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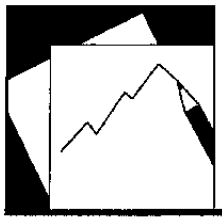

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Poverty Dynamics in Rural India

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Poverty Dynamics in Rural India

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Abstract

India's progress in reducing poverty at the national level masks substantial disparity in the incidence of poverty at the state level. This paper provides a description of the trends in interstate differences in rural poverty for the period 1978–97. Key findings are that poverty generally declined in most states over the last twenty years. However, poverty increased during the early years of the 1990s reform period before decline again in the later years. Relative differences in poverty narrowed during the 1980s but widened somewhat during the next decade. The better success rate of some states in reducing poverty in the 1990s was, in part, due to higher growth and lower inflation.

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Content Page

I. INTRODUCTION

Over the last fifty years, India has achieved significant progress in reducing poverty. However, progress at the national level masks substantial differences at the state level. Moreover, in recent years, some analysts have expressed concerns that the reforms of the 1990s, which were primarily aimed at liberalizing domestic markets and the external sector, raised growth but did not benefit the poor.

Three main results have emerged from existing studies about India's state level poverty experiences:[2] (i) interstate disparities in poverty have narrowed, although, they remain high; (ii) the relatively better success rate of some states in reducing poverty was at least in part due to higher growth and lower inflation; and (iii) initial conditions, such as better infrastructure, higher education, and tenancy reforms also have been significant in reducing poverty. However, these studies were largely limited to the period before 1992, and do not address whether the narrowing trend in interstate disparity in poverty was sustained during the post-reform period. Similarly, they provide no direct evidence that growth has continued to be pro-poor in the post-reform years. This chapter attempts to fill this gap.

The focus here will be exclusively on rural poverty, for two reasons: first, roughly three-quarters of India's poor live in rural areas, and thus changes in rural poverty have a much larger impact on overall poverty; second, several studies have pointed out that rural and urban poverty behave in distinct ways and analyzing both is beyond the scope of a single chapter. Moreover, this chapter focuses on the incidence of rural poverty—the proportion of the population that is poor—rather than the depth of poverty, which measures how poverty stricken the poor are.

The empirical work here departs methodologically from previous studies. The earlier studies used regression analysis to examine whether interstate differences in poverty were narrowing over time and how the pace of catch-up was related to growth and other factors.[3] Results from such analyses are useful and this chapter also carries out such exercises. However, it is possible that by imposing a particular structure (linear or otherwise) on the data, regression exercises do not fully exploit all the available information. Borrowing from the literature on cross-country studies of income convergence, this chapter also carries out nonparametric estimations (which do not impose any structure on the data) to complement panel regression estimates.[4] In particular, the focus is on examining the properties of the interstate distribution

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[2] See Ravallion and Datt (1996) for a review of India's poverty experience since the 1950s and the related literature.

[3] See Jha (2000) and Datt and Ravallion (1998) for examples of such studies in the context of interstate poverty; Aiyar (2001) conducts a similar study of interstate differences in income.

[4] For an exposition of this methodology in the context of cross-country growth see Quah (1997). For more general overviews of nonparametric estimation see Hardle and Linton (1994) and Yatchew (1998).

of poverty, analyzing how they have evolved over time, and determining the factors that have affected their evolution.

Several stylized observations emerge from this exercise. First, the incidence of poverty has fallen across the states over the last two decades. However, in the post-1991 reform period, poverty initially increased before declining in the later years. Second, while interstate differences in poverty narrowed during the 1980s, they do not appear to have narrowed in any discernible way during the 1990s. Third, growth has been pro poor in both the pre- and post-reform periods. Lastly, poverty in the 1990s may have been more strongly influenced by differences in redistributive policies, human capital development, and other "structural" factors.

The rest of the paper is organized as follows. Section II discusses the broad trends and dynamics in state-level poverty. The next section investigates into the possible factors driving the interstate differences in poverty, including the role played by the state's differential growth performances. Section IV deals with poverty experiences during the post-1991 reform period, while Section V concludes the paper.

II. Trends in Rural Poverty

A. Data Issues

The chapter uses data on poverty from National Sample Survey (NSS) estimates. The specific measure of poverty used is the state-level rural headcount ratio, defined as the percentage of the population in a state living below the poverty line.[5] Other data were drawn from datasets previously compiled for state-level variables by Ozler, Datt, and Ravallion (1996), Jha (2000), and the World Bank's SIMA database. Wherever necessary, the data were updated to 1997 using official publications.

The poverty estimates by the NSS, however, have not been free of controversy. Although the quality and comprehensiveness of data on poverty in India is among the best in developing countries, there are a number of areas of weakness. First, the NSS carries out two types of consumer surveys—an annual survey with limited sample size and coverage, and a more comprehensive survey with a larger sample conducted roughly every five years. Although estimates from the smaller samples are publicly released, they are not officially accepted as representative surveys. Consequently, official poverty estimates are available only in five-year intervals, making it difficult to study their time series properties. In the sample period under study, 1978-97, there are four large sample studies for 1977-78, 1983, 1987-88, and

[5] In India, the rural poverty line is based on a nutritional norm of 2,400 calories per day, and is defined as the level of average per capita total expenditure at which this norm can be typically attained. The Planning Commission determined this line at Rs 49 per capita monthly expenditure at October 1973-June 1974 all-India rural prices. For the urban area, the poverty line is computed at Rs 57 per month reflecting a nutritional norm of 2,100 calories.

1993-94. As in previous studies, to enlarge the number of available time series observations, these large sample estimates are supplemented by small sample estimates for 1986-87, 1990, 1991, 1992, 1995, 1996, and 1997.

The second area of concern is related to the latest (1999-2000) large sample survey. Prior large sample surveys were conducted on the basis of a 30-day recall. However, in the 1999-00 survey a 7-day recall questionnaire was added. Some critics have alleged that the two sets of questionnaires may have confused both respondents and enumerators such that even the 30-day recall estimates for 1999-2000 are not comparable with those of the earlier large sample studies. To avoid these difficulties, the 1999-2000 estimates are excluded from the analyses below.

The discussion in this paper covers only the 14 largest states of India, for two reasons. First, the 14 states represent over 90 percent of India's total population, and second, although data on poverty are available for the remaining 17 states and union territories, in many cases they are constructed using one of the larger states as a proxy.[6] Consequently, including the other 17 states and union territories would introduce a bias in favor of the smaller states—which represent more than 50 percent of the sample, but account for less than 10 percent of the total population—and those states (such as Assam) whose headcount ratios are used as proxies for those in the smaller provinces.

B. Poverty Differences Across India's States

The incidence of poverty across India's states varies considerably. For example, in 1978, the headcount ratio—the percentage of population below the poverty line—in Punjab was 20 percent, while that in Bihar was 66 percent. Two decades later, the headcount ratio in Punjab had fallen to 16 percent, while that in Bihar to 62 percent. In both years, Punjab remained the state with the lowest incidence of poverty, and Bihar one of the poorest states. In contrast, during the same period West Bengal reduced its headcount ratio from 56 percent to 27 percent, while Maharashtra lowered it from 70 percent to 45 percent. Therefore, while poverty rates fell in all states, the experience has been extremely uneven (Chart 1).

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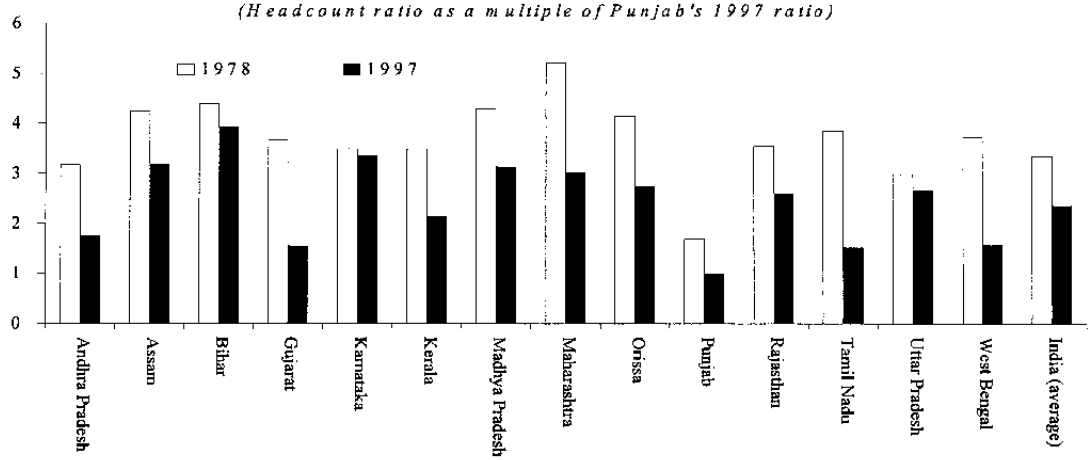
[6] The headcount ratio of Assam is used as a proxy for Sikkim, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, and Tripura; that of Tamil Nadu for Pondicherry, and Andaman and Nicobar Islands; Kerala's headcount ratio proxies for Lakshdweep's; the poverty line of Maharashtra is used to estimate the headcount ratio of Goa, which in turn is used as a proxy to measure poverty in Dadra and Nagar Haveli; and the headcount ratio of Punjab is used to proxy Chandigarh's.

A succinct way to study interstate differences is to examine the entire relative distribution of the state level headcount ratios and how it has changed over time.[7] To do so, the kernels of the poverty ratios of states at different points in time are estimated. A kernel estimator of a set of observations—in this case the relative rankings of headcount ratios across states—is an

Chart 1.India: Incidence of Rural Poverty in India's States
(Headcount ratio as a multiple of Punjab's 1997 ratio)



estimated distribution function from which the observations are likely to have been drawn (for details, see Silverman (1986)).[8] Technically, the kernel estimator $f(x_k)$ of an arbitrary point x_k is defined as

$$f(x_k) = \frac{1}{Nh}\sum_{j=1}^{N} K\left(\frac{x_k - X_j}{h}\right)$$

where, X_j = the jth observation in the sample data; N = number of observations; h = window width/smoothing parameter; and K = kernel or weighting function, which in this exercise is assumed to be the normal distribution.[9]

The kernel estimators were computed in three steps. In the first step, for each year the headcount ratios of the 14 states were rescaled as a factor of Punjab's 1997 ratio. The resulting rankings lie in the interval [0,6]. In the second step, for a suitably large number of points spanning the interval [0,6], the frequency—i.e., the unconditional probability—with which values in this interval can occur was estimated.[10] The probability of each point was

[7] Quah (1997) uses this approach to study cross-country differences in income levels.

[8] For a formal derivation of the estimator and its statistical properties see Pagan and Ullah (1999).

[9] The choice of the weighting function generally does not effect the kernel estimator significantly (see Silverman (1986), Hardle and Linton (1994)).

[10] For these exercises, the interval [0,6] was divided into equally spaced 100 sub-intervals.

computed as the weighted average of the distance of that point from the observed headcount ratios of all the 14 states, with the weights drawn from a normal distribution centered at that point. The smoothing parameter (window width) was chosen to be around $0.9AN^{-1/5}$, where A=min(standard deviation, interquartile range/1.34), following Silverman (1986). In the third step, the frequencies of these points were plotted after the area of the frequency distribution was normalized to be 100.

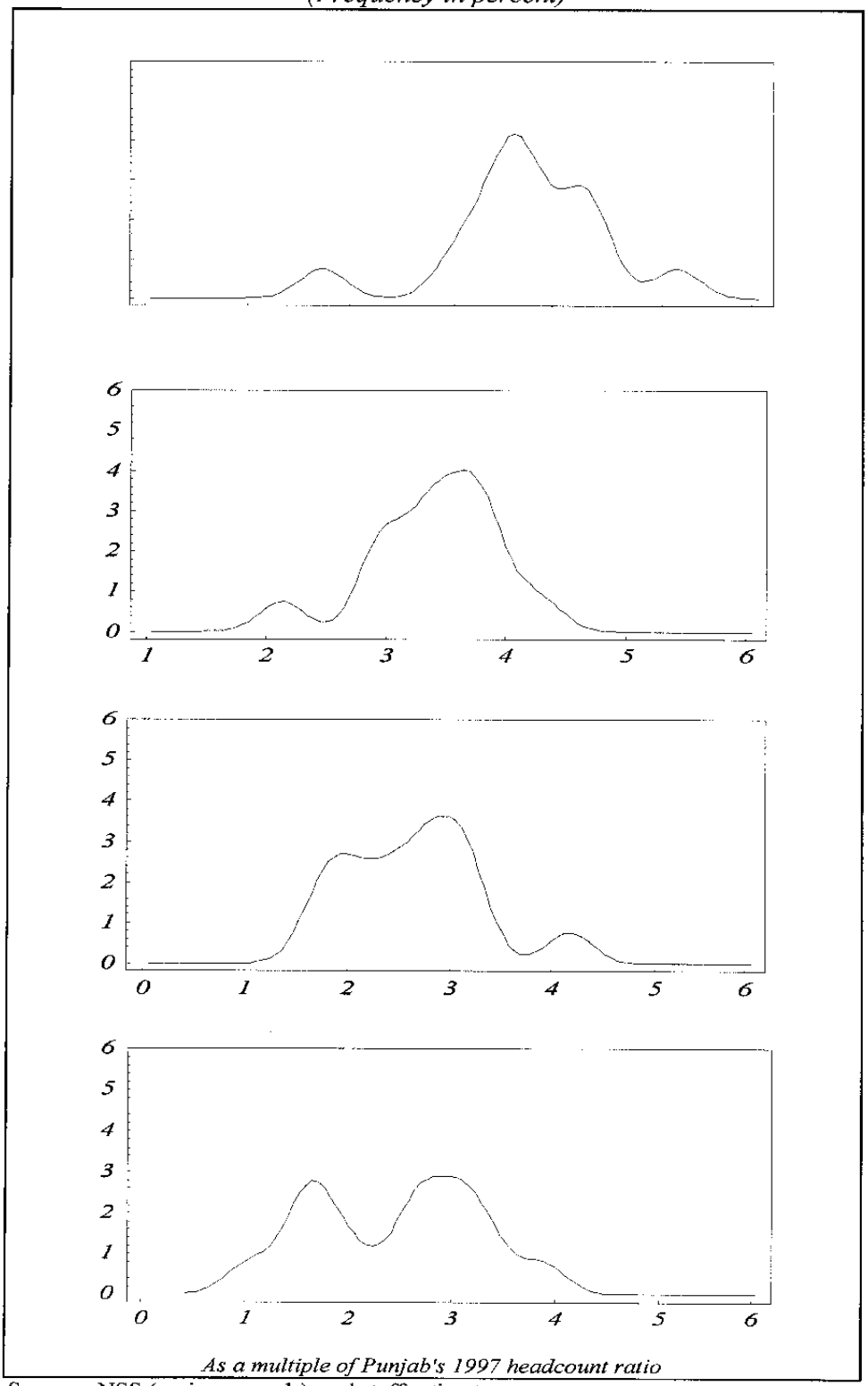
An examination of the interstate distribution of poverty shows that the interstate dispersion of poverty declined significantly between 1978-97 (Chart 2). Over the course of the two decades, the mass of the interstate distribution shifted discernibly to lower incidences of poverty. For example, this implies in 1978 an unconditional probability of 38 percent that a state's headcount ratio was more than four times that of Punjab's 1997 headcount ratio. This probability fell sharply to 3 percent by 1988.

However, this decline in probability at the higher end was compensated by an increase in the probability at the lower end. The likelihood of the headcount ratio being less than two times that of Punjab's 1997 ratio rose from 6 percent to 8 percent during 1978-88, and then to 35 percent by 1997.[11]

While the year-by-year distributions are useful, they tell us little about the intertemporal dynamics between one period and another. In particular, the panels in Chart 2 do not provide information about the fate of individual states. Did the progress in reducing poverty occur across the board and steadily, or did the rankings change over time?

[11] It is relatively straightforward to check the robustness of the shape of the estimated kernels by weighting each state's headcount ratio by the state's share in total population. However, it is not clear how one would interpret such distributions, since they would be estimating the frequency of how rural population is distributed across the whole country, rather than the incidence of poverty.

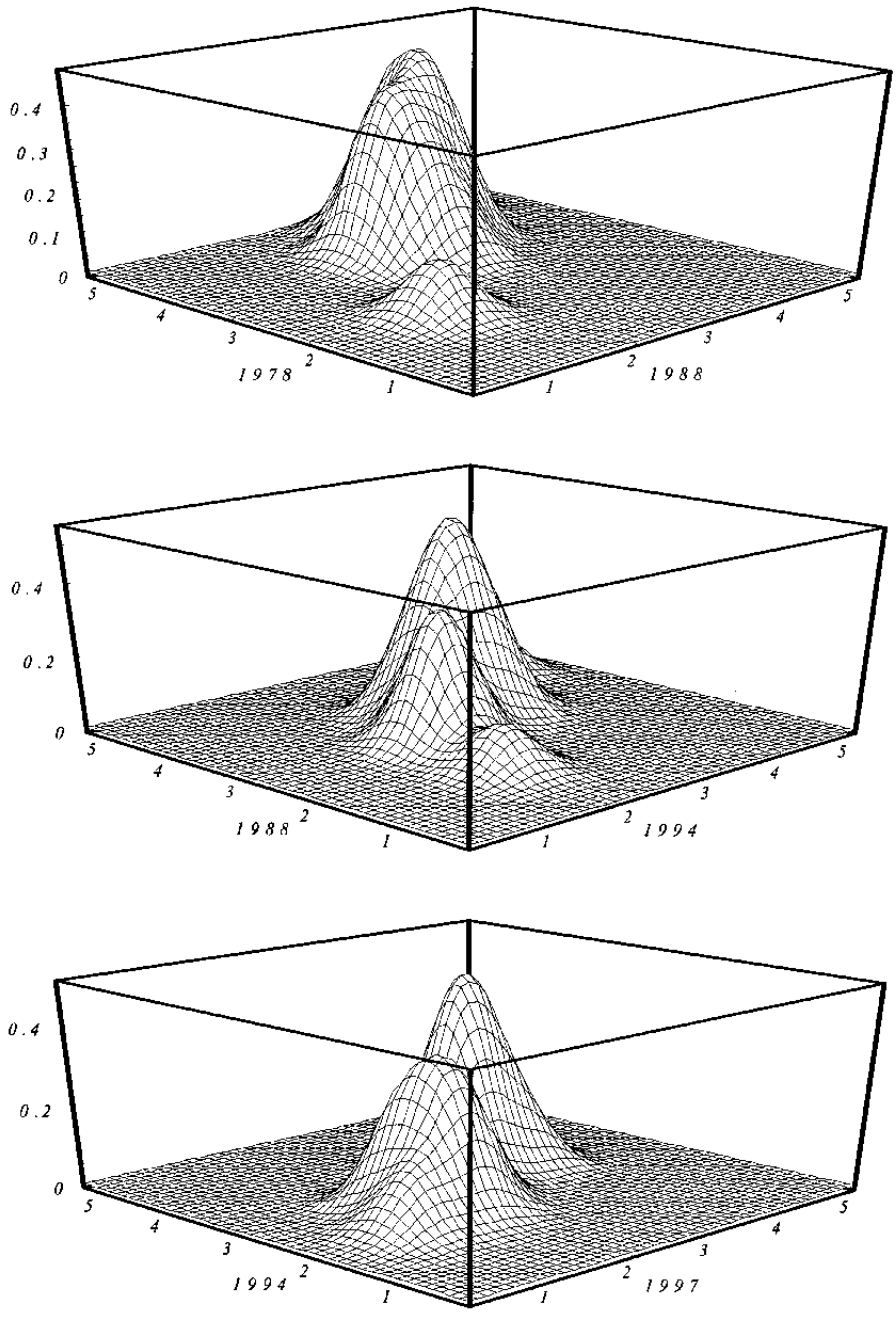
Chart 2. India: Estimated Interstate Distribution of Poverty, 1978-97
(Frequency in percent)



Sources: NSS (various rounds), and staff estimates.

Chart 3. India: Intradistribution Dynamics, 1978-97

The horizontal axes measure headcount ratio as a factor of Punjab's 1997 headcount ratio, while the vertical axis measures the frequency.
Points of the distribution that lie on the left of the north-south diagonal indicate a reduction in poverty between the initial and terminal years, while those to the right indicate an increase.



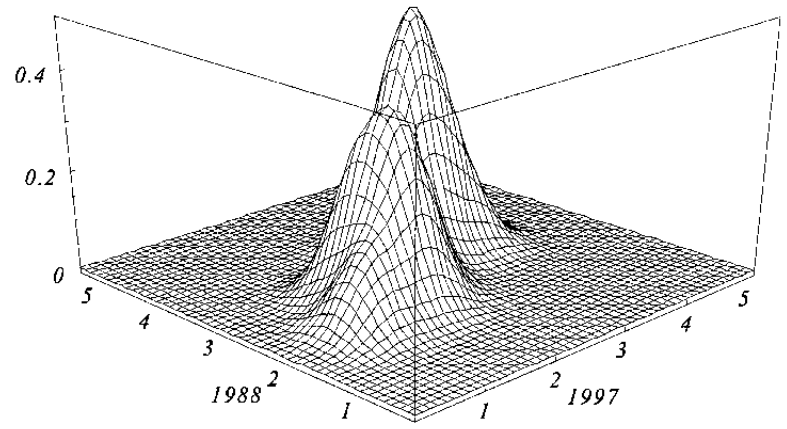
Sources: NSS (various rounds), and staff estimates.

In order to address this type of question, the joint density distributions of poverty were constructed (Chart 3). In each panel of these charts, the kernel of the joint distribution of relative poverty in the initial and terminal years is plotted using the bivariate version of the kernel estimator discussed above. The horizontal axes measure the relative poverty in the initial and terminal years, while the vertical axis measures the frequency. The height of the distribution shows the frequency or probability with which a particular history of poverty occurred between the initial and terminal period. Points of the distribution that lie along the north-south diagonal represent unchanged incidence of poverty, while points to the right (left) of the diagonal represent a rise (decline) in poverty between the two periods.

The intradistribution dynamics differed in the 1980s and 1990s. Between 1978 and 1988, a reduction in poverty occurred across the board. The entire joint distribution for the period is skewed to the left of the north-south diagonal. In fact, 90 percent of the mass of the distribution lies to the left of the diagonal. Moreover, states with initially higher incidence of poverty (those having poverty more than four times that of Punjab's 1997 headcount ratio)

Chart 4. India: Poverty Dynamics Between 1988-97

The horizontal axes measure headcount ratio as a factor of Punjab's 1997 headcount ratio, while the vertical axis measures the frequency.
Points of the distribution that lie on the left of the north-south diagonal indicate a reduction in poverty between the initial and terminal years, while those to the right indicate an increase.



Sources: NSS (various rounds), and staff estimates.

achieved the greatest reduction. This does not appear to have been the case in the 1990s. Between 1988-94, the states at the high and low ends of the distribution witnessed an increase in poverty. Overall, only 60 percent of the mass of the distribution lies to the left of the north-south diagonal, with more than a third of the states experiencing an increase in poverty. The situation changes only marginally in the next three years, such that for the period 1988-97 as a whole, only 60 percent of the experiences showed a reduction in poverty (Chart 4).

C. Convergence in Poverty

A natural question to ask at this point is whether there is convergence across the states in the incidence of poverty. Put differently, did the states that had the higher initial headcount ratio also reduce poverty the most? Or is it the case that relative differences in poverty have remained the same or widened? The genesis of this question lies in the empirical growth literature, where several studies have examined whether income levels across countries or across regions within a country are converging to a common level or not. In the context of India's states, Cashin and Sahay (1996) and Aiyar (2001), among others have found that, although there is little indication of *absolute convergence*, there is evidence of *conditional convergence*. That is, growth rates of states are not inversely related to their initial per capita income; but once differences in economic structure and policy are controlled for, income levels across states are converging.

In the growth literature the convergence hypothesis is tested by regressing per capita growth rates over a period of time on initial per capita income levels. An estimated coefficient on per capita income that is significantly *negative* is interpreted as evidence in favor of absolute convergence. When other control variables are used in the regression equation, and the estimated coefficient of initial per capita income is significantly negative, there is support for the hypothesis of conditional convergence. Following this methodology, one can regress the rate of poverty reduction on the initial level of poverty, and a significantly *positive* coefficient on the initial poverty level would suggest convergence in poverty levels. Convergence tests of this variety have been extensively used in the cross-country growth literature.[12] While they are useful, by relying on the average behavior of the states, they do not employ all the information available on interstate differences.[13] Alternatively, the interstate distribution of the rate of poverty reduction, conditioned on the initial headcount ratio, provides a more comprehensive use of the information available in interstate differences. The conditional distribution can be estimated nonparametrically using the Nadaraya-Watson estimator. Mathematically the Nadaraya-Watson[14] estimator is defined as:

$$f(x_k) = \frac{\sum_{j=1}^{N} Y_j K\left(\frac{x_k - X_j}{h}\right)}{\sum_{j=1}^{N} K\left(\frac{x_k - X_j}{h}\right)}$$

[12] Barro and Sala-i-Martin (1995) is the classic reference for this literature.

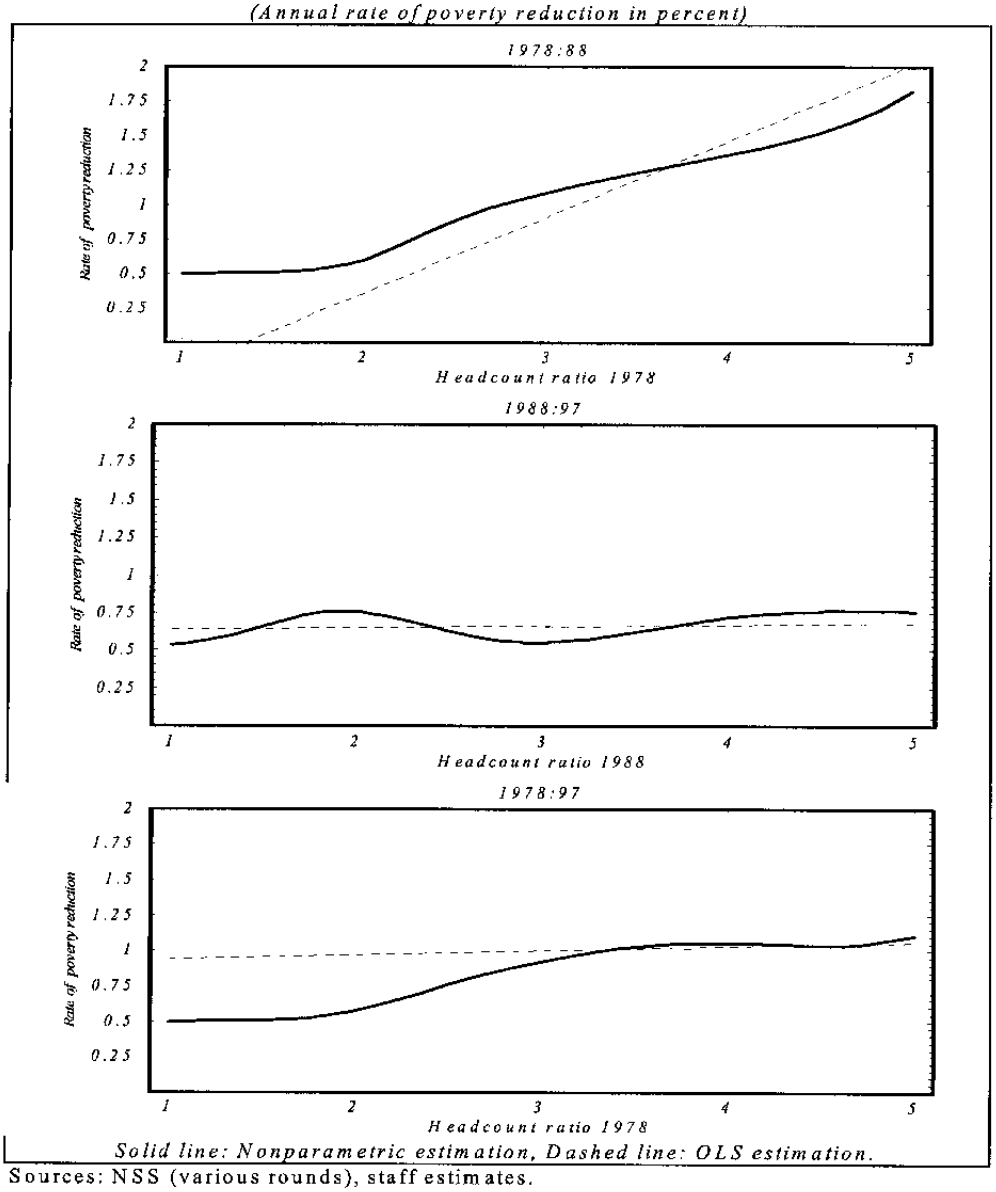
[13] In the context of the empirical growth literature, Quah (1993) and Durlauf and Quah (1998) discuss the limitations of this approach.

[14] For a technical derivation and statistical properties of the Nadaraya-Watson estimator see Pagan and Ullah (1999).

where, Y_j =the jth observation of the dependent variable and X_j = the jth observation of the independent variable. The other notations have the same meaning as before.

While there is strong indication of convergence in poverty during the 1980s, there is little supporting evidence during the 1990s (Chart 5). Both the ordinary least-squares (OLS) and nonparametric estimates indicate that almost uniformly the rate of poverty reduction was faster the higher the initial level of poverty was in the period 1978-88. Put differently, the further away a state was from Punjab's 1997 headcount ratio, the faster was the rate of poverty reduction. However, during the period 1988-97, both the OLS and nonparametric estimates indicate that convergence was weak. For the period as whole, the two methods

Chart 5. India: Poverty Convergence Across India's States, 1978-97
(Annual rate of poverty reduction in percent)



Solid line: Nonparametric estimation, Dashed line: OLS estimation.

Sources: NSS (various rounds), staff estimates.

display contrasting pictures. The OLS estimates indicate little convergence. On the other hand, the nonparametric estimates suggest convergence among states with relatively low initial poverty (headcount ratio being less than 3.5 in 1978, which comprises roughly 40 percent of the sample), and none among states with higher initial poverty.

III. Has Growth Been Pro-Poor?

This section focuses on the role played by growth in the intradistribution dynamics and whether it has been poverty reducing. Studies addressing this question in the context of Indian states have generally used panel regressions to estimate whether growth reduces poverty in any significant way. Datt and Ravallion (1998) exemplify such studies. Using data from 1957-91, they found that rural poverty was reduced by higher agricultural yields and per capita nonfarm output. Other variables that mattered for poverty reduction included inflation, initial infrastructure, level of human capital, and government development spending. In this chapter, the approach in Datt and Ravallion (1998) is modified somewhat. Instead of estimating the level of poverty, the rate of poverty reduction is estimated. Guided partly by the regressors that Datt and Ravallion (1998) found to be significant, and partly by the availability of data, the following equation was tested:

$$\Delta P_{jt} = \alpha_j + \beta^{NFP} \Delta NFP_{jt} + \beta^{YLD} \Delta IYLD_{jt} + \beta^{INFL} (INFL_{jt} + INFL_{jt-1}) + \beta^{GOV} \Delta GOV_{jt} + \pi T + \varepsilon_t$$

where Δ denotes percent change, P is the headcount ratio, NFP is real per capita nonfarm product, YLD is agricultural production per hectare of net sown area, T is the time trend, $INFL$ is the rural inflation rate, GOV is per capita real state development spending, and j refers to a state.

Panel estimates indicate that growth and rural inflation affect poverty in a statistically significant way (Table 1). While overall per capita growth (equation 1)

Table 1. India: Panel Regressions, 1978-97
(Dependent variable: change in headcount ratio)

Independent variable	(1)	(2)	(3)	(4)
Real per capita state GDP growth	-0.61 [0.00]			
Real agricultural yield growth		-0.19 [0.01]	-0.18 [0.01]	-0.19 [0.01]
Real per capita non-farm output growth		-0.36 [0.00]	-0.33 [0.00]	-0.41 [0.00]
Real per capita development spending growth	-0.08 [0.46]	-0.1 [0.36]	-0.11 [0.33]	
Rural inflation (current + lagged)	0.98 [0.00]	0.88 [0.00]	0.99 [0.00]	0.91 [0.00]
Time trend			-0.005 [0.20]	
Adjusted R^2	0.46	0.46	0.46	0.46
Durbin-Watson	2.07	2.06	2.03	2.01
Hausman Test, H_0: Random vs. Fixed Effects (p-value)	0.99	0.99	0.99	0.99

Notes: P-values of the associated t-statistic is in brackets.
Source: Staff estimates.

reduced poverty, several studies have pointed out that the composition of growth also matters. Accordingly, overall growth in subsequent estimations (equations 2-4) was replaced by agricultural yield and the per capita growth rate of nonfarm output. The likely channel by which agricultural yield reduces rural poverty is via raising agricultural real wages and increasing rural employment. In fact, real wages have a very strong impact on rural poverty (Box), although this variable is not used in the analysis since it is highly correlated with agricultural yield and data beyond 1993 are not available. In addition, nonfarm output reduces poverty by absorbing rural labor in urban industries and services sectors. Both these variables were found to be statistically significant.

While some studies (e.g., Datt and Ravallion (1998)) identified a common trend decline in poverty since the 1950s, this decline was not significant for the sample period considered here. Also in contrast to the estimates of other studies, public development spending during this period was not significant. Consequently, the trend and development spending were dropped from the equation to obtain the estimates shown in column 4 of Table 1.

Although, the panel estimates confirm that growth has been pro poor, they do not provide any information on how growth has affected interstate poverty dynamics. To understand this, information from the panel estimates was used to generate interstate distributions of poverty conditioned on growth. The intradistributional dynamics of the conditioned kernels were then contrasted with the unconditioned distributional dynamics, described in the previous section, to draw various inferences. To derive the growth-conditioned interstate poverty distribution, all variables were held constant at their 1978 levels, except for agricultural yield and nonfarm output. Conditioned headcount ratios were then computed for the sample period, using the coefficients estimates of equation (4) in Table1. Next, the conditioned headcount ratios—which reflect only the impact of growth on poverty—were used to compute the kernel estimates of the interstate poverty distribution. This is similar to computing the semiparametric estimate of the interstate poverty distribution.[15]

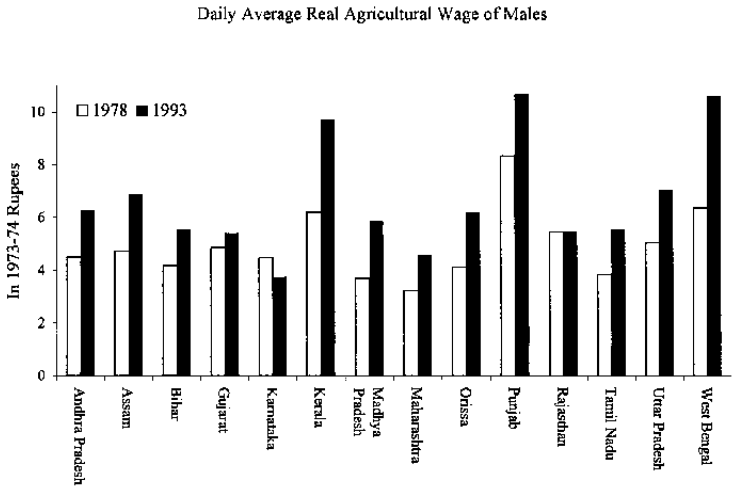
The interstate distribution of growth-conditioned poverty and its dynamics were influenced by growth. By construction, the conditioned headcount ratios indicate what would have been the interstate differences in poverty if growth was the only factor differentiating the states. In principle, if the shapes and intertemporal dynamics of the residual kernels are different from those of the unconditioned kernels estimated in the previous section, then the differences can be used to form a judgment about the influence of growth on the way rural poverty evolved over the last two decades.

[15] See Yatchev (1998) for a heuristic discussion of semiparametric regressions; Pagan and Ullah (1999) for a more technical treatment.

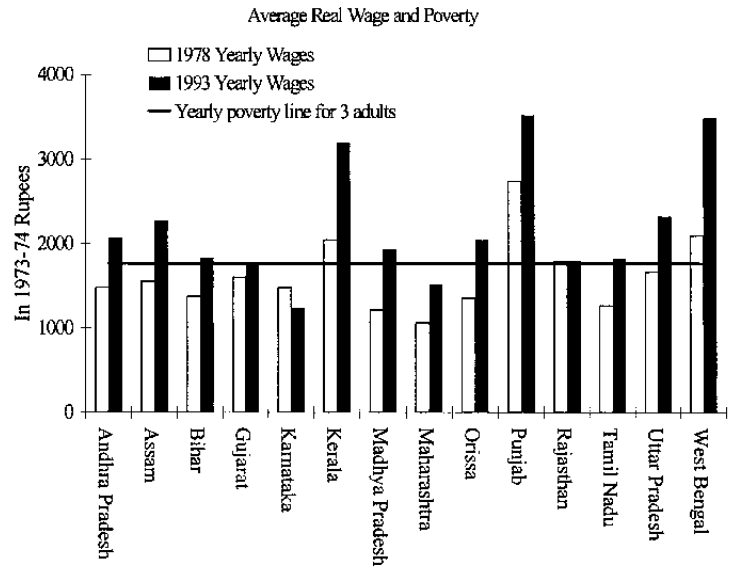
Box: Agricultural Wages: Some Unpleasant Arithmetic

Landless laborers and marginal farmers make up a large portion of the rural poor. Not surprisingly, conditions in agricultural labor markets—particularly agricultural wages—influence rural poverty significantly.

As with poverty, there is a wide disparity in the distribution of agricultural wages across the states in India. The disparity reflects various state-specific institutional features such as minimum wage regulations and how well they are enforced, along with differences in agricultural productivity. For example, in both 1978 and 1997, the average real wage was 40 percent higher in Kerala, Punjab, and West Bengal, than in Andhra Pradesh, Bihar, and even Maharashtra, which is one of the better-developed states. While high agricultural yields have been part of the reason why wages have been higher in some states, government policies have also contributed. For example, in West Bengal much of the improvement in real wages has been attributed indirectly to tenancy reforms of the late 1970's that led to higher agricultural yields (Banerjee, Gertler, and Ghatak, 2000).



Although, agricultural wages have increased in many states, they still remain inadequate to raise living standards above the poverty line in many regions. To see this, consider the following example: suppose a male agricultural laborer has a family unit equivalent to 3 adults (this is less than the typical family size, but in many families the female members and children also work). In order for the three adults to have a consumption basket at the poverty line, the agricultural worker needs to earn a minimum of Rs 1,746 per year, at 1973-74 prices. Assuming that the rural unemployment rate is 10 percent, and the worker's workweek covers all seven days in a week—an extreme assumption under any reasonable circumstances, and more so given significant rural unemployment. In several states the family unit would remain below the poverty line if it earned only the average agricultural wage. In 1978, in only three states—Kerala, Punjab, and West Bengal—would the hypothetical family unit have been above the poverty line. In 1993, despite significant increases in real wages, in as many as five states—Bihar, Gujarat, Karnataka, Maharashtra, and Rajasthan—the hypothetical family would have been barely at or below the poverty line.

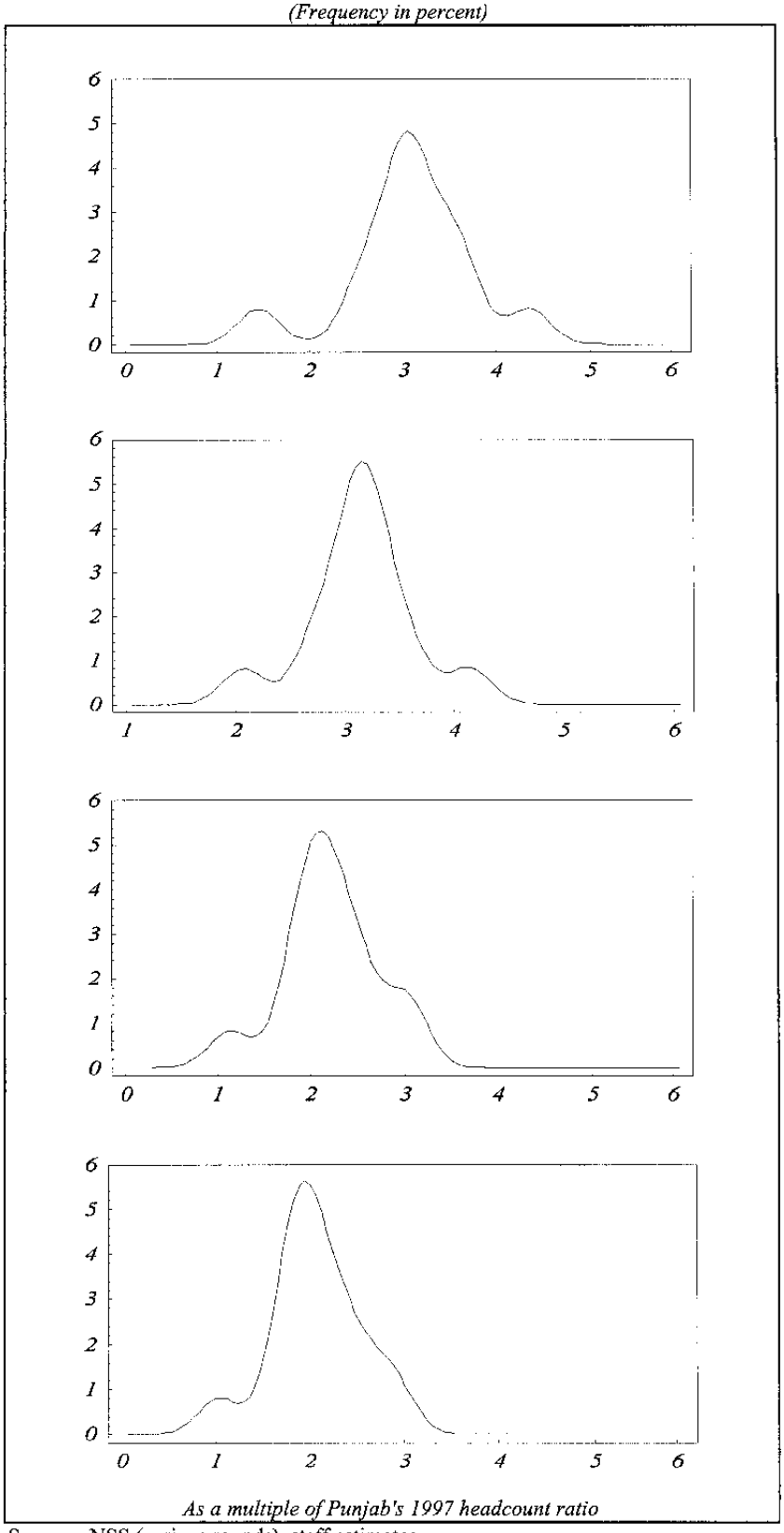


Indeed, the conditioned residual kernels (Chart 6) are strikingly different from the unconditioned kernels in Chart 2. In particular, there is a continued leftward movement in the conditioned kernels over time, including during the 1990s.[16] This result suggests, for example, that the probability of achieving poverty two times that of Punjab's 1997 headcount ratio increased from 8 percent in 1978 to 14 percent in 1988, and then to 44 percent in 1997, conditional on the differential growth experiences of the states. In contrast, for the unconditioned distribution, this progression was from 6 percent in 1978, to 8 percent in 1988, and then to 35 percent in 1997. Thus, if poverty was recalculated based solely on the growth experiences of the states during this period, the headcount ratios of these states would have generally been closer to Punjab's 1997 headcount ratio than otherwise.

The intradistribution dynamics of the conditioned kernels also corroborate the positive impact of growth on reducing poverty discussed in the previous paragraph. However, more interesting is the intradistributional dynamics of the residual poverty distributions, i.e., the interstate distribution of poverty after removing the impact of interstate differences in growth. By construction the interstate distribution of residual poverty includes only the influences of the interstate differences in all the factors not related to growth. In contrast to the unconditioned joint distribution kernels (Chart 3), the kernels in Chart 7 are skewed markedly to the right of the north-south diagonal, indicating that interstate differences in non-growth factors tended to worsen poverty and widen poverty differential across the states in all the three sub-periods. For example, in the unconditional case, 90 percent of the mass of the joint poverty distribution for 1978-88 was to the left of the north-south diagonal. For the residual joint distribution only 52 percent of the mass lies to the left of the north-south diagonal. For 1988-94 and 1994-97, the pattern is similar. Thus, both parametric (OLS regressions—Table 1) and semi-parametric estimates (the residual joint distributions—Chart 6 and 7) indicate that growth during the 1980s and 1990s was poverty reducing, while nongrowth factors tended to raise poverty.

[16] Note, that since Punjab's 1997 headcount ratio is also stripped of all influence except growth, the conditioned and unconditioned kernels are directly comparable.

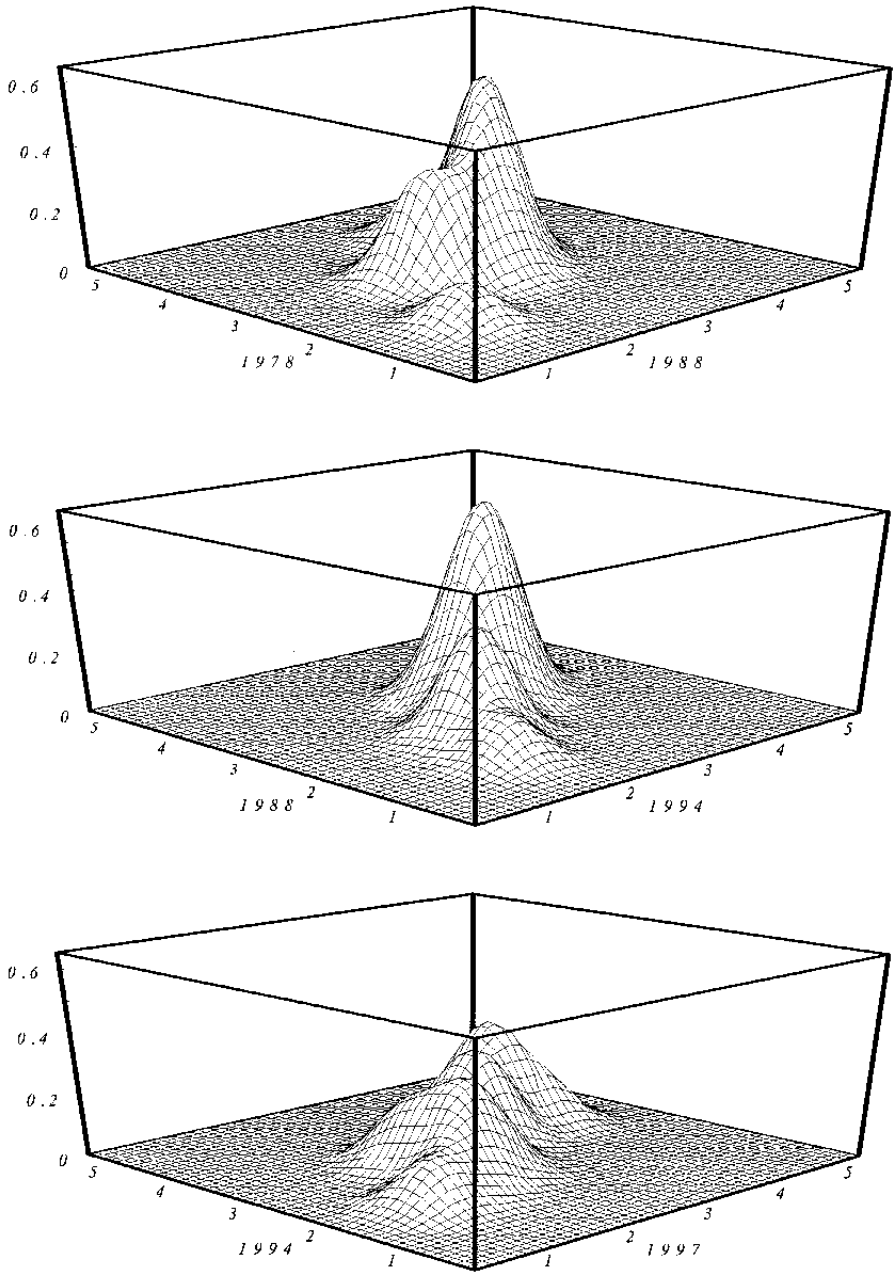
Chart 6. India: Interstate Distribution of Conditioned Poverty, 1978-97
(Frequency in percent)



Sources: NSS (various rounds), staff estimates.

Chart 7. India: Intradistribution Dynamics of Residual Poverty, 1978-97

The horizontal axes measure headcount ratio as a factor of Punjab's 1997 headcount ratio, while the vertical axis measures the frequency.
Points of the distribution that lie on the left of the north-south diagonal indicate a reduction in poverty between the initial and terminal years, while those to the right indicate an increase.



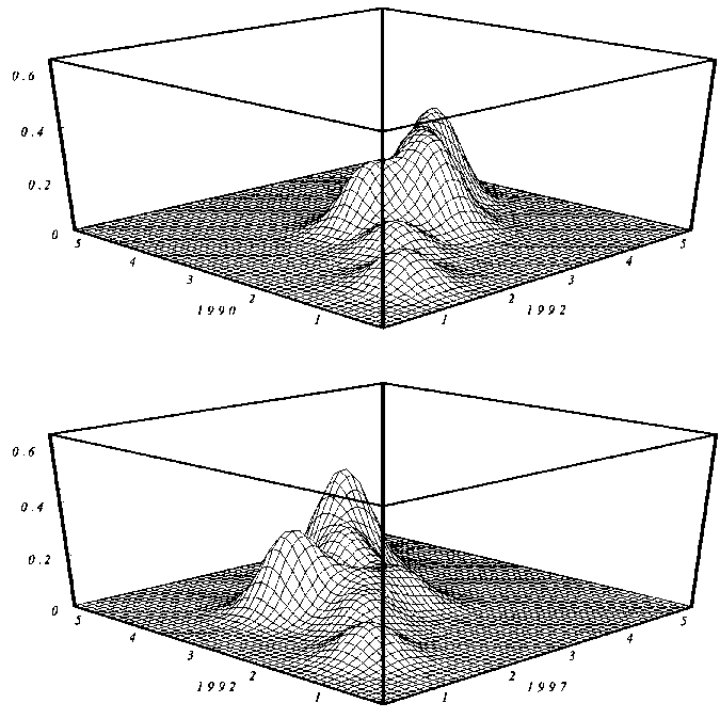
Sources: NSS (various rounds), and staff estimates.

IV. Poverty Dynamics During the Reform Period

In recent years, some analysts have raised concerns that the reforms of the 1990s have not benefited the poor.[17] Critics contend that while liberalization raised GDP growth, the associated decline in poverty was muted, especially when compared to the 1980s. Although evidence discussed above does not support this hypothesis, experiences of other countries that underwent stabilization and reform efforts suggest that poverty generally rises in the initial years of reform, followed by a reversal in the later years. To understand whether such a phenomenon occurred in the case of India's 1991 reforms, the 1990s are divided into two subperiods, 1990-92 and 1992-97—the early and later reform years. The exercise of the previous sections is then repeated for these two sub periods.

Chart 8. India: Poverty Dynamics in the Early and Late Reform Years

The horizontal axes measure headcount ratio as a factor of Punjab's 1997 headcount ratio, while the vertical axis measures the frequency.
Points of the distribution that lie on the left of the north-south diagonal indicate a reduction in poverty between the initial and terminal years, while those to the right indicate an increase.



Sources: NSS (various rounds), and staff estimates.

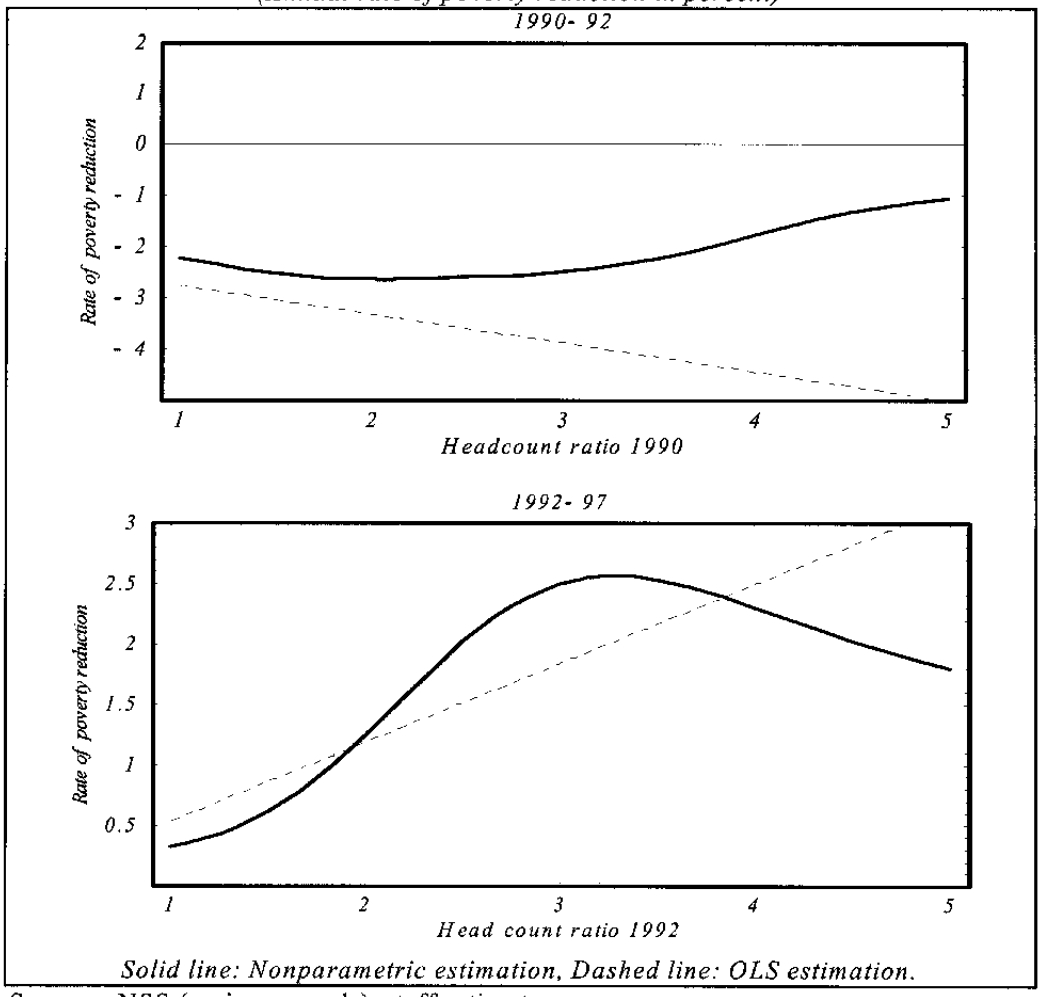
The poverty dynamics suggest that, while poverty worsened in the immediate aftermath of the reforms, the trend was reversed in the later years. As seen in Chart 8, by 1992, the joint distribution shifts to the right of the north-south diagonal, indicating an almost uniform tendency for poverty to increase. In sharp contrast, by 1997 the tendency is reversed as the joint distribution shifts to the left of the north-south diagonal.

[17] See Gupta (1995) and Tendulkar and Jain (1995). Both these papers, however, use data available only to 1992. Extending the data period to 1997, Datt (1999) reached the conclusion that the average trend in rural poverty at the all-India level remained flat in the 1990s.

The nonparametric estimates provide some evidence of mild widening of relative poverty differentials during the early reform period, and states with higher initial (1990) levels of poverty experienced mildly larger increase in poverty (Chart 9). However, in the later years standard convergence exercises points to strong convergence, although nonparametric estimates indicate that states with lower initial poverty gained the most in relative terms in reducing poverty. Thus, relative differences in poverty may have widened in the later reform years too and, putting the estimates from the two sub-periods together, it would appear that relative differences may have widened in the 1990s overall.

Although somewhat muted in the early years, growth remained poverty reducing during the reform period. In the early years, the growth-conditioned joint distribution is distributed evenly along the north-south diagonal, indicating that based solely on growth, some states would have experienced a worsening in poverty. However, in the later reform period, the intradistribution dynamics indicate that growth reduced poverty strongly—almost the entire joint distribution is skewed to the left of the north-south diagonal.

Chart 9. India: Poverty Convergence During the 1990s
(Annual rate of poverty reduction in percent)



Solid line: Nonparametric estimation, Dashed line: OLS estimation.

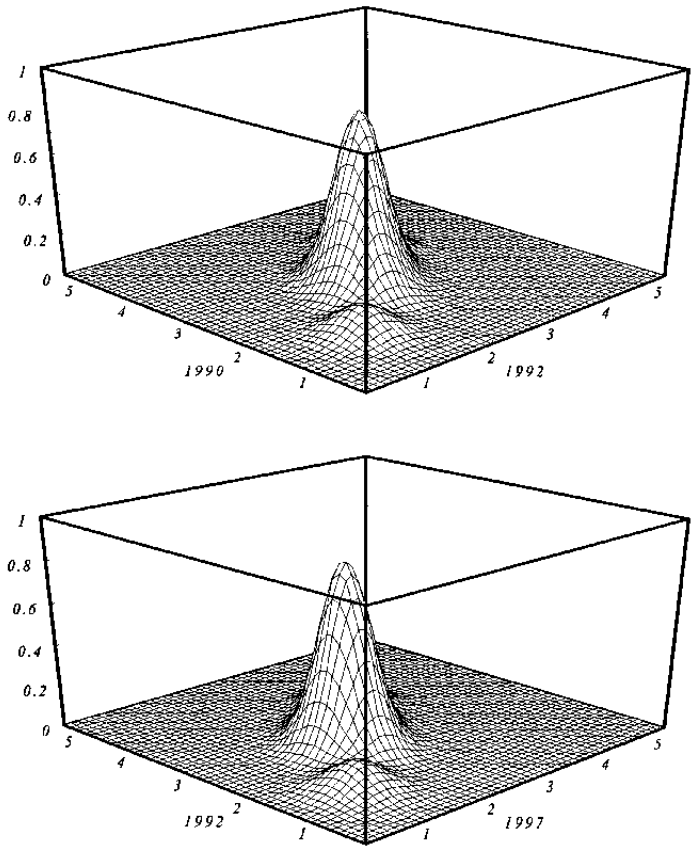
Sources: NSS (various rounds), staff estimates.

V. CONCLUSIONS

The aim of this chapter was to shed light on the dynamics of interstate differences in poverty over the last two decades. In so doing, the chapter extended previous studies on interstate differentials in rural poverty in India in two directions. First, the time period under study was extended to 1997, allowing an investigation into interstate differences in poverty in the post-reform period. Second, standard regression analyses were supplemented with nonparametric estimates of behavior of the interstate distribution of rural poverty to provide a more complete picture of poverty dynamics during the last two decades.

Chart 10. India: Conditioned Poverty Dynamics in the Early and Late Reform Years

The horizontal axes measure headcount ratio as a factor of Punjab's 1997 headcount ratio, while the vertical axis measures the frequency.
Points of the distribution that lie on the left of the north-south diagonal indicate a reduction in poverty between the initial and terminal years, while those to the right indicate an increase.



Sources: NSS (various rounds), and staff estimates.

Key findings are that poverty generally declined in most states over the last twenty years. However, poverty increased during the early years of the 1990s reform period, before declining again in the later years. While relative differences in poverty narrowed during the 1980s, this tendency appears to have reversed somewhat during the next decade.

The paper also found that growth has been pro poor, even during the post-reform period. In particular, earlier econometric results establishing a positive link between growth and poverty reduction continued to hold during the 1990s. In addition, there is evidence that the widening of poverty differentials in the post reform period was largely due to the influence of nongrowth factors—such as, perhaps, changes in redistributional policies, human capital development, and other factors that have been identified in the literature to have an impact on poverty. That is, growth—as proxied by agricultural yield and per capita nonfarm output growth—would have reduced the incidence of poverty in the absence of counteracting nongrowth factors.

REFERENCES

Aiyar, Shekhar. (2001), "Growth Theory and Convergence Across Indian States: A Panel Study," in Tim Callen et al. editors, *India at the Crossroads: Sustaining Growth and Reducing Poverty*, International Monetary Fund, Washington DC.

Banerjee, Abhijit V., Paul J. Gertler, and Maitreesh Ghatak. (2000), "Empowerment and Efficiency: Tenancy Reform in West Bengal," Working Paper, University of Chicago.

Barro, Robert and Xavier Sala-i-Martin. (1995), *Economic Growth*, McGraw-Hill, New York.

Cashin, Paul and Ratna Sahay. (1996), "Internal Migration, Center-State Grants, and Economic Growth in the States of India," *International Monetary Fund Staff Papers*, Vol. 43, No.1.

Datt, Gaurav (1999), "Has Poverty Declined Since Economic Reforms? Statistical Data Analysis," *Economic and Political Weekly*, December 11, pp. 3516-3518.

Datt, Gaurav and Martin Ravallion. (1998), "Why Have Some Indian States Done Better than Others at Reducing Poverty?" *Economica*, Vol. 65, No. 1, pp. 17-38.

Durlauf, Steven N., and Danny T. Quah. (1998), "The New Empirics of Economic Growth," *Centre for Economic Performance Working Paper* No. 384, January.

Gupta, S.P. (1995), "Economic Reform and Its Impact on Poor," *Economic and Political Weekly*, June 3.

Hardle, Wolfgang, and Oliver Linton. (1994), "Applied Nonparametric Methods," *Cowles Foundation Discussion Paper No. 1069*, Yale University.

Jha, Raghbendra. (2000), "Growth, Inequality and Poverty in India: Spatial and Temporal Characteristics," *Economic and Political Weekly*, March 11.

Ozler, Berk, Gaurav Datt, and Martin Ravallion. (1996), "A Database on Poverty and Growth," mimeo, Policy Research Department, World Bank.

Pagan, Adrian, and Aman Ullah. (1999), *Nonparametric Econometrics*, Cambridge University Press.

Quah, Danny. (1993), "Galton's Fallacy and Tests of the Convergence Hypothesis," *The Scandinavian Journal of Economics*, 95 (4), pp. 427-443, December.

Quah, Danny. (1997), "Empirics for Growth and Distribution: Polarization, Stratification, and Convergence Clubs," *Journal of Economic Growth*, 2 (1), pp. 27-59, March.

Ravallion, Martin and Gaurav Datt. (1996), "Poverty and Growth: Lessons from Forty Years of Data on India's Poor," mimeo, World Bank, Washington D.C.

Silverman, Bernard W. (1986), *Density Estimation for Statistics and Data Analysis*, Chapman and Hall, New York.

Tendulkar, Suresh D., and L.R. Jain. (1995), "Economic Reforms and Poverty," *Economic and Political Weekly*, June 10.

Yatchew, Adonis. (1998), "Nonparametric Regression Techniques in Economics," *Journal of Economic Literature*, Vol. XXXVI, No. 2, pp. 669-721.