

# Has India's Economic Growth Become More Pro-Poor in the Wake of Economic Reforms?

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The extent to which India's poor have benefited from the country's economic growth has long been debated. A new series of consumption-based poverty measures spanning 50 years, including a 15-year period after economic reforms began in earnest in the early 1990s, is used to examine that issue. Growth has tended to reduce poverty, including in the postreform period. There is no robust evidence of more or less poverty responsiveness to growth since the reforms began, although there are signs of rising inequality. The impact of growth is higher when using poverty measures that reflect distribution below the poverty line and when using growth rates calculated from household surveys rather than national accounts. The urban-rural pattern of growth matters for the pace of poverty reduction. However, in marked contrast to the period before the reforms, urban economic growth in the period after the reforms has brought significant gains to the rural poor as well as the urban poor. India, poverty, inequality, economic growth. JEL codes: I32, O15, O40

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There has been much hope that India's economic reforms starting in the early 1990s would bring more rapid poverty reduction. Growth has certainly accelerated, with GDP per capita rising at 4–5 percent since 1991, up from barely 1 percent in the 1960s and 1970s and 3 percent in the 1980s. However, as research has shown, the sectoral pattern of growth matters to its impact on poverty in India. The green revolution stimulated pro-poor rural growth.<sup>1</sup> In the past, both the urban and rural poor gained from growth in the rural sector, while urban growth had adverse

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1. Datt and Ravallion (1998) found that farm productivity growth reduced rural poverty. Earlier support for this view includes Ahluwalia (1978, 1985); van de Walle (1985); Bhattacharya, Coondoo, and Mukherjee (1991); and Bell and Rich (1994). Dissenting views include Saith (1981) and Gaiha (1995).

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distributional effects in urban areas and no discernable impact on rural poverty (Ravallion and Datt 1996). The disappointing outcomes for the poor from nonfarm growth have also been traced to India's socioeconomic inequalities in access to schooling.<sup>2</sup>

However, though past research points to the importance of rural economic growth for poverty reduction in India, postreform growth has not favored the rural sector. Several observers have pointed to both geographic and sectoral divergence in India's postreform growth (Bhattacharya and Sakthivel 2004; Jha 2000; Datt and Ravallion 2002; Purfield 2006). This has meant that much of the nonfarm economic growth bypassed the sectors and states where it would have had the most impact on poverty, based on a model calibrated to prereform data (Datt and Ravallion 2002). By this view, the composition of the higher growth would mean that it bypassed many of India's poor.

Against this view is the conjecture that India's growth process has changed—implying a new set of parameters in the relationship between growth and poverty reduction. Ravallion and Datt (1996) studied a period when policy emphasized rapid development of the capital goods sector in a largely closed economy, on the assumption that the capital stock and industrial structure could be manipulated exogenously through central planning, even in a largely market-based economy.<sup>3</sup> The strategy was also founded on “trade pessimism”—the beliefs, grounded in the experiences of colonialism, that India could not compete in global markets until its domestic capital stock was much larger and that foreign (Western) countries could not be trusted as a source of essential goods. These beliefs were questioned in both academic and policy circles at the time, and the poor economic performance as the years passed seemed to substantiate that skepticism.<sup>4</sup> The success of China's promarket reforms starting in 1978 further fueled doubts in the 1980s about India's economic strategy.

The policy debate raged for many years, but it was a balance of payments crisis that triggered more extensive reforms in the early 1990s. Trade liberalization was combined with efforts to support higher productivity in the private sector.<sup>5</sup> Supporters argued that these reforms would allow India to exploit its comparative advantage in labor-intensive goods and services, directly benefiting

2. Ravallion and Datt (2002) found a strong interaction effect between the initial level of human development at the national level and the nonfarm growth rate in determining poverty reduction at a national level.

3. On the history of thought on development strategies and their implications for poverty, with specific reference to India, see Lipton and Ravallion (1995).

4. Some observers in India at the time questioned these assumptions, raising concerns about labor absorption (given high population growth) and (hence) poverty reduction; in particular see Vakil and Brahmanand (1956). Chakravarty (1987) provides an insightful account of the history of thought on India's (prereform) development strategy.

5. On India's reform agenda since the early 1990s, see Ahluwalia (2002) and Panagariya (2008).

the poor. The reforms would “favour the poor by beginning to remove the pervasive bias that exists against the employment of unskilled labour” (Joshi and Little 1996, p. 221). The hope was that the postreform urban economy would be more effective in reducing both urban and rural poverty.

However, there are also reasons to question whether the new policy environment would put India on a new path of rapid poverty reduction. The greater openness to external trade came with sufficient productivity growth to ensure higher growth of national output.<sup>6</sup> But new inequality-increasing forces also appear to have emerged, and several observers have reported evidence of rising consumption inequality since the early 1990s.<sup>7</sup> This may well reflect the antecedent inequalities in other “nonincome” dimensions, particularly in human capital, which can mean that the poorest are largely left behind; these inequalities were far greater in India around 1990 than in China around 1980.<sup>8</sup> Intuitively, rising inequality will attenuate the impact of growth on poverty, though this effect is ambiguous in theory; for example, an increase in a standard measure of inequality, such as the Gini index, need not mean an increase in the proportion of people living in poverty (*ceteris paribus*)—that depends on precisely how the Lorenz curve shifts with the change in inequality (Datt and Ravallion 1992).

Some observers have also questioned whether the postreform growth process has fulfilled expectations that it would increase aggregate demand for unskilled labor and (hence) help reduce poverty. They point out that the fastest growing sectors of India’s economy have tended to be more intensive in capital and skilled labor, notably the booming business services sector. This pattern of growth is hardly what the “comparative advantage” arguments of reform advocates in the 1980s predicted as the outcome of India becoming a more open economy.

Given that an argument for reform is that it should make growth more labor intensive, it is interesting to see what happened to employment in India. The 1999–2000 survey of employment by the National Sample Survey Organization (NSSO) suggested a slight deceleration in employment growth, although the latest available survey for 2004–05 suggests that employment growth was virtually the same from 1993–94 to 2004–05 as in the preceding 10 years (Panagariya 2008, p. 146). These comparisons

6. Eswaran and Kotwal (1994, chapter 7) argue that domestic productivity growth is key to the outcomes for poor people from trade openness in India. The sequencing of reforms was important, and India’s reformers wisely emphasized domestic reforms (such as industrial delicensing) before external reforms (Bhagwati 1993).

7. Evidence of rising inequality in India since 1991 is reported in Ravallion (2000), Deaton and Drèze (2002), and Sen and Hiamshu (2004a, b). There was no trend increase, or decrease, in consumption inequality over the period up to about 1990 (Bruno, Ravallion, and Squire 1998).

8. See the discussion in Drèze and Sen (1995) on the constraints stemming from India’s meager human development attainments at the outset of its current reforms and the contrast with China. Also see Chaudhuri and Ravallion (2006) on the distinction between “good” and “bad” inequalities in China and India and the discussion of inequality of opportunity in World Bank (2005).

are clouded because of the large share of employment in the informal sector, for which reliable measurement is difficult, and because the reforms themselves may induce output and employment to shift to the informal sector.<sup>9</sup>

Even more relevant is the observation that the nonfarm sectors that are relatively intensive in unskilled labor—trade, construction, informal manufacturing—fared better in the post-1991 period than earlier (Kotwal, Ramaswami, and Wadhwa 2009). The nonfarm sector's aggregate demand for unskilled labor appears to have increased after the reforms, even though the most dynamic sectors have been intensive in skilled labor. And these newly created relatively unskilled nonfarm jobs typically pay more than agricultural labor.<sup>10</sup>

The importance of rising rural nonfarm employment and incomes is also suggested by the finding of Foster and Rosenzweig (2004a, b) that nonfarm wages and salaries associated with the rapid growth of the rural factory sector was the fastest growing component of rural incomes during 1971–99 (especially during 1982–99). Moreover, the growth in nonfarm wages and salaries and rural in industrial activity was highest where growth in agricultural yields was lowest. This is consistent with the hypothesis that mobile capital sought relatively low-wage areas to produce tradables in response to demand fueled by urban growth.<sup>11</sup>

Another potential channel through which India's postreform urban economic growth could affect rural poverty is public finance. Higher economic growth rates generate higher tax revenues, which can support propoor spending. In recent years, rural antipoverty programs have expanded considerably, notably under the National Rural Employment Guarantee Act, which aims to provide 100 days of unskilled work to any rural family that wants to work at the statutory minimum wage rate in agriculture. This program is financed through general taxation.

It is clear from these observations that arguments can be made for and against any claim that the economic reforms have helped reduce poverty in

9. Similarly, Sen (2009) shows that employment in the formal ("organized") manufacturing sector did not rise after trade liberalization. However, this is a moot point as 80 percent of manufacturing employment is in the informal sector (Kotwal, Ramaswami, and Wadhwa 2009).

10. For evidence on this point, see Jacoby, Rabassa, and Skoufias (2010), who find a 25 percent differential in farm and nonfarm wages after controlling for age, experience, and education.

11. Kotwal, Ramaswamy, and Wadhwa (2009) point to the limits of nonfarm employment growth in reducing the labor to land ratio in agriculture sufficiently to produce a rapid increase in agricultural wages. The faster growth in nonagricultural wages over agricultural wages suggests the need for a rural labor market model that can explain a premium on nonfarm jobs. That such a premium exists is suggested by some recent evidence; for instance, World Bank (forthcoming) reports a rising premium of casual nonfarm wages over agricultural wages from 25–30 percent in 1983 to 45 percent in 2004–05. Lanjouw and Murgai (2009) further document that education levels are higher among casual nonfarm rural workers than among agricultural workers, which suggests that education plays a role in helping one segment of the rural workforce to better access the growing nonfarm jobs.

India. To help inform this debate, this article addresses the following questions: Has India's higher growth rate since the early 1990s delivered a higher pace of progress against absolute poverty? Has the responsiveness of poverty to growth changed in the postreform period? Has the poverty impact of the urban-rural composition of growth changed? In particular, is there any sign that urban economic growth has been more propoor since the reforms than before them?

Section I outlines the concepts and methods used in this study. Section II describes the dataset, which updates the data set constructed for Ravallion and Datt (1996), along with some improvements in the estimation methods. Section III presents the results and their implications. Section IV draws some conclusions.

## I. CONCEPTS AND METHODS

The analysis uses three poverty measures. The head-count index is given by the percentage of the population who live in households with per capita consumption below the poverty line. The poverty gap index is the mean distance below the poverty line expressed as a proportion of that line, where the mean is formed over the entire population, counting the nonpoor as having zero poverty gap; this can be interpreted as a measure of the depth of poverty. The squared poverty gap index, introduced by Foster and others (1984), is the corresponding mean of the squared proportionate poverty gaps. Unlike the poverty gap index, the squared poverty gap index is sensitive to distribution among the poor, in that it satisfies the transfer axiom for poverty measurement (Sen 1976). The squared poverty gap index can be thought of as a measure of the severity of poverty. All three measures are among those proposed for measuring poverty by Foster, Greer, and Thorbecke (1984).

As for virtually all poverty measures in practice, this class of measures can be written as functions of the survey mean relative to the poverty line and the relative distribution of income, as represented by the Lorenz curve (see, for example, Datt and Ravallion 1992 and Kakwani 1993). (The term "relative distribution" refers to all effects on poverty that are transmitted through changes in the Lorenz curve.) When the poverty line is fixed in real terms, the poverty measure ( $P_t$ ) is strictly decreasing in the mean ( $\mu_t$ ) for any given relative distribution (though the elasticity can vary greatly, depending on the initial mean and Lorenz curve). For example, the elasticity of the headcount index to growth in the mean, holding relative distribution constant, is given by one minus the elasticity of the cumulative distribution function evaluated at the

poverty line. However, a higher growth rate may also entail a shift in distribution for or against the poor. Of interest here is the *total* effect of growth on poverty, allowing distribution to change, rather than the partial effect, holding relative distribution constant.<sup>12</sup> Assuming that the poverty measure can be derived as a differentiable function of the mean, allowing relative distribution to change with the mean, the interest is in estimating the growth elasticity of poverty reduction, defined by:

$$(1) \quad \pi \equiv \frac{d \ln P_t}{d \ln \mu_t}$$

where  $\pi$  is estimated by the regression coefficient of  $\ln P_t$  on  $\ln \mu_t$  across the available time series, allowing the error term to be autocorrelated and heteroskedastic.<sup>13</sup>

When both the dependent and the independent variables are estimated from the same survey data, the possibility of bias arises because measurement errors in the survey can be passed on to both variables. Overestimating the mean will tend to underestimate poverty. (The sign of the bias is ambiguous in theory, given that there is also an attenuation bias in the estimate of  $\pi$ .) An instrumental variable (IV) estimator is also used, in which the instruments exclude any variables derived from the same survey as the dependent variable. This is also helpful for controlling the effect of changes in survey design.

The urban-rural composition of growth and poverty reduction are also examined. In India, as in most developing countries, the rural sector has a higher incidence of extreme poverty and accounts for a substantially higher share of absolute poverty than the urban sector (Ravallion, Chen, and Sangraula 2007). Also in common with most (growing) developing economies, India's trend rate of growth has been higher in the nonfarm sectors than in agriculture.

The fortunes of poor people in urban and rural areas are linked. The scope for the urban economy to absorb wage labor from rural areas has long been seen as a key factor in poverty reduction. Labor mobility can yield an equilibrium relationship between the real wages of similar workers, entailing "horizontal integration" in earnings and income distributions, with the living standards of people at similar levels of living but in different sectors causally related. Such integration can also arise without labor mobility. Proximity to

12. Analytic formulae for the partial elasticities (holding relative distribution constant) are found in Kakwani (1993). On the conceptual distinction between partial and total elasticities in this context, see Ravallion (2007). Also see the discussion of alternative definitions of this elasticity in Heltberg (2004).

13. A dynamic model (with lags in  $P_t$  and  $\ln \mu_t$ ) is not feasible given the uneven spacing of the time series. However, there is little choice but to assume even spacing when implementing the corrections to the standard errors for serial correlation.

urban areas enhances demand for the outputs of the rural economy.<sup>14</sup> The living standards of households in different sectors but sharing similar factor endowments will tend to move together to the extent that trade in goods attenuates differences in real factor prices. The fact that the rural sector produces food some of which is consumed in the urban sector can mean that agricultural growth boosts urban welfare by lowering food prices (to the extent that domestic food markets are only weakly integrated with global markets). Transfers can also produce horizontal integration.

The existence of such horizontal integration suggests that changes emanating from the urban sector can have powerful effects on levels of living in the rural sector and vice versa. This can also entail distributional effects, notably when the distributions of absolute levels of living in different sectors overlap imperfectly (share a positive density over certain, compact, intervals of the range of living standards but not others). The urban sector of a developing country will often include an elite that has no counterpart in the rural sector. When combined with shared poverty in the overlapping interval of the distribution, this uneven overlap of urban-rural distributions can have strong implications for how an increase in incomes in one sector spill over to affect both average levels of living and relative distribution in the other sector.

The urban-rural decomposition of poverty is also of interest. The relevant measures of poverty can be additively decomposed using population weights, such that the national level of poverty at date  $t$  is given by:

$$(2) \quad P_t = n_{ut}P_{ut} + n_{rt}P_{rt} \quad (t = 1, \dots, T)$$

where  $n_{it}$  is the population shares and  $P_{it}$  the poverty measures for sector  $i = u, r$  (for urban and rural). This property of additivity is exploited in testing whether the sectoral composition of growth matters by estimating the following regression on the discrete data:

$$(3) \quad \begin{aligned} \Delta \ln P_t = & \pi_u s_{ut-1}^\mu \Delta \ln \mu_{ut} + \pi_r s_{rt-1}^\mu \Delta \ln \mu_{rt} \\ & + \pi_n (s_{rt-1}^\mu - s_{ut-1}^\mu n_{rt-1}/n_{ut-1}) \Delta \ln n_{rt} + \varepsilon_t \quad (t = 2, \dots, T) \end{aligned}$$

where  $\Delta$  is the discrete time difference operator,  $s_{it}^\mu = n_{it}\mu_{it}/\mu_t$  is sector  $i$ 's share of mean consumption at date  $t$ , and  $\mu_{it}$  is the mean for sector  $i$ . The  $\pi_u, \pi_r$  parameters can be interpreted as the impact of (share-weighted) growth in the urban and rural sectors, while  $\pi_n$  gives the effect of the population shift from rural to urban areas—interpretable as a “Kuznets effect” following Kuznets (1955). To motivate this test regression, notice that, under the null hypothesis of

14. Lanjouw and Murgai (2009) and World Bank (forthcoming) argue that India's urban economic growth has exerted a pull on the rural economy through diversification into rural nonfarm activities.

$\pi_u = \pi_r = \pi_n = \pi$ , equation (3) collapses to:

$$(4) \quad \Delta \ln P_t = \pi \Delta \ln \mu_t + \varepsilon_t$$

Thus, under this null hypothesis, it is the overall growth rate that matters, not its composition. Rejecting this null tells us that the composition of growth is a significant factor in poverty reduction.

Whether economic growth in one sector affects distribution in the other sector is also tested, estimating the following system (dropping time subscripts for brevity):

$$(5.1) \quad s_u^P \Delta \ln P_u = \pi_{u1} s_u^\mu \Delta \ln \mu_u + \pi_{u2} s_r^\mu \Delta \ln \mu_r + \pi_{u3} (s_r^\mu - s_u^\mu n_r/n_u) \Delta \ln n_r + \varepsilon_u$$

$$(5.2) \quad s_r^P \Delta \ln P_r = \pi_{r1} s_u^\mu \Delta \ln \mu_u + \pi_{r2} s_r^\mu \Delta \ln \mu_r + \pi_{r3} (s_r^\mu - s_u^\mu n_r/n_u) \Delta \ln n_r + \varepsilon_r$$

$$(5.3) \quad (s_r^P - s_u^P n_r/n_u) \Delta \ln n_r = \pi_{n1} s_u^\mu \Delta \ln \mu_u + \pi_{n2} s_r^\mu \Delta \ln \mu_r + \pi_{n3} (s_r^\mu - s_u^\mu n_r/n_u) \Delta \ln n_r + \varepsilon_n$$

where  $s_{it}^P = n_{it} P_{it} / P_t$  and  $\pi_i = \pi_{ui} + \pi_{ri} + \pi_{ni}$ , so that summing equations (5.1), (5.2), and (5.3) yields equation (3). Equation (5.1) shows how the composition of growth and population shifts affect urban poverty; equation (5.2) shows how they affect rural poverty; and equations (5.3) shows the effect on the population shift component of  $\Delta \log P$ . Only equations (5.1) and (5.2) are estimated.<sup>15</sup>

## II. DATA

To address the questions posed in this article, it is desirable to have a reasonably long time series of household surveys; a short series can be deceptive for inferring a trend.<sup>16</sup> India provides rich time series evidence for testing and quantifying the relationship between the living standards of the poor and macroeconomic aggregates. Among developing countries, India has the longest series of national household surveys suitable for tracking living conditions of the poor. At the time of writing, distributional data on household consumption in India could be assembled from 47 surveys spanning 1951–2006. Though some of the earliest surveys had smaller sample sizes and covered shorter periods, the surveys are large enough to be considered representative at the urban and rural levels as well as nationally. And because the basic survey instruments and

15. Equation (5.3) need not be estimated separately since the parameters can be inferred from the estimates of equations (5.1), (5.2), and (3) using the adding-up restriction. These three equations are estimated as single equations, although there may be some efficiency gains from estimating them as a system.

16. For example, the first survey (1992) available in the postreform period indicated a substantial increase in poverty, fueling much debate about the wisdom of reforms. Datt and Ravallion (1997) questioned this inference at the time, arguing that the 1992 survey was deceptive about trends.

methods have changed little (though there are some comparability problems, addressed below), the surveys should be comparable over time.

The period of analysis in Ravallion and Datt (1996) ended two years after India's economic reforms began. This article adds 14 more rounds of National Sample Surveys (NSS). Though the data are not ideal, there are now sufficient postreform data to revisit the question of whether India's higher growth rates have delivered the promise of a higher rate of progress against poverty. While attribution to reforms per se is clearly problematic, revisiting those earlier findings using these new data spanning 15 years of the postreform period offers some insight into whether India's progress against poverty has accelerated or decelerated.

### *Survey Data*

A new and consistent time series of poverty measures for rural and urban India over 1951–2006 was derived for this study, based on consumption distributions from 47 household surveys (rounds 3–62) conducted by the NSSO. This series improves greatly on the most widely used time series on poverty measures in India to date based on Ahluwalia (1978, 1985).<sup>17</sup> The pre-1991 data also differ in some respects from the dataset constructed in Ravallion and Datt (1996), as noted below.

Some of the early survey rounds (notably rounds 4–12) covered periods considerably shorter than a year. These rounds were aggregated to broadly conform to a year-long survey period. Rounds 4 and 5, 6 and 7, 9 and 10, and 11 and 12 were pair-wise aggregated using the number of survey months covered as weights.<sup>18</sup> Thus, with these combined rounds, the dataset has 43 observations over 1951–2006.

As is well established practice for India and elsewhere, real consumption expenditure per person is used to measure household standard of living. The underlying survey data do not include incomes, though it can be argued that current consumption is a better welfare indicator of living standards than is current income.

While the surveys are highly comparable over time by international standards, there is a comparability problem in the rounds since the early 1990s. While most of the surveys used a uniform recall period of 30 days for consumption items, seven of the survey rounds (55–60 and 62) used a mixed-recall period, with one week recall for some items (such as food) and one year for others (mainly nonfood items). Preliminary investigation found that the mixed-recall period reduced the log of the headcount index at a given level of mean consumption by

17. Prior to Ravallion and Datt (1996), work on poverty and growth in India had relied on poverty measures in Ahluwalia (1978), which contained estimates of poverty measures for rural areas for only 12 survey rounds spanning 1956–57 to 1973–74. Ahluwalia (1985) extended this by another round (1977–78).

18. For instance, the headcount index for combined rounds 6 (for May–September 1953) and 7 (for October 1953–March 1954) is  $5/11$ th of the headcount index for round 6 plus  $6/11$ th of the headcount index for round 7.

about 0.2 and that the effect is (highly) significant.<sup>19</sup> This is probably because the shorter recall periods for food in the mixed-recall period give higher reported food spending, which has a higher budget share for poorer households. All the regressions include a control for mixed-recall period survey rounds.

Urban-rural classification is from the NSSO.<sup>20</sup> Over such a long period, some rural areas would have become urban. To the extent that rural (nonfarm) economic growth may contribute to the evolution of successful villages into towns, this process might produce a downward bias in estimates of the (absolute) elasticities of rural poverty to rural economic growth. The impact on the urban elasticities could go either way, depending on the circumstances of new urban areas relative to old ones. There is little choice but to use the NSSO's classification, however, since the unit record data are unavailable for the full period covered by this exercise (nor is it clear what the best corrective would be if there were access to that data).

The population numbers are from the censuses and assume a constant growth rate between censuses. They are also centered at the mid-points of the survey periods. The trend increase in the urban population share was 0.24 percentage point a year in the period 1951–2006 (with a robust standard error of 0.04). In the 40 years after 1950, the urban sector's population share rose from 17 percent to 26 percent, and it reached 29 percent by 2005.

### *Poverty Lines and Price Indices*

The rural and urban poverty lines used here are those originally defined by the [India Planning Commission \(1979\)](#) and endorsed by the Expert Group on Estimation of Proportion and Number of Poor ([India Planning Commission 1993](#)). These lines were set at a per capita monthly expenditure of 49 rupees (Rs) for rural areas and Rs 57 for urban areas at 1973–74 prices, corresponding to per capita total expenditure needed to attain caloric norms of 2,400 calories per person per day in rural areas and 2,100 in urban areas.<sup>21</sup>

19. Regressing the change in the log of  $H$  across 42 rounds on the change in the log of the survey mean and the change in a dummy variable for the mixed-recall period rounds (*MRP*) yielded a regression coefficient of  $-0.20$  with a  $t$ -ratio of 16.7. (Note that since the other variables in the regression are in differences not levels, the *MRP* dummy variable is also differenced.) Similarly, mixed-recall period rounds tended to yield significantly lower inequality (as measured by the Gini index) in both rural and urban areas.

20. The NSS has followed the Census definition of urban areas, which is based on several criteria including a population greater than 5,000, a density of at least 400 people per square kilometer, and three-fourths of the male workers engaged in nonagricultural pursuits.

21. An expert group constituted by the [India Planning Commission \(2009\)](#) recently recommended a higher poverty line for rural areas for 2004/05 while retaining the official line for urban areas. Thus, the implied urban–rural cost of living differential at the poverty line is lower than that in this study. The new rural line was not used in this study because it showed zero cost of living difference at the poverty line in the 1970s when the poverty lines were backcast using the study's urban and rural deflators, which is not plausible.

Rural and urban price indices are needed to update (and backcast) these poverty lines for different survey periods. Since the analysis is confined to the all-India level, so are the deflators.<sup>22</sup> Following well-established practice, the deflators are based on the all-India Consumer Price Index for Industrial Workers (CPIIW) for urban areas and the all-India Consumer Price Index for Agricultural Laborers (CPIAL) for rural areas.<sup>23</sup>

Deaton (2008) argues that between the 1999–00 and 2004–05 rounds, the official CPIAL underestimated the rate of rural price inflation because the food component of the index underestimated the rate of food price inflation and the index assigned too much weight to food during a period when food prices were falling relative to nonfood prices. (Potentially similar problems arise for the CPIIW, although Deaton found these to be of less concern for that period.) Deaton's comparison of the CPIAL with his survey-based food price index using median unit values of food items from the two surveys offers support for his claim that the CPIAL underestimated the rate of food price inflation.<sup>24</sup> However, Deaton's method cannot be used here because the household-level data needed to construct unit values–based food price indices are not accessible for the long period of the analysis. And feasibility aside, there are concerns about using unit values over time (and across space). The quality of consumption could change, which would change the unit value even if prices were unchanged; for example, if the quality of rice consumed rises over time, the unit values will suggest price inflation even when there is none.

However, Deaton is right to stress the importance of properly weighting food when measuring poverty. This study weighted both the food and the nonfood components of the CPIAL and CPIIW using the survey-based (rural and urban) food shares that can be calculated from the published grouped data for NSS rounds. It used the food share at the poverty line (similar to one set of Deaton's price indices<sup>25</sup>), which is conceptually more appropriate for measuring poverty. More precisely, the food and nonfood components of the CPIAL and CPIIW for any round were reweighted by the predicted food and nonfood shares for the rural and urban areas at the poverty line in the preceding round.

22. Thus, this study does not use any state-level price indices or poverty lines, which have been subject to criticism (Deaton 2003; Deaton and Tarozzi 2005).

23. While the analysis covers a long period back to 1951, the all-India CPIAL is available from September 1964 and the all-India CPIIW from August 1968. For the earlier years, we rely on our past work on constructing a consistent rural and urban price index series, using the state-level CPIALs and the Consumer Price Index for the Working Class, a precursor to the CPIIW (see Datt 1997 for details). This series also corrects for firewood prices in the CPIAL, which had remained unchanged in the published CPIAL data since 1960–61. The final CPIIW and CPIAL are averages of monthly indices corresponding to the exact survey period of each NSS round.

24. The unit value is the ratio of expenditure on a type of goods to quantity. This is the price only if there is just one good of that type; in practice, the categories differ in quality.

25. Deaton (2008) presents price indices using both average food shares and estimated food shares at the poverty line. The estimated food shares are derived from a regression of food shares on the log of per capita consumption and its squared value using unit-record data.

Predicted food shares are derived from grouped data on budget shares, using a regression for the previous round of food budget shares as a cubic function of the cumulative proportion of the population ranked by per capita monthly total expenditure. Poverty line food shares for the current round were then derived as predictions at the estimated headcount index for the previous round.<sup>26</sup> Since the published grouped data on budget shares are available only from round 14 (July 1958–June 1959), the reweighting started with round 15 (July 1959–June 1960) using the predicted poverty line food shares for round 14. The reweighted indices for successive rounds were then combined to form the final chain price indices for rural and urban areas. These indices correspond to the evolving food and nonfood budget shares of people near the poverty line and thus help attenuate errors due to the use of outdated consumption patterns (in the official price indices) to measure current inflation for the poor.

These price indices can be compared with other recent work on this subject. First, the rates of rural and urban inflation implied by these indices can be compared with those in Deaton (2008) and with official price indices (CPIAL/CPIIW) for 1999–2000 (55<sup>th</sup> round) to 2004–05 (61<sup>st</sup> round), the only period for which the Deaton indices are available. Deaton finds a higher rate of rural inflation (14 percent) over this period than that implied by the official price indices or the revised indices in this study (both at 11 percent). The urban rates of inflation are similar across all three sets of indices.<sup>27</sup> The food share in the current study's rural index (71 percent) is similar to that in the CPIAL (69 percent), and both are higher than Deaton's (65 percent). Thus, the CPIAL's food share in rural areas in 2004–05 is not inappropriate for the current study's poverty line, despite this study's use of a higher urban food share (see the statistical appendix, available at <http://wber.oxfordjournals.org/>, for details). But the bulk of the difference is due to Deaton's use of a food price index based on unit values instead of the CPIAL food index based on actual prices.<sup>28</sup> As mentioned, since survey-based food price indices over the longer period of the current analysis cannot be constructed, further comparisons cannot be made for the earlier prereform period.

A second comparison is with the survey unit value–based urban to rural (Tornquist) price indices estimated by Deaton (2003) for the 43<sup>rd</sup> (1987–88), 50<sup>th</sup> (1993–94), and the 55<sup>th</sup> rounds (1999–2000), which are 111.4, 115.6, and 115.1 (with rural equal to 100 in each round), as against this study's higher estimates of 133.0, 131.7, and 136.2. However, two observations are

26. Thus, for instance, for the 43<sup>rd</sup> round, the food share regression was estimated for the 42<sup>nd</sup> round, and the poverty line food share for reweighting the price index for the 43<sup>rd</sup> round was estimated as the prediction from this regression at the headcount index for 42<sup>nd</sup> round. In the case of mixed-recall period survey rounds, the regression for the most recent round with a uniform recall period was used.

27. The urban to rural price index of this study (with the 55<sup>th</sup> round as the base) lies between those for the official price indices and Deaton's (2008).

28. The numbers reported in Deaton (2008) imply that 75 percent of the difference between his deflators and the CPIAL is due to his use of unit values; the rest is due to the weights.

pertinent. First, Deaton's indices are food price indices while this study's indices are general price indices; the relative price of food has certainly not been constant, as shown by Deaton's own work. Second, this study's starting point is the official poverty lines for 1973–74, which imply a 16 percent urban to rural price differential. This differential increased to 33 percent by 1987–88 and remained roughly constant till 1999–2000, the relative constancy over this period being analogous to Deaton's estimates. Thus, as far as the *change* in the urban to rural price ratio is concerned, comparison is possible only over essentially the postreform period for which this study's estimates are similar to Deaton's deflators.

### *National Accounts*

Private final consumption expenditure and net domestic product data are from the national account system (NAS). Imperfect matching between the survey periods and the annual accounting periods used in the NAS makes it harder to detect the true effect of aggregate growth on poverty. To mesh the NAS data with the NSSO poverty data, the annual NAS data were linearly interpolated to the mid-point of the survey period for different rounds. Following Ravallion and Datt (1996), both NAS and NSS data are used in the same regressions only for the period 1958 onward, because the shorter survey periods of the early rounds lead to poor mapping between NSS rounds and NAS annual data for that period.

The NSS series of mean household consumption per capita does not fully reflect the gains in mean consumption indicated by the NAS from the early 1990s onwards. The overall elasticity of the NSS mean consumption to NAS consumption is 0.48 ( $t = 4.03$ ) in a regression of consumption growth from the NSS on consumption growth from the NAS, with controls for changes in whether the round used mixed-recall periods and changes in the log ratio of the rural price index to the NAS deflator. The elasticity is significantly less than unity. It is also lower in the post-1991 period, declining from 0.57 (4.47) in the pre-1991 period to 0.45 ( $t = 3.29$ ). However, the null hypothesis that the elasticities are the same for the two subperiods cannot be rejected.

To investigate further the source of divergence between NAS and NSS consumption per capita data in the two subperiods, the difference between the NAS and the NSS mean consumption growth rates were also regressed on dummy variables for pre- and post-1991 subperiods and on pre- and post-1991 per capita net domestic product growth rates. (All regressions include controls for change in the dummy variable for a mixed-recall period round as well as change in the log ratio of the rural price index to the NAS deflator.) These tests confirmed that the divergence in mean consumption growth rates was greater in the post-1991 period, although the difference between the two subperiods is not statistically significant. The divergence between NAS and NSS mean consumption growth rates tends to be higher the higher the per capita net domestic

product growth rate, an association that is somewhat stronger in the post-1991 period.

It is difficult to fully assess the role of NSSO methods in this divergence from NAS consumption. By international standards, those methods appear to have changed little over decades. That is probably good news for comparability, although it does raise questions about whether NSSO methods are in accord with international best practice. However, it is notable that the multiple-recall period rounds of the NSS have narrowed the gap between the NAS and NSS consumption aggregates. When the difference over time in the log of the NSS mean is regressed on the corresponding difference in NAS consumption and the change in the dummy variable for mixed-recall period rounds, the coefficient is 0.055 ( $t = 4.14$ ). This suggests that NSS design may account for at least some of the discrepancy between the two data sources.

Some of the gap between the consumption aggregates from these two sources is undoubtedly due to errors in NAS consumption, which is determined residually in India after subtracting other components of domestic absorption from output at the commodity level. There are also differences in the definition of consumption, and NAS consumption includes components that should not be in a measure of household living standards.<sup>29</sup> Some degree of underreporting of consumption by respondents, or selective compliance with the NSS's randomized assignments, is inevitable. However, it is expected that this is more of a problem for estimating consumption by the rich (notably in urban areas) than the poor.<sup>30</sup> If so, then it is not clear that there will be much bias in the poverty measures based on the surveys.<sup>31</sup>

For the same reason that the consumption aggregates from the NSS are diverging from the private consumption component of domestic absorption in the NAS, one cannot rule out the possibility that the NSS is underestimating the increase in inequality in India.

### III. RESULTS

This section presents an overview of trends in the variables of interest, both for the entire 50-year period and for the periods before and after 1991. It also presents estimated growth elasticities of poverty reduction, separately for urban and rural areas and for their interaction.

#### *Trends*

There can be no doubt that growth has accelerated in the postreform period. The trend rate of growth in India's net domestic product per capita was 1.63

29. For further discussion of the differences between the two data sources, see Sundaram and Tendulkar (2001), Ravallion (2000, 2003), Sen (2005), and Deaton (2005).

30. There is evidence from other sources consistent with that expectation; see Banerjee and Piketty (2005) on income underreporting by India's rich.

31. For a more complete discussion of this issue, see Korinek, Mistiaen, and Ravallion (2006).

percent during 1958–91 (with a robust standard error of 0.06 percent) and 4.28 percent (0.18 percent) during 1992–2006.<sup>32</sup> Similarly, the annual rate of growth of private consumption per capita from the NAS rose from 1.21 percent before 1991 to 3.13 percent after. The acceleration in the survey-based per capita consumption growth—though less than that in mean income or consumption from the NAS—is also notable, from 0.68 percent a year before 1991 to 1.33 percent after. By sector, the highest growth rates in output in the period after 1991 were in the tertiary sector (primarily services and trade), followed closely by manufacturing, while agriculture continued to lag. The sector that gained the most between the two periods was services; agriculture showed little or no improvement in growth (Chaudhuri and Ravallion 2006). The main long-run structural shift in India's economy has been out of agriculture into services, a trend that continued after 1991.

What about poverty? The headcount index and the squared poverty gap for both urban and rural sectors exhibit neither a trend increase nor a trend decrease in rural poverty until about 1970, when a trend decrease emerged (figure 1). Sustained, though uneven, progress against poverty had clearly emerged in India before the economic reforms starting in the early 1990s. Comovement is strong between the urban and rural measures, and there is clear indication of a declining absolute difference between the poverty measures for urban and rural areas after about 1970.<sup>33</sup> Indeed, the urban squared poverty gap overtakes the rural index by the end of the period. In common with other developing countries (Ravallion, Chen, and Sangraula 2007), in India poverty has been urbanizing over time, as the share of the poor living in urban areas has risen. Only about 15 percent of India's poor lived in urban areas in the 1950s, but about 28 percent did in 2005–06. However, because more than 70 percent of the population still lives in rural areas, the rural sector accounted for the bulk of national poverty at the end of the period—72 percent of the total number of poor, 68 percent of the aggregate poverty gap, and 65 percent of the aggregate squared poverty gap.

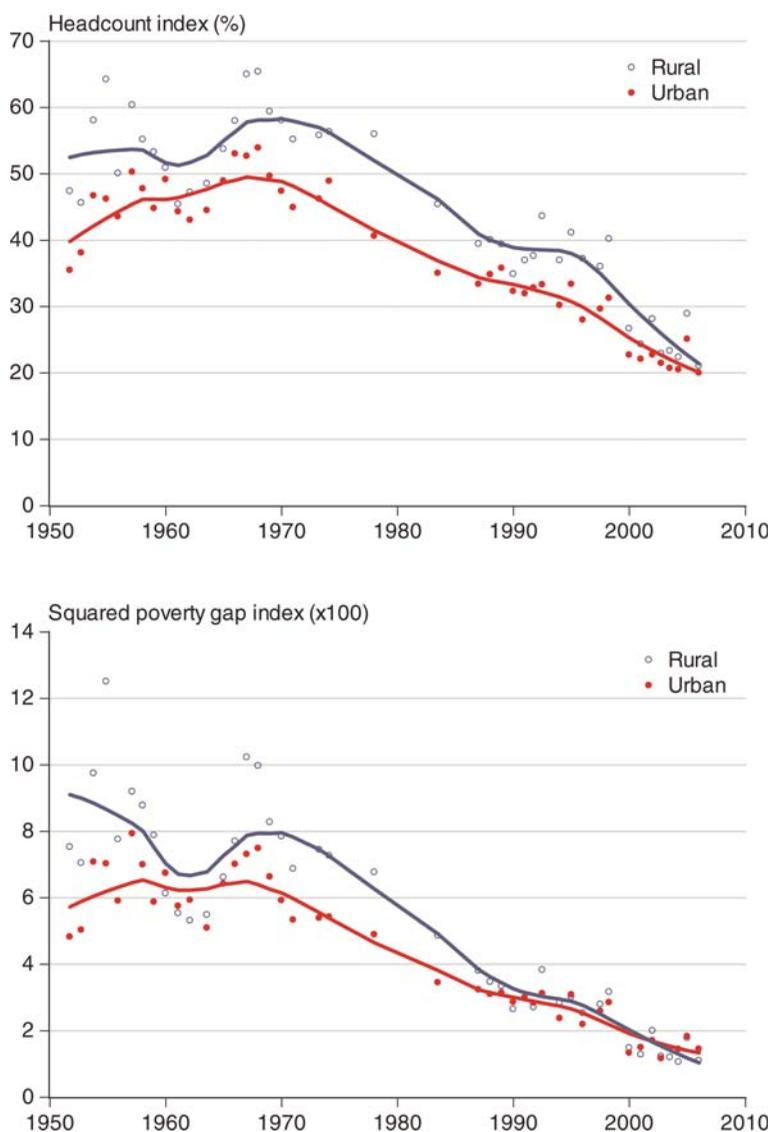
The number of poor people has declined since the early 1990s, primarily as the number of poor in rural areas has declined.

Over the entire 50-year period, the exponential trend in poverty reduction—the regression coefficient of the log poverty measure on time—was 1.3 percent a year for the headcount index, rising to 2.2 percent for the poverty gap and 3.0 percent for the squared poverty gap. For the period before 1991, the trends were 1.1 percent for the headcount index,

32. These are based on regressions of log net domestic product per capita on time. Here and elsewhere, following Boyce (1986), the two growth rates are estimated as parameters of a single regression constrained to ensure that the predicted values were equal in 1992 (to avoid an implausible discontinuity). The supplemental appendix (available at <http://wber.oxfordjournals.org/>) contains a fuller analysis of trends.

33. The regression coefficient of rural  $H$  minus urban  $H$  on time after 1970 is  $-0.231$  percentage point a year ( $t = -4.617$ ); for  $SPG$  it is  $-0.062$  ( $t = -9.545$ ).

FIGURE 1. Poverty Measures for India



*Source:* Authors' calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

2.1 percent for the poverty gap, and 2.8 percent for the squared poverty gap; for the period after 1991 the corresponding trends were 2.4 percent, 3.4 percent, and 4.2 percent. So exponential trends in poverty reduction are higher for the postreform period, but the difference between the pre- and

post-1991 trends are statistically significant only for the headcount index and then only at about the 8 percent level.<sup>34</sup>

Alternatively, the trend could be defined by the level of the poverty measure or mean consumption/income rather than by its log. Doing so confirms the finding of an acceleration of growth (in mean income and consumption) in the post-1991 period but yields no evidence of a parallel acceleration in poverty reduction. (Details are in the supplemental appendix.)

Growth and poverty trends in urban and rural areas are similar to those at the national level described above. While the (survey-based) mean consumption growth rates were higher (nearly twice as high) in the post-1991 period than in the pre-1991 period in both rural and urban areas, only the acceleration in urban growth was statistically significant. There are some indications of a faster poverty decline after 1991, more notably in rural areas, but the increase was often not statistically significant. For instance, there was no significant acceleration in the trend decline in the poverty gap or the squared poverty gap in either rural or urban areas. Only for the headcount index is the increase in the trend rate of poverty decline significant—at the 10 percent level in rural areas and at the 3 percent level in urban areas.

Part of the reason that the faster postreform growth has not yielded correspondingly higher rates of poverty reduction is that rising inequality has accompanied the higher overall growth. As in many developing countries, the gap between urban and rural living standards is an important dimension of overall inequality. The urban mean has risen faster than the rural mean in India. The trend rate of growth in mean consumption based on the NSS since 1958 has been 0.87 percent a year (standard error of 0.10 percent) for urban areas and 0.65 percent (0.14 percent) for rural areas.<sup>35</sup> So inequality between urban and rural areas increased.

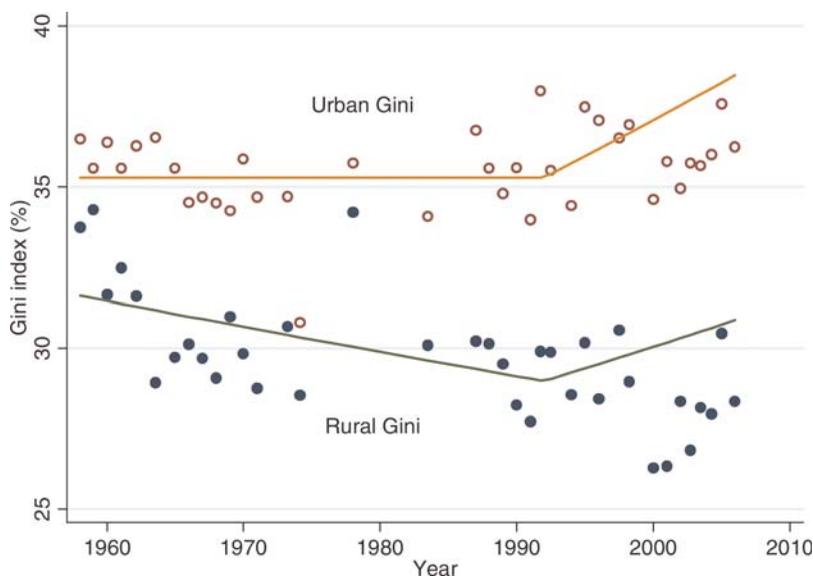
What has happened to inequality within urban and rural areas? The Gini indices calculated from the relevant NSS rounds, but without adjusting for the difference between the uniform and the mixed-recall period, suggest that in rural areas inequality declined, whereas in urban areas it declined until about 1980 and tended to increase thereafter. However, this changes after controlling for the mixed-recall periods of the several NSS rounds since the 1990s, which have a dampening effect on measured inequality (as already noted). Figure 2, which gives the predicted values after controlling for the differences in recall periods between surveys, shows evidence of a clear rising trend in inequality within both rural and urban areas after 1991.

The next subsection looks at whether the rising inequality in the postreform period, both between and within urban and rural areas, attenuated the impact of growth on poverty.

34. The supplemental appendix provides a complete set of statistical tests.

35. The rural mean was rising relative to the urban mean during most of the 1950s. This period is excluded from the calculation because it is so unusual.

FIGURE 2. Trends in Urban and Rural Inequality in India Controlling for Changes in Survey Reference Periods



*Note:* The lines show predicted Gini indices after controlling for the effect of mixed-recall period rounds (as distinct from the actual values plotted, which are naturally without controls).

*Source:* Authors' calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

### *Growth Elasticities of Poverty Reduction*

Elasticities of the three poverty measures are estimated by regressing the log poverty measure on log mean consumption per person from the NSS, consumption per person as estimated by the NAS and population census, and net domestic product (income, for short) per person, also from the NAS and census (table 1). In addition, an "adjusted" estimate adds a control variable for the first difference of the log of the ratio of the consumer price index for agricultural laborers to the national income deflator (that is, the difference in the rate of inflation implied by the two deflators). This allows for possible bias in estimating the growth elasticity due to the difference in the deflator used for the NAS data and that used for the poverty lines.

For 1958–2006 as a whole, the national poverty measures responded significantly to economic growth by all three measures. This also holds when the IV estimator is used to reduce the potential for spurious correlation arising from common survey measurement errors. The (absolute) elasticities are higher when using NSS consumption rather than NAS consumption. The elasticities are lowest for per capita income. This may be due to intertemporal consumption smoothing, which may make poverty (in terms of consumption) less

TABLE 1. Elasticities of National Poverty Measures to Growth in India, 1958–2006

Poverty measure	Period	Elasticity of poverty measure with respect to:					
		Mean consumption from National Sample Surveys		Mean private consumption from national accounts		Mean net domestic product	
		Ordinary least squares	Instrumental variable	Unadjusted	Adjusted	Unadjusted	Adjusted
<i>Headcount index</i>	Whole period	-1.62(-26.0)	-1.60(-61.4)	-0.90(-9.57)	-0.50(-9.76)	-0.65(-9.20)	-0.35(-9.27)
	Up to 1991	-1.58(-27.8)	-1.57(-75.2)	-0.98(-6.77)	-0.51(-7.35)	-0.73(-6.07)	-0.36(-6.35)
	After 1991	-2.07(-21.4)	-2.07(-22.9)	-0.70(-5.10)	-0.62(-2.99)	-0.49(-4.13)	-0.42(-2.70)
$H_0$ : pre-1991 elasticity = post-1991 elasticity	F(1,34 or 32)Prob.	16.08(0.00)	24.91(0.00)	1.50(0.23)	0.25(0.62)	1.43(0.24)	0.12(0.73)
<i>Poverty gap index</i>	Whole period	-2.66(-21.8)	-2.68(-35.5)	-1.53(-10.6)	-0.95(-11.5)	-1.11(-10.3)	-0.68(-11.5)
	Up to 1991	-2.63(-20.3)	-2.66(-33.5)	-1.75(-8.74)	-1.09(-10.6)	-1.31(-7.97)	-0.80(-9.88)
	After 1991	-2.94(-12.2)	-2.78(-11.5)	-0.97(-4.94)	-0.80(-2.43)	-0.69(-4.17)	-0.56(-2.24)
$H_0$ : pre-1991 elasticity = post-1991 elasticity	F(1,34 or 32)Prob.	1.10(0.30)	0.19(0.66)	5.96(0.02)	0.67(0.42)	5.21(0.03)	0.67(0.42)

(Continued)

TABLE 1. Continued

Poverty measure	Period	Elasticity of poverty measure with respect to:					
		Mean consumption from National Sample Surveys		Mean private consumption from national accounts		Mean net domestic product	
		Ordinary least squares	Instrumental variable	Unadjusted	Adjusted	Unadjusted	Adjusted
<i>Squared poverty gap index</i>							
	Whole period	-3.48(-19.7)	-3.48(-31.8)	-2.03(-10.7)	-1.31(-10.7)	-1.48(-10.5)	-0.94(-10.9)
	Up to 1991	-3.48(-18.0)	-3.52(-26.3)	-2.37(-9.63)	-1.58(-10.6)	-1.79(-8.86)	-1.16(-10.3)
	After 1991	-3.49(-8.20)	-3.28(-7.73)	-1.17(-4.74)	-0.95(-2.20)	-0.84(-4.17)	-0.69(-2.10)
H <sub>0</sub> : pre-1991 elasticity = post-1991 elasticity	F(1,34 or 32) Prob.	0.00(0.99)	0.26(0.61)	9.51(0.00)	1.78(0.19)	8.36 (0.01)	1.56(0.22)

*Note:* Numbers in parentheses are *t*-ratios based on heteroskedasticity and autocorrelation-consistent standard errors. Results are based on regressions of log poverty measures against log consumption or net product per person using 37 surveys spanning 1958–2006. All regressions include a control for surveys that used a mixed-recall period. The “adjusted” estimates control for the difference in the rates of inflation implied by the rural consumer price index and the national income deflator (Ravallion and Datt 1996). The instrumental variables for the survey mean regressions included lagged survey means (split urban and rural), current and lagged mean consumption from the national accounts, current and lagged rural and urban consumer price indices, current and lagged rural population shares, interval between mid-points of survey periods, and a time trend. The regressions also incorporate a kink at survey round 47 (July–December 1991) so that there is no discontinuity in the predicted values of log poverty measures between the pre- and post-1991 periods.

*Source:* Authors’ calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

responsive in the short term to income growth than to consumption growth. Imperfect matching of the time periods between the NSS and the NAS could also be attenuating the elasticities using NAS growth rates. However, the more important reason for lower (absolute) elasticities with NAS consumption or income is likely the divergence between NSS and NAS growth rates of mean consumption or income. Note that:

$$(6) \quad \frac{d \ln P}{d \ln C} = \frac{d \ln P}{d \ln \mu} \cdot \frac{d \ln \mu}{d \ln C}.$$

An elasticity of  $\mu$  with regard to  $C$  (NAS consumption per capita) of around 0.5 (section II) would yield a poverty elasticity with regard to  $\mu$  that is about double that with regard to  $C$ —roughly in accord with table 1.

When the period is split at 1991, the (absolute) elasticity of the headcount index with respect to the survey mean is appreciably higher in the post-1991 period (2.07) than in the pre-1991 period (1.58), and the difference is statistically significant.<sup>36</sup> However, for the poverty gap measures, the difference in the elasticities for the two periods (2.63 and 2.94) is much smaller and is not statistically significant. Finally, for the squared poverty gap measure, the elasticities are the same for the two periods (about 3.48). The pattern is similar using the IV method to control for correlated measurement errors, although the difference between the two periods is narrower and for the squared poverty gap measure the post-1991 elasticity (3.28) is lower than the pre-1991 elasticity (3.52). The vanishing difference in post- and pre-1991 elasticities for the higher order measures of poverty is consistent with the increase in inequality during the postreform period, given that the higher order poverty measures will tend to be more responsive to rising inequality.

In contrast to the growth rates based on the survey means, both NAS-based growth rates indicate lower (absolute) elasticities in the post-1991 period, although the difference between the two periods is generally not statistically significant. Exceptions are for the “unadjusted” elasticities of poverty gap and squared poverty gap, which are significantly lower in the postreform period. It is notable, however, how much difference there is in the elasticity based on the NSS consumption growth rates and those based on the NAS rates for the post-1991 period. The much lower NAS elasticities reflect the much faster NAS-based growth than NSS-based growth. Since this growth divergence is more pronounced in the period after 1991, for the poverty gap and squared poverty gap measures it yields even lower (absolute) elasticities for this period relative to the pre-1991 period.

36. See Table 3 later in the article. These results are based on regressions of log poverty measures on the log survey mean interacted with dummy variables for pre- and post-1991 periods and a dummy variable for mixed-recall period surveys. The regressions also incorporate a kink at NSS round 47 (July–December 1991) such that there is no discontinuity in the predicted values of log poverty measures between the pre- and post-1991 periods.

The estimated semi-elasticities, from the regression of  $P_t$  on  $\ln \mu_t$ , show a lower poverty impact of growth in the survey mean in the post-1991 period for the headcount index ( $-0.73$ ,  $t = -45.8$ ), the poverty gap ( $-0.34$ ,  $t = -32.3$ ), and the squared poverty gap ( $-0.17$ ,  $t = -25.3$ ) than in the pre-1991 period ( $-0.63$ ,  $t = -15.7$ ;  $-0.20$ ,  $t = -9.82$ ; and  $-0.08$ ,  $t = -7.24$ ). This is to be expected; if elasticities are similar between the two periods, but poverty has fallen, absolute rates of decline will be lower in the later period.

To summarize: the proportionate response of poverty to economic growth when measured from the NSS data remained roughly the same across the pre- and postreform periods, though with a slightly higher elasticity for the headcount index. However, there are signs that the responsiveness to growth measured through the NAS has declined during the postreform period.

### *Urban–Rural Composition of Consumption Growth*

Table 2 summarizes the results of testing the poverty impact of the urban-rural composition of consumption growth.<sup>37</sup> Table 3 presents the test statistics on whether the urban-rural composition of growth matters and whether the population shift effect is significant. These results on the relative effects of urban and rural growth are presented for national poverty measures and separately for urban and rural areas.

*IMPACT ON NATIONAL POVERTY.* For the pre-1991 period, the hypothesis that only the overall rate of growth matters for poverty reduction is strongly rejected (table 3). The weaker hypothesis of uniform poverty effects of urban and rural growth is also strongly rejected. This echoes the results from Ravallion and Datt (1996) that the growth effects on poverty before 1991 are attributable largely to rural consumption growth, with virtually no contribution from urban growth and only a limited contribution from the Kuznets process.

However, there is a significant structural shift between the pre-1991 and post-1991 periods. The hypothesis that growth effects are the same during the two periods is rejected (at the 8 percent level of significance or better; see table 2). In the post-1991 period, the rural growth rate remains significant for poverty reduction (with the possible exception of the squared poverty gap index), though the growth effects are smaller in absolute terms. Unlike in the pre-1991 period, rural growth does not appear to be the prime driver of national poverty reduction. The most notable change is that the (share-weighted) urban growth variable is now highly significant. The null hypothesis that only the overall growth rate matters for poverty reduction in the post-1991 period can also be largely rejected (see table 3), although the evidence for a Kuznets effect is weaker during this period and limited to the headcount index.

37. Table 2 uses mean consumption from the surveys, since the NAS data do not permit an urban-rural breakdown.

TABLE 2. Impacts on Poverty of the Urban-rural Composition of Growth: 1951–2006

Poverty measure	Period	Variable	National poverty		Urban poverty		Rural poverty	
			Coefficient	<i>t</i> -ratio	Coefficient	<i>t</i> -ratio	Coefficient	<i>t</i> -ratio
<i>Headcount index</i>								
	Up to 1991	Urban growth	-0.38	-1.03	-0.64	-11.42	0.46	1.47
		Rural growth	-1.45	-21.79	-0.08	-4.16	-1.38	-34.32
	After 1991	Urban growth	-3.73	-2.40	-0.94	-3.47	-2.96	-2.07
		Rural growth	-0.98	-3.88	-0.03	-0.25	-1.01	-5.18
	H <sub>0</sub> : Pre-1991 coefficient = Post-1991 coefficient		F(2,34) (prob.)		0.52 (0.60)		3.44 (0.04)	
	H <sub>0</sub> : All Pre-1991 coefficients = Post-1991 coefficients		F(3,34) (prob.)		0.97 (0.42)		2.96 (0.05)	
<i>Poverty gap index</i>								
	Up to 1991	Urban growth	0.21	0.27	-0.67	-4.54	0.90	1.16
		Rural growth	-2.19	-26.32	-0.14	-4.04	-2.06	-16.82
	After 1991	Urban growth	-8.19	-2.79	-2.24	-3.84	-5.31	-1.88
		Rural growth	-1.59	-3.72	0.00	0.03	-1.59	-3.27
	H <sub>0</sub> : Pre-1991 coefficient = Post-1991 coefficient		F(2,34)(prob.)		3.25(0.05)		2.13(0.13)	
	H <sub>0</sub> : All Pre-1991 coefficients = Post-1991 coefficients		F(3,34)(prob.)		4.50(0.01)		1.47(0.24)	
<i>Squared poverty gap index</i>								
	Up to 1991	Urban growth	0.47	0.44	-0.58	-3.55	1.51	1.48
		Rural growth	-2.69	-15.27	-0.17	-4.13	-2.54	-11.80
	After 1991	Urban growth	-11.64	-2.33	-3.95	-4.77	-7.45	-1.70
		Rural growth	-1.66	-1.54	-0.33	-1.27	-1.19	-1.35
	H <sub>0</sub> : Pre-1991 coefficient = Post-1991 coefficient		F(2,34)(prob.)		11.03(0.00)		2.33(0.11)	
	H <sub>0</sub> : All Pre-1991 coefficients = Post-1991 coefficients		F(3,34) (prob.)		7.42(0.00)		1.56(0.22)	

*Note:* These are the  $\pi$  coefficients in the regressions in equations (3) and (5) rather than elasticities. All regressions include a control for surveys that used a mixed-recall period (by adding the change between surveys in a dummy variable for such surveys). The regressions are estimated using a 2-stage GMM estimator. The instruments for the urban and rural growth variables included lagged survey means (split urban and rural), current and lagged mean consumption from the national accounts, current and lagged rural and urban consumer price indices, current and lagged rural population shares, interval between mid-points of survey periods and a time trend. The *t*-ratios are based on heteroskedasticity and autocorrelation-consistent standard errors.

*Source:* Authors' calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

TABLE 3. Test Statistics on the Significance of the Pattern of Growth and the Kuznets Effect

Poverty measure	Sector	Pattern of growth matters $H_0: p^i_u = \pi_r$		Pattern of growth matters $H_0: \pi_u = \pi_r = \pi_n = \pi$		Kuznets effect $H_0: \pi_n = 0$	
		F(1,34)	Prob.	F(2,34)	Prob.	t ratio	Prob.
<i>Headcount index</i>							
Pre-1991	National	7.55	0.01	7.31	0.00	-2.18	0.04
	Urban	63.05	0.00	32.36	0.00	-1.32	0.20
	Rural	32.17	0.00	22.27	0.00	-1.76	0.09
Post-1991	National	2.55	0.12	4.06	0.03	-1.76	0.09
	Urban	7.71	0.01	4.25	0.02	0.47	0.64
	Rural	1.60	0.21	4.85	0.01	-1.77	0.09
<i>Poverty gap index</i>							
Pre-1991	National	7.77	0.01	12.76	0.00	-3.94	0.00
	Urban	9.38	0.00	5.63	0.01	-1.69	0.10
	Rural	11.74	0.00	12.04	0.00	-3.33	0.00
Post-1991	National	4.72	0.04	2.78	0.08	0.28	0.78
	Urban	10.84	0.00	9.10	0.00	1.62	0.12
	Rural	1.56	0.22	1.24	0.30	0.25	0.81
<i>Squared poverty gap index</i>							
Pre-1991	National	6.98	0.01	8.49	0.00	-3.08	0.00
	Urban	4.37	0.04	8.52	0.00	-3.48	0.00
	Rural	11.74	0.00	9.74	0.00	-2.72	0.01
Post-1991	National	3.54	0.07	1.82	0.18	0.31	0.76
	Urban	13.56	0.00	10.09	0.00	1.68	0.01
	Rural	1.81	0.19	1.38	0.27	-0.31	0.76

Note: See equations (4), (5.1), (5.2) and discussion in text.

Source: Authors' calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

The emergence of a significant effect of urban growth on national poverty is the most striking feature of these results. Table 4 reports the elasticities of national headcount, poverty gap, and squared poverty gap measures with respect to urban and rural growth. The contrast between the pre-1991 and post-1991 periods is compelling. While urban growth did not seem to matter for national poverty reduction before 1991, after 1991 not only did a significant urban growth effect emerge, but the urban growth elasticities of all three national poverty measures were higher (in absolute terms) than the corresponding rural growth elasticities.

*IMPACTS ON RURAL AND URBAN POVERTY.* The urban-rural decomposition reveals something about the source of these differences between the pre- and post-reform periods. The hypothesis of no structural change is rejected for measures of the depth and severity of poverty in urban areas, but only for the headcount index in rural areas. However, for the rural depth and severity of

TABLE 4. Elasticities of Poverty with Respect to Urban and Rural Growth: 1951–2006

Poverty measure	Period	National poverty	Urban poverty	Rural poverty
<i>Headcount index</i>				
Urban growth	Pre-1991	-0.09	-0.85	0.13
Rural growth	Pre-1991	-1.11	-0.35	-1.29
Urban growth	Post-1991	-1.21	-1.26	-1.26
Rural growth	Post-1991	-0.66	-0.08	-0.90
<i>Poverty gap index</i>				
Urban growth	Pre-1991	0.05	-0.89	0.25
Rural growth	Pre-1991	-1.68	-0.61	-1.91
Urban growth	Post-1991	-2.65	-2.79	-2.32
Rural growth	Post-1991	-1.08	0.01	-1.46
<i>Squared poverty gap index</i>				
Urban growth	Pre-1991	0.11	-0.78	0.43
Rural growth	Pre-1991	-2.07	-0.77	-2.36
Urban growth	Post-1991	-3.77	-4.73	-3.31
Rural growth	Post-1991	-1.12	-0.83	-1.11

*Note:* Elasticities are evaluated at means for the pre- and post-1991 periods using the parameter estimates reported in table 1.

*Source:* Authors' calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

poverty, too, the hypothesis of similar effects of urban growth for the two sub-periods is rejected.

For the pre-1991 period, urban growth reduced urban poverty (see table 2), but so did rural growth, which had a significant impact on poverty in both urban and rural areas for all three poverty measures. Indeed, for the squared poverty gap, the (absolute) elasticity of urban poverty to rural growth (0.77) is virtually the same as to urban growth (0.78; see table 4). The effect of urban growth, which for the pre-1991 period is confined to urban poverty, appears to be too small to be detected in the national average poverty measures in this period.

The data for the post-1991 period look very different. Urban economic growth not only reduced urban poverty (as it did before), but had positive feedback effects on rural poverty, especially the rural headcount index. Indeed, the estimated elasticities of rural poverty measures to urban growth are even higher than to rural growth. On the other hand, rural economic growth remains important to rural poverty reduction (in particular, for the incidence and depth of rural poverty), although there are signs that rural consumption growth has been somewhat less effective (in elasticity terms) against rural poverty in the post-1991 period. Also, the spillover effect to the urban poor has become considerably weaker in the post-1991 period for the headcount index and the poverty gap, though it remains strong for the squared poverty gap, suggestive of a continuing (propoor) distributional effect in urban areas of rural economic expansion (see table 4).

Figure 3 shows the estimated impact of urban economic growth for the periods before and after 1991. For each period, the figure plots the change in log national headcount index that remains unexplained by rural growth against the change in log urban mean consumption. There was no significant poverty-reducing effect of growth in mean urban consumption in the pre-1991 period, but a significant impact emerges after 1991.

The qualitative results are generally robust to the choice of poverty measure. As in Ravallion and Datt (1996), the growth elasticities tend to be highest (in absolute value) for the squared poverty gap and higher for the poverty gap than for the headcount index. As in Ravallion and Datt, the higher growth elasticity of the poverty gap than the headcount index implies that growth also reduces the depth of poverty (as measured by the mean poverty gap relative to the poverty line). Similarly, the even higher elasticity of the squared poverty gap implies that growth reduces inequality among the poor (as measured by the coefficient of variation). Thus, the impacts of growth within and between sectors are not confined to households in a neighborhood of the poverty line.

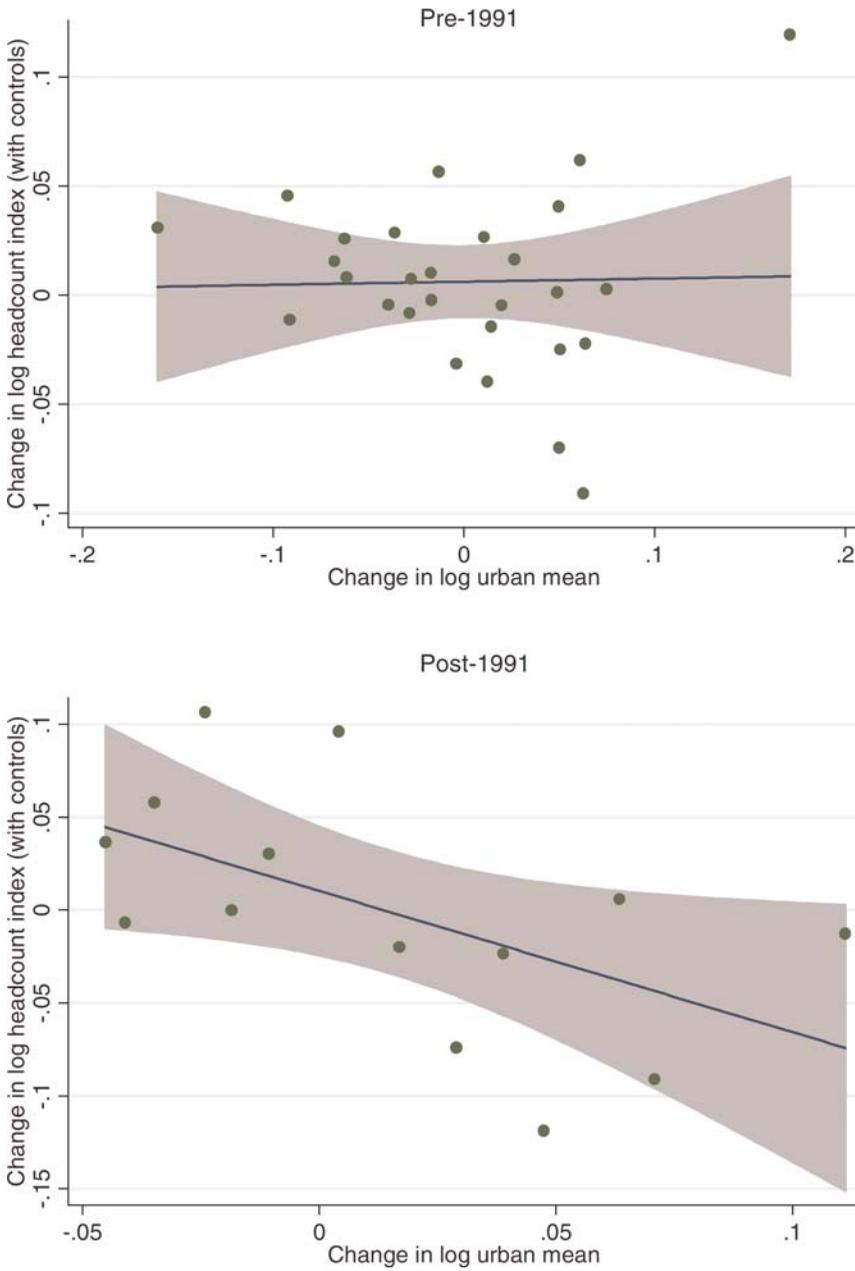
There are two notable exceptions. The first is in the pre-1991 data for urban areas, where a slightly lower elasticity is found for the squared poverty gap than for the poverty gap in the effects of urban growth on urban poverty (see table 4). This suggests an underlying adverse distributional effect among the poor in the urban economic growth process of the prereform period. The second exception is in the impacts of rural economic growth on rural poverty in the post-1991 period, for the elasticity is lower for the squared poverty gap than for the poverty gap in the post-1991 period (see table 4). It appears that an adverse distributional effect among the rural poor has emerged in the rural growth process of the prereform period.

Compared with the earlier findings in Ravallion and Datt (1996), the most striking new result is the evidence that the urban economic growth process since 1991 has been appreciably more effective in reducing rural (and national) poverty. Since the regressions for rural poverty include rural mean consumption, the urban growth effect can be interpreted as a distributional effect. Supportive evidence is provided by the following regression of changes in the rural log Gini index ( $G^r$ ) of inequality on the (share-weighted) urban and rural growth rates:<sup>38</sup>

$$\begin{aligned}
 \Delta \ln G_t^r = & \underset{(1.75)}{1.54} (1 - d_t^{91}) s_{ut-1}^\mu \Delta \ln \mu_{ut} - \underset{(-1.68)}{3.64} d_t^{91} s_{ut-1}^\mu \Delta \ln \mu_{ut} \\
 (7) \quad & - \underset{(-1.13)}{0.20} (1 - d_t^{91}) s_{rt-1}^\mu \Delta \ln \mu_{rt} + \underset{(2.50)}{1.48} d_t^{91} s_{rt-1}^\mu \Delta \ln \mu_{rt} \\
 & - \underset{(-1.67)}{0.08} \Delta MRP_t + \hat{\varepsilon}_t \quad R^2 = 0.32; n = 41
 \end{aligned}$$

38. Population shift effects were included (as in equation 5.2), but they were insignificant and are not reported. The share-weighted urban and rural growth terms are instrumented, as in table 3.

FIGURE 3. Poverty Impacts of Urban Economic Growth in India



Note: The shaded area shows the 95 percent confidence interval.

Source: Authors' calculations based on consumption data from 47 National Sample Surveys and on private final consumption expenditure and net domestic product data from national accounts and the population census; see text for details.

where  $d_t^{91} = 1$  for the post-reform period. From equation (7) it can be seen that, unlike in the pre-1991 period, higher growth rates of mean urban consumption since 1991 have reduced inequality in rural areas (significant at the 10 percent level). Rural consumption growth, on the other hand, has had the opposite effect.

### *Implications of Measurement Errors*

Concerns about underestimation of consumption in the NSS have implications for assessing how the urban-rural composition of growth has affected poverty. The proportionate bias in the NSS estimates of mean consumption may well be greater in India's urban areas, where (as noted) it is widely thought that the NSS does not fully capture the consumption of the rich (notably for consumer durables and celebrations).

Even so, the direction of any net bias in these estimates of the growth elasticity of poverty reduction is unclear a priori. There are three sources of potential bias. First, greater measurement error in the log of mean consumption in urban areas than in rural areas would imply greater attenuation bias in the estimate of the impact of urban economic growth on poverty, leading to underestimation of the true elasticity, meaning that the true elasticity is more negative. Second, to the extent that the NSS is not fully capturing the growth in consumption by the relatively rich, the measured mean consumption growth rate from the surveys may be lower than the true rate.<sup>39</sup> Call this the "growth-rate bias." This will partly or even fully offset the attenuation bias; indeed, if the effect is strong enough, the measurement error in the mean may lead to an overestimate of the true elasticity, meaning that the true elasticity is less negative. Third, some of the bias in estimating mean consumption will be passed onto the poverty measures—also pushing toward overestimation of the elasticity. This can be called the "spillover bias." The net effect of these three potential sources of bias is unclear.

Nor is it clear how much all of this would matter to the comparison of elasticities between the pre-and post-1991 periods. Since the balance of these effects cannot be determined on theoretical grounds, the conclusion that urban economic growth has become more poverty reducing may not be robust to correcting for measurement error in the NSS. The spillover bias is unlikely to be strong, since it is consumption by the urban nonpoor that tends to be underestimated by the NSS; correcting for this bias would not have much effect on the poverty measures. However, by the same logic, the growth rate bias could be large, and so there can be no presumption that the attenuation bias would dominate.

39. In more technical terms, the measurement error in the NSS mean is not just a simple additive error in the log mean, as in the standard formulation of the attenuation bias in a regression coefficient due to additive measurement error in the regressor.

It could be argued that measurement error in the NSS has become a bigger problem in more recent years. That conjecture is at least consistent with the increasing divergence between the NSS mean and the NAS consumption aggregates, although this divergence could also stem from a rising share of the components of consumption included in the NAS aggregates that are not included in the NSS (including measurement errors in the NAS). Evidence is found of a lower elasticity of NSS consumption to NAS consumption in the postreform period, although the difference is small and not statistically significant.<sup>40</sup> However, this would presumably strengthen both the attenuation bias and the growth rate bias, leaving the net effect indeterminate.

#### IV. CONCLUSIONS

While progress against poverty has been uneven, the long-run trend has been a decline in all three poverty measures based on a new time series of survey-based poverty measures for urban and rural India spanning 50 years, including 15 years after economic reforms started in earnest in the early 1990s. Exponential (proportionate) trends are higher for the poverty gap and squared poverty gap indices than for the headcount index, reflecting gains to those living well below the poverty line. Both urban and rural poverty measures have shown a trend decline; rural poverty measures have historically been higher than urban measures, though the two have been converging over time.

Progress against poverty has been maintained in the postreform period. Indeed, there was a higher proportionate rate of progress against poverty after 1991, although the difference in trend rates of change between the two periods is statistically significant only for the headcount index. The linear trend—the annual percentage point reduction in the poverty measures—remained about the same in the postreform period. The responsiveness of poverty to growth in the survey mean—the growth elasticity of poverty reduction—has also generally remained the same between the two periods; only for the headcount index is there a significant increase in the absolute growth elasticity in the postreform period. When growth as measured in the NAS is used, there are signs that the postreform growth process has become less propoor in the sense of attaining a lower proportionate rate of poverty reduction from a given rate of growth. This seems to be the result largely of the faster postreform growth not being fully reflected in the surveys, and of the increase in inequality during the postreform period. The data do not make a robust case for saying that the growth elasticity of poverty reduction has risen (or fallen) since the reforms began.

40. The elasticities obtained by regressing consumption growth from the NSS on consumption growth from the NAS (with controls for changes in whether the round used a mixed-recall period and for changes in the log ratio of the rural price index to the NAS deflator) indicate that the elasticity is lower in the post-1991 period, declining from 0.57 (4.47) in the pre-1991 period to 0.45 ( $t = 3.29$ ). However, the null hypothesis that the elasticities for the two subperiods are the same cannot be rejected.

Recognizing that the fortunes of the poor in urban and rural areas are linked in various ways—through trade, migration, and transfers—this study also revisited earlier (prereform) findings on the relative importance of growth in urban and rural areas to poverty reduction in both areas and nationally (Ravallion and Datt 1996). Like that 1996 study, this one finds that the pattern of growth matters for poverty reduction. But it also finds a striking change in the relative importance of urban and rural economic growth in the postreform period. The 1996 study found that urban economic growth helped reduce urban poverty but brought little or no overall benefit to the rural poor; the main driving force for overall poverty reduction was rural economic growth. This study confirms that finding for the data up to 1991, but the picture changes after 1991. As before, urban growth reduced urban poverty, and rural growth reduced rural poverty. But there is much stronger evidence of a feedback effect from urban economic growth to rural poverty reduction in the post-1991 data than was found in the pre-1991 data. There are also signs that the post-1991 rural growth has been less poverty reducing in rural areas.

The relatively weak performance of India's agricultural sector and the widening disparities between urban and rural living standards remain important concerns, including for India's poor. However, it is encouraging that rising overall living standards in India's urban areas in the postreform period appear to have had significant distributional effects favoring the country's rural poor. While the attribution of this effect to the reforms is hardly conclusive—since there can be no comparison group for India after 1991 without the reforms—these findings are consistent with the view that with India's efforts to create a more open and productive market economy has come a reversal in the historical pattern of weak feedback effects of urban economic growth on rural living standards.

This may be a surprising conclusion considering that sectors that rely on skilled labor have been the most dynamic. However, the more relevant observation is that the nonfarm sectors that use unskilled labor more intensively—notably trade, construction, and the “unorganized” manufacturing sectors—have seen higher employment growth in the postreform period. This is plausibly the main reason behind the stronger spillover effect of urban economic growth on the rural distribution of levels of living since 1991. This encouraging finding comes with a warning, however. While the rural poor have benefited more from urban economic growth in the postreform economy, it can also be expected that they will be more vulnerable in the future to urban-based economic shocks.

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