Is India's Economic Growth Leaving the Poor Behind?

Gaurav Datt and Martin Ravallion

More of the world's income-poor live in India than any other country. Using an international poverty line of $1 per day (measured at a 1993 purchasing power parity exchange rate), about one-third of the poor in the mid-1990s lived in India.[1] What happens to poverty in India is quantitatively important to the world's overall progress in fighting absolute poverty.

Thus, the recent signs of sustainably higher growth in India may offer encouraging news for poverty reduction. In the 1960s and 1970s, the real annual rate of GDP growth in India was 3.4 percent, implying a per capita annual growth rate of barely 1 percent. Growth rates in national output since the mid-1980s have been appreciably higher on average. In the 1990s, average consumption per capita (as measured in the national accounts) has grown at an annual rate of 3.0 percent, implying about a one-third increase in consumption per capita over the decade. It appears plausible that the economic reforms carried out by India in the 1990s have helped achieve this higher growth (as Ahluwalia explains in this issue).

Experience prior to the 1990s suggests that economic growth in India has typically reduced poverty. Using data from 1958 to 1991, Ravallion and Datt (1996) find that the elasticity of the incidence of poverty with respect to net domestic product per capita was −0.75 and that with respect to private consumption per capita it was −0.9, as shown in Table 1. The first column of Table 1 measures poverty with a headcount index: the percentage of people below the poverty line set by India's government. The next two columns of Table 1 show how two other

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[1] This calculation is based on the World Bank's Global Poverty Monitoring database (⟨http://www.worldbank.org/research/povmonitor/⟩).

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Table 1

Elasticities of National Poverty Measures to Economic Growth in India, 1958–1991

Elasticity with Respect to	Headcount Index	Poverty Gap Index	Squared Poverty Gap Index
Mean consumption from national sample surveys	−1.33 (15.19)	−1.88 (12.83)	−2.26 (10.22)
Mean private consumption from national accounts	−0.90 (4.23)	−1.36 (3.98)	−1.67 (3.45)
Mean net domestic product from the national accounts	−0.75 (3.68)	−1.15 (3.59)	−1.45 (3.27)

Notes: Absolute t-ratios in parentheses. The headcount index is the percentage of people below the poverty lines discussed in the text. The poverty gap index is the mean distance below the poverty line as a proportion of the poverty line, counting the nonpoor as having zero poverty gap. The squared poverty gap index is the measure proposed by Foster et al. (1984), in which the proportionate poverty gaps are weighted by themselves to reflect the extent of inequality amongst the poor. The elasticities are based on regressions of first differences of the log poverty measures against first differences of the log consumption or net product per person using 33 surveys spanning 1951–1991 for estimating the elasticity with respect to the surveys-based mean consumption and 23 surveys spanning 1958–1991 for estimating elasticities to consumption or income from the national accounts. The estimates based on the national accounts included a correction for differences in deflators in the form of an additional regressor, namely the difference in the rates of inflation implied by the consumer price index and the national income deflator. All regressions comfortably passed residual diagnostics tests for serial correlation, functional form, normality and heteroskedasticity.
Source: Ravallion and Datt (1996).

measures of poverty have historically responded to changes in consumption and net domestic product. The poverty gap index is the mean distance below the poverty line as a proportion of the poverty line. Squaring the individual poverty gaps gives additional weight to observations further below the poverty line. The higher absolute elasticities for measures of the depth and severity of poverty in columns 2 and 3 of Table 1 indicate that those well below the poverty line have benefited from macroeconomic growth, as well as those near the poverty line. Nor is there any convincing evidence that economic growth in India prior to the 1990s has tended to be associated with rising overall inequality (Bruno, Ravallion and Squire, 1998). These observations clearly refute claims that pre-1990s growth in India tended to leave the poor behind.

However, the 1990s are more contentious. Some observers have argued that poverty has fallen far more rapidly in the 1990s than previously (for example, Bhalla, 2000). Others have argued that poverty reduction has stalled and that the poverty rate may even have risen (for example, Sen, 2001).

So what has happened in India in the 1990s? Has poverty continued to fall with growth, or has the nature of the growth process changed, such that the poor have been left behind? This paper tries to answer those questions. We do not attempt to assess the impact of India's macroeconomic reforms of the 1990s on poverty, since this would require identification of the counterfactual of what would have been experienced in the 1990s without the reforms. Rather, our aim is to describe what has happened to poverty in India in the 1990s. In the course of the discussion, we

will learn about the proximate causes of changes in India's poverty rate. Moreover, although this discussion is India-specific, it illustrates themes that are often encountered in the analysis of poverty in low-income economies, including difficult issues of survey design and comparability and the proximate factors underlying the responsiveness of poverty to economic growth.

Measuring Poverty in India

Many surveys have thrown light on the dimensions and causes of poverty in India, ranging from village-level studies to national surveys. However, by far the most important tool for monitoring poverty since the 1960s has been the Household Consumer Expenditure Surveys conducted by the National Sample Survey (NSS) Organization. Various methods have been used to measure poverty with the NSS data. Figure 1 presents our estimates of the poverty rate in India since 1958. These are population-weighted averages of the poverty measures for urban and rural areas of 14 major states of India (not including Jammu and Kashmir, for which there are data problems). The estimates use household consumption expenditure per person as the indicator of individual welfare, and they use the urban and rural poverty lines developed by India's Planning Commission (Government of India, 1979). This poverty line was about 15 percent higher in urban areas than in rural areas in 1973–1974. We have adjusted these urban and rural poverty lines over time and space using price indexes for the different states of India.[2] We should emphasize that the state-specific poverty lines implied by our price indices differ from the current poverty lines used by the Planning Commission, despite their common starting point in the original 1979 Planning Commission poverty lines, because the Planning Commission uses a different set of spatial and temporal deflators to update poverty lines.[3]

Prior to the release in 2001 of the results from the 1999–2000 survey round, a number of observers had looked at the numbers such as in Figure 1 and concluded that India's economic reforms were leaving the poor behind—in short, that poverty reduction had stalled (Datt, 1999; Jha, 2000a). Some commentators have seen this as a damning criticism of the reform process. Others questioned the data. While the NSS has been a well-respected survey instrument and a model for other countries,

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[2] For a description of our approach to the data, see Özler, Datt and Ravallion (1996) and Ravallion and Datt (2002, appendix). A compilation of the data and description of sources can be found at ⟨http://www.worldbank.org/poverty/data/indiapaper.htm⟩. For further details on the construction of the price indices, see Özler, Datt and Ravallion (1996), Datt (1997) and Datt and Ravallion (1998a).

[3] Comparisons of poverty measures between urban and rural areas in developing countries have been notoriously difficult, and different methods of setting the urban-to-rural differential in poverty lines can give radically different results. For example, a poverty measure based on cost-of-living differences can yield very different results from another commonly used method based on expenditures at which food energy requirements are typically met (Ravallion, 1994). Elsewhere, we have discussed this issue in the context of poverty measurement in India and argued that our urban-rural and interstate differentials in poverty lines accord well with independent estimates of cost-of-living differences facing the poor (Ravallion and Datt, 2002, appendix).

Figure 1
Poverty Incidence in India, 1960–2000
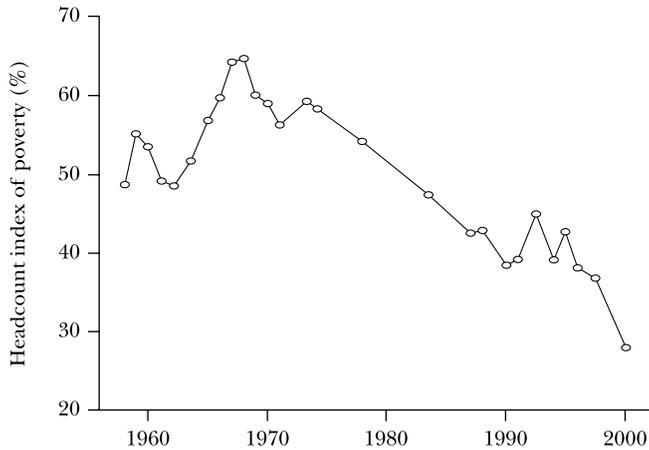
the seeming dichotomy between macroeconomic evidence on growth of consumption and the lack of commensurate poverty reduction in the NSS (prior to the latest survey round for 1999–2000) led some to doubt the reliability of the NSS as an instrument for monitoring poverty in India.

The Difference Between the NSS and the National Accounts

It has long been clear that the macroeconomic data from India's national accounts define consumption differently from the NSS. Private consumption in India's national accounts includes expenditures by nonprofit organizations as well as households, while the NSS surveys only households. Consumption in the national accounts also includes financial services and imputed rents for housing that are not found in the consumption numbers from the NSS. Comparing the nominal consumption aggregates from both sources over the period 1972–1997, Sen (2001) finds that the consumption by households in India implied by the NSS accounts for 60–70 percent of the national private consumption implied by the national accounts, depending on the precise measures of consumption used. Moreover, the divergence between the NSS and the national accounts seems to be growing. We calculate that consumption rose an average of 0.74 percentage points faster per year (with a standard error of 0.10) in the national accounts than in the NSS data over 1972–1997, though this difference was not significantly greater in the 1990s.[4] This is clearly not a negligible

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[4] Two warnings are worth noting here. First, there are not a lot of data for drawing conclusions about whether trends changed in the 1990s. Second, there was a revision to the methods used for the national accounts data in the 1990s, in line with new international standards. The extent of divergence depends on whether one uses the new series (base 1993–1994) or the old one (base 1980–1981). The results in the text use the new series. Using the old series, we find that consumption in India's national accounts grows 0.55 percentage points faster per year (with a standard error of 0.07 points) from 1972 to 1997. The new methods for measuring the national accounts increased the rate of consumption growth in the 1990s.

difference in growth rates between the two main sources of data on aggregate consumption in India.

Some observers have assumed that the divergence is due entirely to underestimation of consumption in the NSS and that this underestimation has been distribution neutral—that the surveys get the mean wrong but inequality right. If one recalculates India's poverty measures under that assumption—by scaling up all survey consumption levels by a fixed proportion to reach the national accounts levels—then one finds (of course) lower levels of poverty and a higher rate of poverty reduction than indicated by the NSS (Bhalla, 2000; Srinivasan, 2000).

However, there is no basis for assuming that the divergence between the NSS and the national accounts is solely due to underestimation of consumption in the NSS. Nor is there any basis for the assumption that any underestimation by the NSS is distribution neutral, such that inequality is correctly estimated (Ravallion, 2000b). For example, household surveys are rarely considered a reliable source for measuring incomes of the rich. The rising income share of India's richest taxpayers that is found in tax records for the 1990s has not been reflected in the NSS consumption distributions, though it appears that this alone cannot account for the discrepancy between the NSS and national accounts growth rates (Banerjee and Piketty, 2001).

One way to explore the sources of divergence between the household data in the NSS and the national accounts data sources is to focus on specific categories of consumption. For example, in India, food is about 60 percent of consumption on average. When one focuses on consumption of the food staples that figure most prominently in the budgets of the poor, there appears to be little or no divergence between the NSS and the national accounts data (Sundaram and Tendulkar, 2001a; Kulshreshtha and Kar, 2002). These calculations suggest that "correcting" for survey underestimation by scaling up all consumptions to reach the national accounts aggregate entails a substantial overcorrection for the poor and, hence, underestimation of the extent of poverty in India.

Interpreting the 1999–2000 NSS Data

Given the concerns about whether poverty reduction had been stalling in the postreform period, the release of the NSS data covering 1999–2000 was keenly awaited. Based on these data, India's Planning Commission (2001) reported a sharp reduction in poverty in 1999–2000 like that evident in our Figure 1.

However, upon closer examination, one finds that the design of the NSS changed in 1999–2000 in ways that cast doubt on the comparability of the resulting poverty estimates with those from earlier rounds. When the NSS began in the 1950s, it used 30-day recall for consumption; that is, it asked people how much they had spent on various items in the previous 30 days. This changed with the survey done in 1994–1995, and for this survey and the ones carried out in 1995–1996, 1997 and 1998, the NSS administered two different consumption schedules to two independent subsamples of households: one with the traditional 30-day recall, the other with multiple recall periods for different items: 7-day recall for food (food, pan, tobacco and intoxicants), 30-day recall for high-frequency nonfood (fuel and

light, miscellaneous goods and services, noninstitutional medical) and 365-day recall for low-frequency nonfood (educational, institutional medical, clothing, footwear and durable goods). These changes were not of serious concern, since one can still make consistent comparisons over time using the first schedule (as we have done in constructing Figure 1).

The 1999–2000 data from the NSS also included a far more worrying change. In that round, food consumption was obtained by both 7-day and 30-day recall for the same set of households, with the columns appearing side-by-side on the same page of the questionnaire. The numbers for mean of food consumption from the two recall methods in the 1999–2000 NSS round are quite similar—far more so than in the four previous experimental rounds, in which different households got different recall schedules (Visaria, 1999; Government of India, 2000). Putting both 7-day and 30-day recall questions side-by-side on the same page of the questionnaire probably promotes convergence; interviewers and respondents naturally would tend to cross-check or validate the response based on one recall period with that based on the other. By contrast, spending on low-frequency nonfood consumption items—typically accounting for about 20 percent of average consumption—was obtained only using a one-year recall period, also an important change from the earlier rounds of the NSS. This change could increase or decrease the poverty count (while the longer recall period will tend to give a lower mean, it will probably also give a lower variance). The 30-day recall period was only used for the high-frequency nonfood items, accounting for the other 20 percent of aggregate consumption.

It turns out that the way one interprets the 1999–2000 NSS data depends heavily on whether one uses 7-day or 30-day recall for food expenditures. If one uses the 30-day recall estimates for food and ignores the other differences in the 1999–2000 data, then the consumption distributions for that year imply a sizable reduction in poverty. The Planning Commission's (2001) estimates along these lines indicate that the national poverty rate fell by about 10 percentage points between 1993–1994 and 1999–2000, from 36 percent in 1993–1994 to only 26 percent in 1999–2000. If instead one compares the 7-day estimates for 1999–2000 with the 7-day estimates from the previous four experimental rounds, then one gets an *increase* in poverty. The comparison suggests an increase of 2 percentage points in the rural poverty rate between 1994–1995 and 1999–2000 and an increase of 5 percentage points in the urban poverty rate (Visaria, 1999; Sen, 2001).

Is it possible to work with the data in the 1999–2000 NSS round in a way that produces estimates more comparable to those from earlier rounds? Deaton (2001a) attempts to do so by exploiting the fact that some goods in the 1999–2000 data—accounting for about one-fifth of mean consumption—used the same 30-day recall period as in previous surveys. Deaton makes two key assumptions. First, he assumes that the survey results for the goods with the common 30-day recall period were unaffected by the change in survey design. Secondly, he assumes that the distribution of total consumption conditional on consumption of the common-recall goods has not changed over time and so can be inferred from the 1993–1994 round (which was of course uncontaminated by the change in survey design).

These assumptions allow him to generate an estimate of the distribution of total consumption as if there had been no change in survey design.

Using the Planning Commission's (2001) official poverty lines, Deaton (2001a) finds that the rural poverty rate fell from 37.2 percent in 1993–1994 to 30.2 percent in 1999–2000, while urban poverty fell from 32.6 percent to 24.7 percent. After weighting these reductions by the urban and rural population shares, Deaton's estimates imply that the national poverty rate fell from 36.2 percent in 1993–1994 to 28.8 percent in 1999–2000—a decline of 1.2 percentage points per year. Using a similar method, Tarozzi (2001) finds a similar rate of decline in poverty. Deaton (2001b) uses an alternative price deflator developed by Deaton and Tarozzi (1999) that leads to a lower estimate of the poverty rate, but a similar estimate of the decline in the poverty rate in the 1990s.

Of course, these "corrections" are only as good as the identifying assumptions on which they are based, as Deaton points out. The assumptions here imply that, at a given level of total consumption, demand for the goods with the common recall period must not change over time because of changes in tastes, relative prices or survey design. It is known that the structure of relative prices changed during this period (Sen, 2001). There will be an underestimation of the level of poverty in 1999–2000 if the underlying changes in tastes and prices entail that demand for the goods with the common recall period increased over time at any given level of total spending and a corresponding overestimation of poverty if the underlying tastes decreased. Nor is it obvious that the changes in survey design would leave the results for the "30-day goods" unaffected. Deaton (2001a) and Tarozzi (2001) find indirect supportive evidence for their identifying assumptions using the intermediate "thin" NSS sample surveys between 1993–1994 and 1999–2000. Of course, if one accepts these intermediate surveys for validation purposes, then one must presumably accept their implied poverty measures, in which case the puzzle remains as to why poverty fell so sharply in just one or two years.

Other Surveys for Measuring Poverty in India

Other surveys have been used to measure poverty in India in the 1990s. These surveys have their own problems, but generally point to the conclusion that India has experienced a nonnegligible reduction in the aggregate incidence of poverty in the 1990s.

For example, the National Sample Survey Organization also carried out Employment-Unemployment Surveys (EUS) in 1993–1994 and 1999–2000 that included consumption modules, which were not contaminated by the mixture of recall periods within one survey, as in the expenditure survey for the 1999–2000 NSS. The consumption module in the EUS was abridged compared with the standard Consumer Expenditure Surveys. However, past surveys have demonstrated that abridged modules tend to report lower levels of consumption, so the EUS may provide a lower bound to the degree of reduction in poverty over the period 1993–1994 to 1999–2000. Sundaram (2001) analyzed the consumption distributions from the EUS and found that annual rates of poverty reduction were

0.50 points per year for rural areas and 0.27 points per year for urban areas. So we can be reasonably confident that poverty incidence has in fact fallen.[5]

Yet another survey is the Market Information Survey of Households (MISH), carried out by the National Council of Allied Economic Research. This annual survey was started in the mid-1980s for the purpose of assessing the market for various consumer goods. MISH was not designed for obtaining reliable consumption (or income) aggregates. For example, MISH does not include food consumption, so one cannot create consumption-poverty measures directly comparable to those from the NSS. The survey also asks for "total household income from all sources" in the form of a single question. Naturally, this question is very difficult to answer, and it is far from clear that the answers would be consistent or accurate, given the ambiguity in what "income" means (not least in the rural areas of a developing country) and the influence of subjective factors and respondent knowledge of family income.[6]

However, working within these limitations, Lal, Mohan and Natarajan (2001) compare a series of poverty measures from MISH using a poverty line that gives the same poverty rate as the Planning Commission's 1987–1988 estimate. Using the same deflators as the Planning Commission, Lal, Mohan and Natarajan report a decline in India's poverty rate from 39 percent in 1987–1988 to 26 percent in 1997–1998—clearly a steeper decline than indicated in Figure 1.

While none of these data sources or methods can be considered conclusive on their own, it is compelling that they at least point to the same qualitative result that there was a nonnegligible decline in India's poverty rate during the 1990s. We will revisit this assessment once we have looked more closely at what has been happening at the state level.

## Disaggregating Poverty and Growth by State

With some states of India larger than all but a few countries, one cannot be satisfied looking solely at all-India aggregates, as in Figure 1. We will first show that there is considerable diversity across states in rates of poverty reduction underlying Figure 1. We will then argue that this offers some important insights into how

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[5] Sundaram and Tendulkar (2001b) take this comparison with the EUS a step further and argue that the 30-day recall numbers from the 1999–2000 expenditure survey are comparable with previous rounds. They note that for a number of food items, the mean expenditure from the EUS, despite the abridgement, is very similar to that from the published 30-day recall numbers from the Consumer Expenditure Surveys. (If the published 30-day recall numbers were "contaminated," they should have been doubly higher, both due to a more detailed consumption module and a shorter recall.) This argument is suggestive, but we do not think the case is fully proven. For the items where there is a substantial difference between the EUS and NSS estimates, the bulk of this difference may still be due to artificially higher 30-day estimates in the NSS rather than the abridgement of the EUS. In this case, the use of an unadjusted 30-day distribution with the 1999–2000 data would overstate poverty reduction.
[6] Unfortunately, the micro data from MISH are not currently available to researchers outside the National Council of Allied Economic Research, so it has not been possible to explore further the survey results, as it has been with the NSS.

Figure 2
Growth Divergence in the 1990s Across all but the Richest Two States

Mean GDP per capita in the 1980s
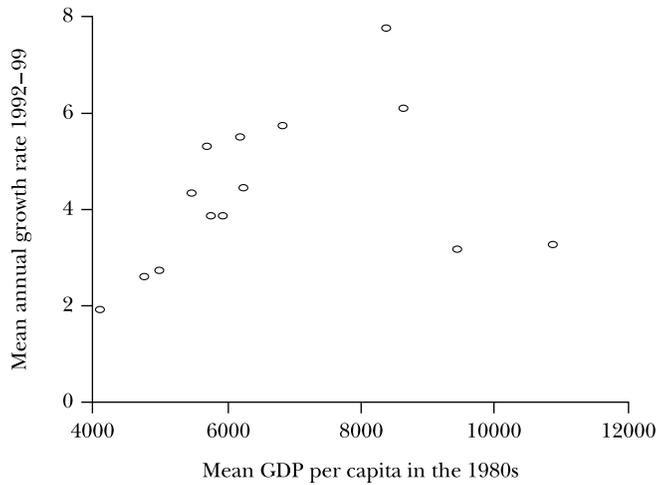
recent economic growth has affected the incidence of poverty nationally and what actions might be needed to assure a more pro-poor growth process in the future.

Geographic and Sectoral Patterns of Growth

Let us look first at the geographic pattern of India's growth process in the 1990s. The states that have had the slowest growth in per capita GDP in the 1990s are the states with the lowest level of per capita GDP in the 1980s *and* the two states with the highest level of per capita GDP in the 1980s (Punjab and Haryana). The high growth rates in the 1990s have been in the middle-income states. This pattern can be seen in Figure 2, which plots the mean annual growth rates from 1992–1993 to 1999–2000 against mean real GDP per capita over the 10 years 1980–1989. Ignoring the two states with the highest GDP per capita in the 1980s, there is a strong positive relationship between level of per capita GDP in the mid-1980s and growth rate in the 1990s; that is, there is divergence in per capita GDP among all but the richest states of India. Including the two richest states, no simple linear relationship exists.

It is not clear that Figure 2 tells us much about where the Indian economy is heading in the longer term. In theoretical models, a decrease in the costs of trade can in some cases first lead to divergence between two trading regions and then later to convergence (Baldwin, Martin and Ottaviano, 2001). However, the regional imbalance evident in the 1990s growth process will be an important factor in the following analysis.

It is also notable that agriculture as a whole has lagged the nonagricultural sector in the 1990s; while India's aggregate GDP grew at a rate of 6.7 percent per annum over the period 1993–1994 to 1999–2000, agriculture and allied services grew at only 3.2 percent per annum. The importance of rural economic growth,

Figure 3
Ratio of Rural-to-Urban Poverty
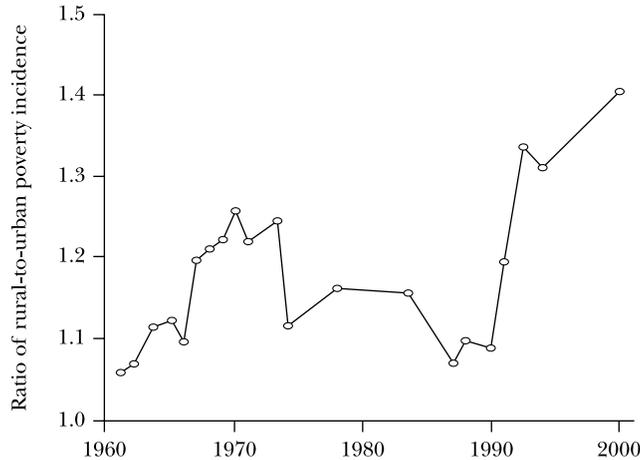
and agricultural growth in particular, to poverty reduction in India has long been recognized.[7]

Rural/Urban and State-Level Trends in Poverty

Let us first consider the evolution of rural and urban poverty rates. In India, as in most developing countries, the incidence of poverty has historically been higher in rural areas than urban areas. Prior to the 1990s, there was little sign of a trend in the ratio of rural-to-urban poverty incidence. From 1960 to 1990, for example, the ratio of the rural poverty rate to the urban poverty rate in India hovered in the range of 1.1–1.2. However, over the 1990s, the ratio of rural-to-urban poverty rates has leaped up to 1.4, as shown in Figure 3. The 1990s have seen rising rural incidence relative to urban.

Table 2 summarizes the trend rates of poverty reduction by state underlying Figure 1. The trend rates of poverty reduction have varied greatly across states, with Kerala with the highest rate of poverty reduction (both as a proportion and in percentage points per year) and Assam the lowest, with Bihar close behind (and Jammu and Kashmir, in the linear case). Kerala's performance relative to Bihar is notable; around 1960, Kerala had one of the highest poverty rates, along with Bihar. By the mid-1990s, Kerala's poverty rate was almost half that of Bihar.

Cross-State Tests of Hypotheses about Poverty Reduction

In understanding how India's growth process in the 1990s has affected national poverty, it is important to note that India's states vary enormously in terms of initial conditions that are relevant to how much impact economic growth will have

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[7] Empirical evidence linking measures of poverty to agricultural output can be found in Ahluwalia (1978), Bell and Rich (1994), Ravallion and Datt (1996) and Datt and Ravallion (1998b).

Table 2

Unconditional Trends in Poverty Incidence by State, 1960–2000

State	Log-Linear Annual Proportion Rate of Change (Percentage)		Linear Annual Rate of Change (Percentage Points)	
	1960–2000	Excluding the 55th Round (1999/00)	1960–2000	Excluding the 55th Round (1999/00)
Andhra Pradesh	−2.38	−2.18	−1.02	−0.99
Assam	−0.06	0.06	−0.06	−0.01
Bihar	−0.32	−0.11	−0.20	−0.09
Gujarat	−2.02	−1.57	−0.88	−0.77
Jammu & Kashmir	−1.02	−1.02	−0.29	−0.29
Karnataka	−1.54	−1.11	−0.70	−0.57
Kerala	−3.26	−2.73	−1.45	−1.37
Madhya Pradesh	−0.80	−0.63	−0.41	−0.34
Maharashtra	−1.31	−1.01	−0.64	−0.53
Orissa	−1.55	−1.59	−0.76	−0.77
Punjab and Haryana	−2.96	−2.55	−0.70	−0.67
Rajasthan	−1.49	−1.15	−0.67	−0.57
Tamil Nadu	−1.92	−1.51	−0.85	−0.74
Uttar Pradesh	−1.11	−0.88	−0.49	−0.41
West Bengal	−2.29	−1.97	−0.87	−0.81
Total	−1.43	−1.18	−0.65	−0.58

Note: Log-linear estimates are based on regressions of the log of the headcount index on time, while the linear estimates are based on regressions of the level of the headcount index on time.

on poverty (Ravallion and Datt, 2002). Those differences also lead one to expect that the sectoral composition of growth will matter more in some states than in others; in a state with high literacy, for example, there could be more scope for reducing poverty through nonagricultural growth. We also need to allow for differences in other covariates of poverty.

With these features in mind, our equation for studying how economic growth has affected poverty takes the following form. The dependent variable is the headcount index of poverty in state i at date t. The first explanatory variable is real nonagricultural product per head of the population in state i at date t. A second explanatory variable is a measure of average farm productivity, namely the real value of agricultural output per hectare. A third explanatory variable takes state government development spending into account. A fourth variable is the inflation rate, which is known to have an adverse short-term effect on the real wage rate for unskilled labor (Datt and Ravallion, 1998b). Consistently with Datt and Ravallion (1998a,b), we found that the fit of this model was improved if we used the current plus lagged values of nonagricultural product, farm yield and lagged values of state development spending. Since we are interested here in modeling the evolution of poverty measures over time (rather than the level of poverty), we also include a dummy variable for each state in all regressions. To allow for any omitted (time

trended) variables, we also include state specific trends. These variables are defined more precisely and justified more thoroughly in Ravallion and Datt (2002).[8]

We began by allowing all coefficients to vary across states. However, we found that we could not reject the null hypothesis (at the 10 percent level or better) that the coefficients on farm yield, government spending and inflation were constant across states. Thus, we imposed the restriction that these coefficients were constant, while allowing the coefficient on nonagricultural output per person to vary across states.[9] We retained the state fixed effects and time trends. Table 3 presents the results of this restricted model. The model's explanatory power is clearly good; it accounts for over 90 percent of the variance in poverty incidence across states and over time.

What do we learn from these results? Higher farm yields and higher development spending reduce the incidence of poverty, and the coefficients are highly significant. Higher nonagricultural output per person lowers poverty in all states. Higher inflation increases poverty. We also find significant positive time trends for 10 of the 15 states, which means that after adjusting for other factors, there was an upward trend on poverty rates over this time. Such a trend could arise from population pressure on agricultural land availability at given yield per acre or it could reflect an adverse distributional effect of population growth on poverty, as argued by van de Walle (1985). However, it might also reflect rising underreporting of consumption in the NSS, as is thought to be the main source of the divergence between the NSS-based consumption estimates and those from the national accounts statistics. Upon closer examination, a population-based explanation appears more likely. The positive time trends are not just a 1990s phenomenon, as has sometimes been claimed. On the contrary, the conditional trends are strongest for the 1970s—when there was not much puzzle about the relationship between macroeconomic growth and poverty—but weaker for the 1980s and 1990s. In addition, Ravallion and Datt (2002) show that the time trends disappear or switch sign if one allows for population growth or total population effects.

Perhaps the most striking finding from Table 3 is the variation in the elasticity of poverty with respect to nonagricultural output. The (absolute) elasticities vary from a low of 0.26 in Bihar to a high of 1.33 in Kerala. (Notice that the elasticities are twice the estimate from Table 3 because nonagricultural product enters as the sum of the current and the lagged values.) The next section will explore the implications of this variation in the nonagricultural output elasticities of poverty for understanding India's progress in poverty reduction during the 1990s.

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[8] We initially estimated the model with an autoregressive error term, allowing for the uneven spacing of the surveys when estimating the autoregression coefficient (following the method in Datt and Ravallion, 1998a). However, the autoregression coefficient was not significantly different from zero, so we set it to zero to simplify the estimation method.

[9] We also tested whether the implied elasticities of poverty with respect to nonagricultural output per capita had changed over time. To do this, we split the data into two periods, before and after 1980, and tested for stability. We found no significant difference in the elasticities between the two periods. The hypothesis of no change in elasticities is readily accepted (probability value of 0.27).

Table 3

Regressions for State Headcount Indices of Poverty in India, 1960–1994

Independent Variable	Parameter Estimate	t-ratio
Real agricultural output per hectare of net sown area: current + lagged	−0.097	−3.50
Real per capita state development expenditure: lagged	−0.128	−2.16
Inflation rate	0.392	4.71
Real nonagricultural output per person: current + lagged (NAG)		
Andhra Pradesh	−0.141	−1.31
Assam	−0.361	−2.30
Bihar	−0.130	−2.02
Gujarat	−0.289	−2.36
Jammu & Kashmir	−0.369	−3.29
Karnataka	−0.332	−2.73
Kerala	−0.665	−4.02
Madhya Pradesh	−0.320	−3.83
Maharashtra	−0.251	−2.34
Orissa	−0.290	−4.63
Punjab and Haryana	−0.426	−2.09
Rajasthan	−0.270	−3.24
Tamil Nadu	−0.272	−2.03
Uttar Pradesh	−0.337	−4.14
West Bengal	−0.511	−5.56
Time trend $\times 10^{-2}$		
Andhra Pradesh	0.223	0.25
Assam	3.088	2.21
Bihar	1.530	3.72
Gujarat	1.575	1.75
Jammu & Kashmir	3.302	3.21
Karnataka	2.223	2.42
Kerala	2.500	2.16
Madhya Pradesh	2.611	4.48
Maharashtra	2.006	2.44
Orissa	1.266	2.38
Punjab and Haryana	2.339	1.24
Rajasthan	1.164	2.23
Tamil Nadu	1.545	1.46
Uttar Pradesh	2.172	3.80
West Bengal	0.979	1.94
Root mean square error		.0937
R^2		0.923
Test for common non-ag. growth elasticities across states: $F(14,238)$ with p-value in parentheses.		1.59 (0.08)
Test for common time trends across states: $F(14,238)$ with p-value in parentheses.		1.12 (0.34)

Notes: The dependent variable is the log of the headcount index of poverty (percentage below the poverty line) by state and date. All other variables are measured in natural logarithms. A positive (negative) sign indicates that the variable contributes to an increase (decrease) in the headcount index. The estimated model also included state-specific intercept effects not reported in the table. The number of observations used in the estimation is 272, using an unbalanced panel data for 15 states. See Datt, Kozel and Ravallion (2002) for further details.

India's Pattern of Growth and Aggregate Poverty Reduction

Growth in large states with high levels of poverty is what matters most for aggregate poverty reduction. Table 4 compares the growth rates in nonagricultural output over 1993/1994–1999/2000 with our estimates of the poverty-weighted elasticities of poverty incidence to nonagricultural economic growth based on Table 3. Note that the elasticities from Table 3 have to be weighted by the states' shares of total poverty; the weighted elasticity then gives the impact on national poverty of growth in a given state.

There is no sign that the rates of growth were higher in the states where growth would have had greater impact on national poverty. Over the 14 major states, the correlation coefficient between the growth rate in nonagricultural output per person from 1993–1994 to 1999–2000 and the weighted (absolute) growth elasticity of poverty is -0.10, which is not statistically significant at any reasonable level. Figure 4 plots the estimates from Table 4. It is clear that the nonagricultural growth has not been concentrated in the states where it would have had the greatest impact on poverty nationally. A more pro-poor geographic pattern of growth in India's nonagricultural economy would have required higher growth in states such as Bihar, Madhya Pradesh, Orissa and Uttar Pradesh. Nor has the geographic pattern of agricultural growth been particularly pro-poor. The states with higher growth in agricultural yields were not the key states with higher shares of India's poverty. Indeed, there is a mild negative correlation, although not statistically significant.

Another way to assess the sectoral and geographic distribution of India's growth from the point of view of poverty reduction can be found in the regression results presented earlier in Table 3. Those results were based on data from 1960 to 1994. By using the actual performance of the various explanatory variables from 1993–1994 to 1999–2000, one can estimate how far the poverty level would have dropped by 1999–2000 if the historical relationships between these variables had continued to hold. When we carry out this exercise, we predict that the incidence of poverty in India falls from 39.1 percent in 1993–1994 to 34.3 percent in 1999–2000, implying a rate of reduction of about 0.8 percentage points per year.[10] This rate of poverty decline is slightly higher than the historical average for India. The average rate of decline in the poverty rate implied by the entire series of national measures in Figure 1 is 0.65 percentage points per year (with a standard error of 0.11).

However, an annual rate of decline in the poverty rate of 0.8 percentage points per year is lower than one would have expected given India's growth rate in the 1990s and the historical elasticity of the national poverty rate to aggregate growth. As mentioned earlier, the elasticity of the poverty rate with respect to changes in per capita net national product, based on data from 1958 to 1991, was -0.75 (Ravallion and Datt, 1996). India's actual growth rate in net national product per

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[10] The postsample projections, including discussion of confidence intervals, are discussed further in Datt, Kozel and Ravallion (2002).

Table 4

Did the Growth Occur Where it Would Have the Most Impact on Poverty?

State	Headcount Index of Poverty for 1993/94	Share of National Poverty 1993/94 (Percentage)	Share Weighted Elasticity	Percentage Increase in Nonagricultural Output Per Capita 1993/94– 1999/00	Percentage Increase in Farm Output Per Hectare 1993/94– 1999/00
Andhra Pradesh	29.5	6.1	−0.017	43.2	21.9
Assam	44.5	3.1	−0.023	13.2	27.8
Bihar	60.3	16.7	−0.043	29.3	0.5
Gujarat	33.7	4.4	−0.025	38.1	29.9
Jammu & Kashmir	n.a.	n.a.	n.a.	n.a.	n.a.
Karnataka	37.4	5.3	−0.035	53.4	11.9
Kerala	28.8	2.6	−0.034	73.5	64.0
Madhya Pradesh	44.0	9.2	−0.059	18.1	26.8
Maharashtra	43.2	10.8	−0.054	27.4	11.4
Orissa	40.3	4.0	−0.023	26.3	36.7
Punjab	21.4	2.5	−0.021	43.2	14.0
Rajasthan	43.3	6.1	−0.033	44.3	64.5
Tamil Nadu	34.9	6.0	−0.032	58.9	−6.4
Uttar Pradesh	40.1	17.8	−0.120	37.3	26.1
West Bengal	25.9	5.5	−0.056	49.4	83.0

Notes: The share-weighted elasticity in column 3 is the product of the elasticity of poverty to nonagricultural output implied by Table 1 and the share of national poverty given in column 2. Output measures in columns 4 and 5 are deflated by the Consumer Price Index for Agricultural Laborers for consistency with other data in the model.

capita was 4.8 percent per annum between 1993–1994 and 1999–2000, implying that the poverty rate would have fallen by 1.3 points per year over that period. Similarly, if one uses our model in Table 3 to estimate a counterfactual in which farm and nonagricultural sectors and all states have the same growth rate, given by the national rate, with all else remaining the same, then we predict a poverty rate reduction of 1.2 percentage points per year. If not for the sectoral and geographic pattern of growth, India's macroeconomic growth rate in the 1990s would have delivered a rate of poverty reduction roughly double the historical trend.

Why Does Economic Growth Benefit the Poor More in Some States?

One of the most striking results presented earlier in Table 3 is how much the elasticity of poverty to nonagricultural output has varied across states. Why does poverty respond so much less to economic growth in some states than in others?

A plausible explanation, with some support from cross-country regressions, is that certain types of initial inequalities can severely impede the prospects for growth-mediated poverty reduction (Ravallion, 2001). For example, pervasive credit market imperfections and greater initial inequality of assets (particularly of

Figure 4
Nonagricultural Growth Did Not Occur in the States Where it Would Have Had the Most Impact on Poverty Nationally
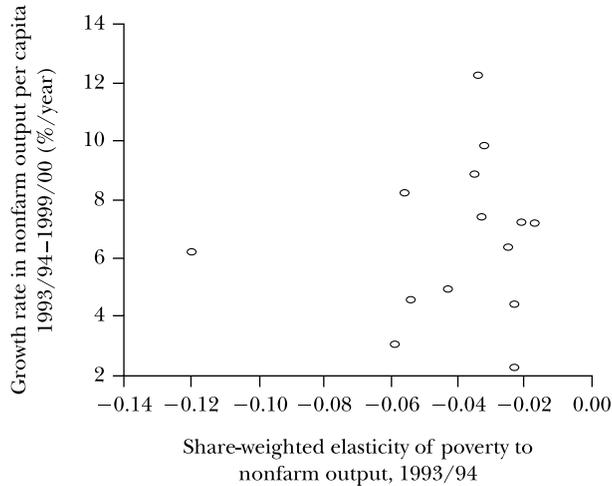
land) can mean that the growth that does occur reduces poverty by less. In addition, low basic education attainments are often identified as an impediment to the ability of the poor to participate in opportunities for economic growth. The initial income disparity between urban and rural sectors can also limit poverty reduction through growth in a dualistic labor market environment. This argument echoes a long-standing view (though not a dominant one in recent development thinking) that rural underdevelopment constrains prospects for poverty reduction through industrialization (for example, Clarke, 1940). However, initial urbanization could have a positive influence on the poverty impact of nonagricultural growth by enhancing the poor's access to markets and infrastructure. One could also argue that higher initial farm yields and nonfarm product will promote tighter labor market conditions and help to bid up wages as economic growth increases demand for labor.

One can test to see if initial conditions can explain the differences in the elasticity of poverty with respect to growth rates. In Ravallion and Datt (2002), we show that a number of conditions around 1960—the average farm yield, the ratio of urban to rural average consumption, the share of the rural population that is landless in the state, the state's infant mortality rate and the literacy rate—are significant predictors of the elasticity of poverty with respect to growth. Table 5 presents the key results showing that nonagricultural economic growth was less effective in reducing poverty in states with "poor" initial conditions in terms of rural development (in both absolute terms and relative to urban areas) and human resources. Low farm productivity, low rural living standards relative to urban areas and poor basic education and health all inhibited the prospects of the poor participating in growth of the nonagricultural sector.

Table 5

How State-Level Initial Conditions Affect the Elasticity of Poverty with Respect to Nonagricultural Output

Due to a 10 Percent Increase in . . .	*Increase in Absolute Elasticity of the State-Level Headcount Index with Respect to Nonagricultural Output Per Person . . .*
Initial female literacy rate	1.53
	(6.89)
Initial urban-rural mean consumption disparity	−1.66
	(2.33)
Initial percentage of rural landless households	−0.72
	(2.81)
Initial infant mortality rate	−1.01
	(2.17)
Initial yield per hectare	0.27
	(2.37)

Notes: Absolute t-ratios in parentheses. The estimates are based on a regression for the log of the headcount index of poverty (across states and over time) on the same variables as in Table 3 with the difference that the state dummy variables interacting with nonagricultural output in Table 3 were replaced by variables describing initial conditions in the state around the beginning of the time period interacted with nonagricultural output. State effects and time trends were also included. For further details, see Ravallion and Datt (2002).

Amongst the conditions that are found to matter significantly to prospects for pro-poor growth, the role played by initial literacy is particularly notable. India's relatively poor performance in expanding literacy is well known (for example, Drèze and Sen, 1995; World Bank, 1997; PROBE Team, 1999; Swaminathan and Rawal, 1999). Our results reveal just how costly low educational attainment has been to India's poor, by retarding their capacity to participate in the opportunities that come with economic growth. For example, more than half of the difference between the elasticity of the headcount index of poverty to nonagricultural output for Bihar (the state with the lowest absolute elasticity) and Kerala (the highest) is attributable to Kerala's substantially higher initial literacy rate (Ravallion and Datt, 2002). Women's literacy matters no less than men's; indeed, women's literacy is a slightly more significant predictor of the elasticity of poverty with respect to economic growth.

The need to combine human resource development with economy-wide policies favorable to growth has been well recognized in discussions of policies for fighting poverty (for example, World Bank, 1990). The revealed importance of human resource development as a precondition for propoor growth in India reinforces the concerns of Drèze and Sen (1995) and others that rapid poverty reduction in India will require more than economic reform. The key message emerging from recent research is that achieving a policy environment conducive to growth interacts *multiplicatively* with human resource development. By doing just economic reform or just human resource development, one may achieve very little in terms of poverty reduction, but doing both can take a nation a long way.

Conclusion

Our own estimates and our review of alternative estimates in the recent literature lead us to the conclusion that India has probably maintained its 1980s rate of poverty reduction in the 1990s. Our results suggest that the incidence of poverty has been falling at a little less than one percentage point per year over the main postreform period. Using very different methods, other researchers obtain estimates of one percentage point per year or higher. While none of the multiple and methodologically diverse attempts that have been made to assess the extent of bias in poverty measures for 1999–2000 can be considered fully convincing on its own, they do point to significant poverty reduction in the 1990s, though the question of acceleration of poverty reduction in this decade remains contentious. Our own investigation fails to provide any evidence in support of such an acceleration.

However, the basic question of measuring India's poverty rate has turned out to be harder to answer than it needed to be because of difficulties with coverage and comparability of the survey data. There are lessons here for India and other countries about the need for assuring that potentially valuable experimentation and innovation with key survey instruments do not compromise their ability to provide reliable monitoring of how living standards are changing over time. There is no reason why such a high price needs to be paid for innovation in survey design; by simply assuring that, for a time, the same survey instrument is maintained for a sizable subsample (parallel to experimental samples), one can achieve both goals.

Our investigation also emphasizes the considerable diversity in performance across states, with important clues for understanding why economic growth has not done more for India's poor. Our results suggest that, by and large, the (farm and nonfarm) growth in India during the 1990s has not been occurring in the states where it would have the most impact on poverty nationally. If not for the sectoral and geographic imbalance of growth, we estimate that the national rate of growth would have generated a rate of poverty reduction that was double India's historical trend rate.

We also find large differences across states in the poverty impact of any given rate of growth in nonagricultural output. States with relatively low levels of initial rural development and human capital development were not well suited to reduce poverty in response to economic growth. Our results are thus consistent with the view that achieving higher aggregate economic growth is only one element of an effective strategy for poverty reduction in India. The sectoral and geographic composition of growth is also important, as is the need to redress existing inequalities in human resource development and between rural and urban areas.

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