on whether growth is positive or negative, our Normalised Poverty Bias of Growth measure divides the PBG above by the absolute value of the growth component:

$$\text{Normalised } PBG = \frac{-\Delta P_{\psi}}{\left|\Delta P_{\mu}\right|} \tag{8}$$

The benefit of this normalised PBG measure can be seen using a simple diagram. Figure 1 shows four different combinations of the unadjusted PBG and the growth component. The first and fourth quadrants correspond to ΔP_{μ} being positive, that is an increase in poverty due to recession, whilst the second and third quadrants show a reduction in poverty due to growth. The first and second quadrants correspond to $-\Delta P_{\psi}$ (the unadjusted PBG) being positive i.e. a pro-poor bias to growth, while the third and fourth correspond to anti-poor growth.

Consider the calculation of the growth and inequality components for three different countries (or provinces/states) denoted A, B and C. If the calculation for country A reflects a five year period and the

[5] Alternative definitions of pro-poor growth are possible: White (1999) suggests that growth should be defined as pro-poor if the income share of the poor rises with growth. The difficulty with this is that the definition of who is poor also changes with growth and so it is not clear whether we should be looking at the income share of those who are poor before or after the change; this is similar to the 'index number problem' mentioned earlier. We also prefer our measure because it looks at how changing the share of the entire Lorenz curve impacts upon the poverty measure rather than examining the single point on the Lorenz curve corresponding to the income share of the poor.

calculation for country B reflects a 10 year period, the unadjusted PBG will be much higher for country B than for country A. However, since A and B lie on the same ray from the origin in Figure 1, both countries have the same normalised PBG. Now consider a third country C, for which data is available for 20 years. Comparing country A and country C by the unadjusted PBGs would suggest that C's poverty bias is greater. However, this may simply reflect a longer period of comparison. The normalised PBG measure shows country A to have a stronger pro-poor bias than country C despite a smaller unadjusted PBG.

3 APPLICATION

The calculation and interpretation of the PBG and normalised PBG measures are illustrated with reference to the Indian states of Andhra Pradesh and Uttar Pradesh between 1973 and 1989.[6] Our choice of Andhra Pradesh and Uttar Pradesh was motivated by the broad similarities between the two states: both states have large populations and land areas; they had similar State Domestic Products in the early 1970s and experienced similar growth rates in the subsequent two decades (Nagaraj *et al.* 1998).[7] The period from 1973 until 1989 was one of moderately rapid growth throughout India.

For both states, grouped data on the distribution of per capita consumption expenditure in rural areas was obtained from the State level database assembled by Özler, Datt and Ravallion (1996) from different rounds of the Indian National Sample Survey (NSS). Such grouped data on the distribution of expenditure (or incomes) is available from secondary sources, such as statistical yearbooks, for many developing countries. However, the Indian NSS data assembled by Özler, Datt and Ravallion is commonly regarded as of particularly high quality. In addition Bell and Rich (1994) have used the same data set to estimate econometrically the extent to which growth in India between 1951/52 and 1977/78 was biased against the poor. Our analytical method therefore provides a useful complement to their econometric approach. However, since we are not attempting to estimate a structural model, we are not inhibited by the gaps in the surveys between 1977/78 and 1986/87 which restricted Bell and Rich to an earlier period of analysis.

The software, POVCAL (Chen *et al.* 1991) was used to fit Lorenz curves to the consumption distribution data for 1973 and 1989 using either the generalised quadratic or the beta model.[8] After calculating growth in mean expenditure per capita for each state between the two years, their distributions for 1973 were then projected forward to 1989 assuming distributionally neutral growth. The process was then repeated starting with the distributions for 1989 and projecting backwards to 1973 assuming distributionally neutral contraction (i.e. negative 'growth'). For each distribution (actual 1973, actual 1989, forward projected 1989 and backward projected 1973) the headcount, poverty gap and squared poverty gap were calculated using a poverty line of Rs 49 per capita per month in constant 1973 terms.[9] The change in poverty between 1973 and 1989 was then decomposed into a growth component and an inequality

[6] The data for 1973 relates to October 1973-June 1974; the data for 1989 relates to the financial year July 1989-June 1990. However, we refer to 1973 and 1989 in the text for simplicity of exposition.
[7] Andhra Pradesh's growth performance has been better than that of Uttar Pradesh when considered over the longer period of 1957/58 - 1990/1991.
[8] See Datt and Ravallion (1992) for details of the generalised quadratic and beta distributions.
[9] This is the poverty line estimated by the Indian Planning Commission (1993).

component according to equation (5). For each poverty measure, the unadjusted and normalised poverty bias of growth (PBG) were then calculated using equations (7) and (8), as shown in Table 1:

Table 1: The Poverty Bias of Growth for Andhra Pradesh and Uttar Pradesh

	Andhra Pradesh			Uttar Pradesh		
	P_0	P_1	P_2	P_0	P_1	P_2
Change in Poverty (ΔP)	-24.26	-9.81	-4.75	-21.91	-6.79	-2.78
Growth component ($\Delta P\mu$)	-23.19	-8.62	-3.89	-26.63	-9.89	-4.36
Inequality component ($\Delta P\psi$)	-1.07	-1.19	-0.86	4.72	3.10	1.58
Unadjusted PBG ($-\Delta P\psi$)	1.07	1.19	0.86	-4.72	-3.10	-1.58
Normalised PBG ($-\Delta P\psi / \lvert\Delta P\mu\rvert$)	0.05	0.14	0.22	-0.18	-0.31	-0.36

Table 1 shows that both states secured substantial reductions in poverty between 1973 and 1989 with the poverty headcount (P_0) in Andhra Pradesh falling by 24 percentage points, whilst that in Uttar Pradesh fell by 22 points. Large reductions can also be observed in the depth and severity of poverty in each state, as measured by the poverty gap (P_1) and the squared poverty gap (P_2) respectively. Decomposing the change in poverty into growth and inequality components shows that most of the change in each poverty measure in each state resulted from growth in the mean consumption expenditure. However, examining the PBGs shows that growth in Andhra Pradesh had a pro-poor bias whereas growth in Uttar Pradesh was biased against the poor. The normalised PBGs show that the pro-poor bias for Andhra Pradesh was relatively small for the headcount, with distributional change causing the reduction in the headcount to be 5 per cent greater than it would otherwise have been. However, the importance of distributional change increases as one looks at poverty measures which are sensitive to the distribution of expenditure below the poverty line. Thus in Andhra Pradesh, the change in the distribution between 1973 and 1989 resulted in a squared poverty gap 22 per cent lower than it would have been had growth been distributionally neutral.

By contrast, the worsening distribution in Uttar Pradesh reduced the gains which might have occurred. Eighteen per cent of the reduction in the poverty headcount which would have resulted from distributionally neutral growth was forfeited due to the anti-poor bias of growth. Furthermore the impact of the anti-poor bias is greatest for the poorest households, with 31 per cent of the potential reduction in the poverty gap lost and 36 per cent of the reduction for the squared poverty gap. Thus in Uttar Pradesh the anti-poor bias of growth has significantly curtailed the poverty reduction which growth has brought.

For the headcount measure of poverty, it is also possible to show the results of the PBG calculations graphically. Figure 2 shows the cumulative distribution functions (CDF) for consumption expenditure in Andhra Pradesh in 1973, together with the actual distribution in 1989 and the distribution which would have resulted from distributionally neutral growth. Figures 3 repeats these plots for Uttar Pradesh.[10]

When economic growth occurs, the CDF will shift to the right as per capita expenditures increase. Thus if all the households in Andhra Pradesh had experienced the same proportionate increase in their per capita expenditures as the average for the state between 1973 and 1989 then the CDF would have moved outward in the parallel manner shown by the 1989 Dist Neutral line in Figure 2. This corresponds to the case of distributionally neutral growth under which the relative distribution of expenditures (and therefore any scalar measure of inequality) does not change from its initial value. In Andhra Pradesh, distributionally neutral growth would have led to a fall in the headcount from 56 per cent in 1973 to 33 per cent by 1989. In contrast, had growth been distributionally neutral in Uttar Pradesh the poverty headcount would have fallen from 56 to 26 per cent as shown in Figure 3.

However, it would be very unlikely that all households in each State experience the same proportionate increase in their per capita expenditure levels. So Figures 2 and 3 also show how the actual distribution of per capita expenditure changed between 1973 and 1989 in Andhra Pradesh and Uttar Pradesh. These patterns of growth resulted in 1989 poverty headcounts of 32 and 34 per cent respectively. If growth had been distributionally neutral in Andhra Pradesh, the headcount would have fallen by 23 per cent, whereas the actual pattern of growth resulted in a slightly greater decline of 24 per cent. But in Uttar Pradesh, distributionally neutral growth would have caused the headcount to decline by 29 per cent whereas only a 22 per cent reduction was actually achieved.[11] The pro-poor pattern of growth in Andhra Pradesh is shown by the actual CDF for 1989 lying below that of the distributionally neutral projection for the same year. Similarly the anti-poor bias of growth in Uttar Pradesh can be seen from the actual distribution for 1989 lying above that of the distributionally neutral projection.

The relationship between poverty, distribution and growth can also be explored by examining how the Gini coefficients for consumption expenditure change in the two states. This is an imperfect method of assessment, because when calculating poverty measures and the poverty bias of growth what one cares about is the distribution below the poverty line not inequality over the whole distribution. In addition, unless first-order Lorenz dominance holds changes in the Gini coefficient can be ambiguous and misleading. Nonetheless, the fact that the Gini coefficient for Andhra Pradesh declined from 0.29 in 1973 to 0.27 in 1989 suggests that the poverty reducing impact of growth was reinforced by a reduction in inequality. In contrast, an increase in inequality in Uttar Pradesh – where the Gini coefficient rose from 0.24 to 0.28 – partially counteracted the poverty reducing impact of growth in the state.

[10] In each figure, households are ranked in order of their real per capita expenditures along the horizontal axis, while the vertical axis shows the cumulative percentage of households with monthly consumption expenditures below the value shown on the horizontal axis. Thus when a vertical line corresponding to the poverty line (Rupees 49 per month) is drawn, the headcount can be read off the vertical axis.

[11] These figures are slightly different from those shown in Table 1 since they only consider the difference between the poverty reduction actually achieved and the distributionally neutral forward projection, whereas those in Table 1 average the forward and backward projections. However, the conclusions remain the same.

4 CONCLUSION

This paper has demonstrated how, for a widely used class of poverty measures, two simple measures of the poverty bias of growth (PBG) can be calculated by deducting the change in poverty produced by the actual pattern of growth from that which would have been produced by distributionally neutral growth and normalising the result. An application to data from two Indian states shows that growth between 1973 and 1989 in Andhra Pradesh was moderately pro-poor whilst growth in Uttar Pradesh was biased against the poor over the same period. Put differently, changes in inequality reinforced the poverty reducing impact of economic growth in Andhra Pradesh, but reduced it in Uttar Pradesh.

Four caveats to the use of the PBG measures should be noted. First, the PBG, like the poverty measures used in their calculation, ignores the welfare of households above the poverty line. Thus if a distributional change reduced inequality amongst the poor while simultaneously increasing inequality for the population as a whole, the PBG would interpret this as a pro-poor shift in the distribution. Second, the PBG measures are 'gender blind' – indeed they do not consider any aspect of the intra-household distribution of welfare. It is, unfortunately, not possible to 'get inside the household' using the types of grouped distributional data that this methodology (along with all previous growth-inequality decompositions) employs.

Third, and perhaps most importantly, great care must be taken in the use of the PBG measures for assessing budgetary spending priorities or the efficacy of anti-poverty policy. This is because changes in mean income and the distribution of income already reflect the influence of both initial conditions and existing policy interventions. Thus if growth between two periods has had an anti-poor bias this does not necessarily mean that policy interventions between the periods have been anti-poor; it is possible that interventions may have offset an even larger anti-poor bias to growth. Conversely a pro-poor bias to growth is not necessarily indicative of good policy. To assess the impact of policy interventions on poverty a full counterfactual analysis is required.

Finally, the PBG is not designed to give any indication of the trade-offs which may (or may not) exist between policies aimed at increasing growth and those attempting to improve distribution. Nonetheless, it is hoped that the methodology proposed in this paper does provide a simple and intuitive way to assess the extent to which economic growth has been biased towards the poor.

Figure 1: The Normalised Poverty Bias of Growth

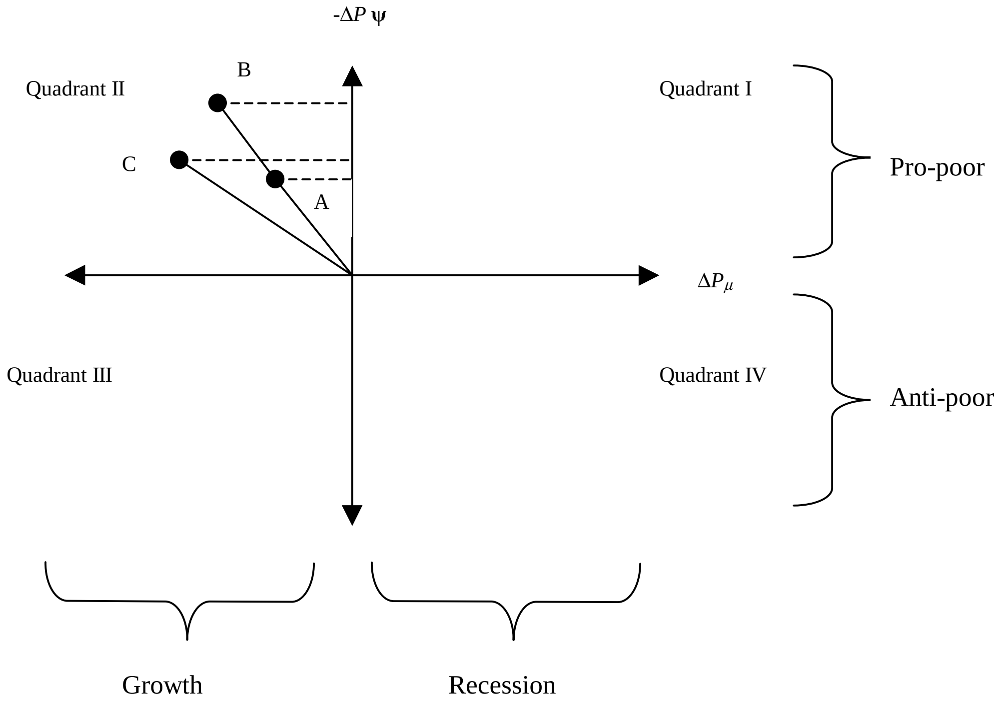


Figure 2: Cumulative Distribution of Per Capita Expenditure for Andhra Pradesh

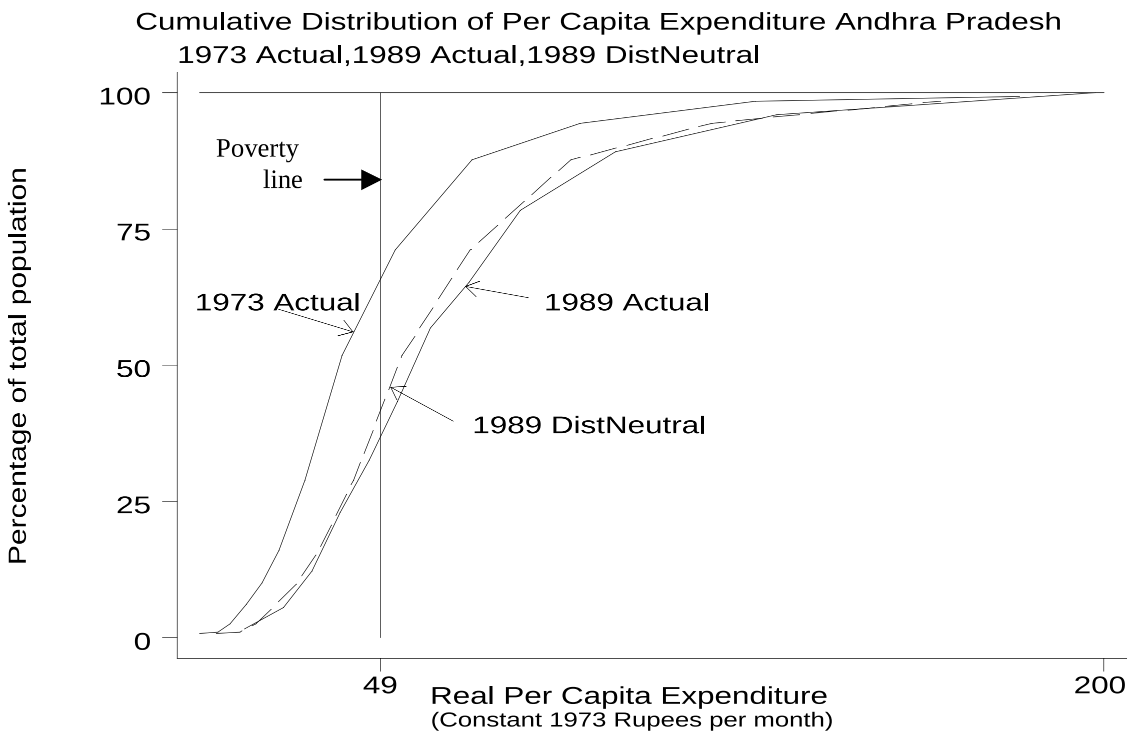
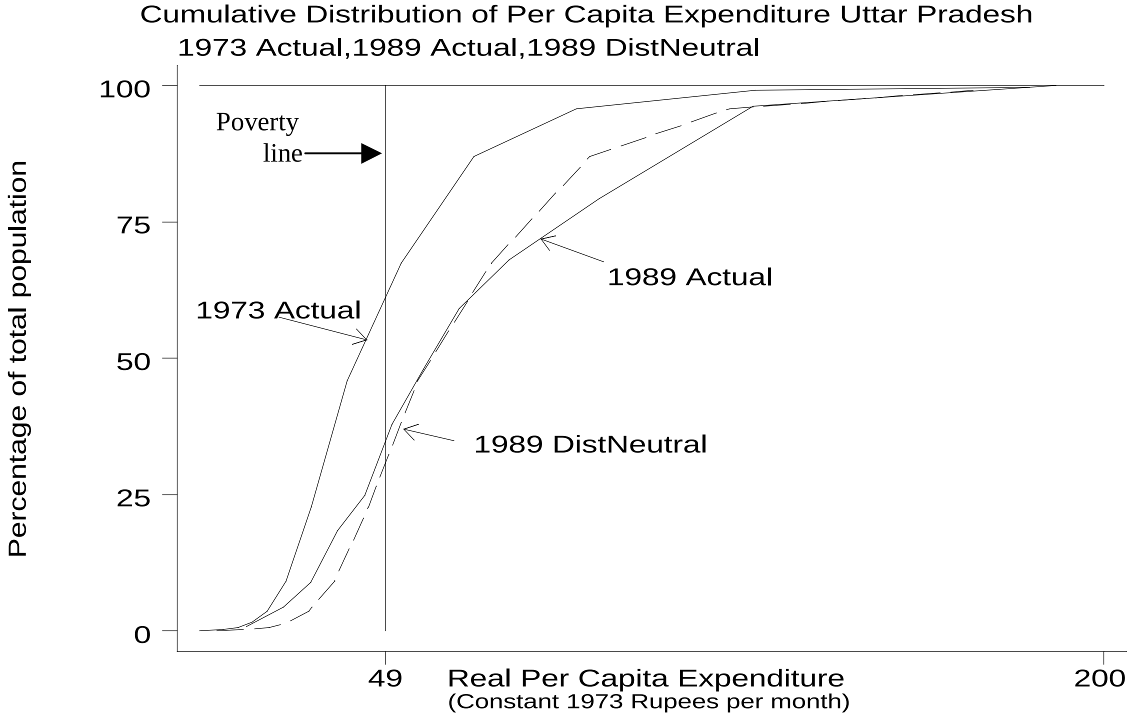


Figure 3: Cumulative Distribution of Per Capita Expenditure for Uttar Pradesh



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