

# POVERTY AND GROWTH IN INDIA OVER SIX DECADES

GAURAV DATT, MARTIN RAVALLION, RINKU MURGAI

We study the evolution of consumption-poverty measures for post-independence India, including 20 years since extensive economic reforms began in 1991. Progress against poverty was negligible until the mid-1970s, after which a downward trend in poverty measures emerged. The pace of poverty reduction accelerated in the post-reform period, despite rising inequality amidst faster growth. A key finding is that the relationship to the pattern of growth changed greatly, suggesting stronger intersectoral linkages, with urban consumption growth benefiting both the rural and urban poor. In contrast to the pre-reform period, growth in primary, secondary and tertiary sector outputs yielded similar impacts on poverty.

*Key words:* Poverty, inequality, Kuznets, economic growth, rural development, urbanization.

*JEL codes:* I32, O15, O40.

## Introduction

A number of studies have found that growth in developing countries tends to be distribution-neutral on average, meaning that changes in inequality are orthogonal to growth rates in the mean, with the implication that absolute poverty tends to fall with aggregate economic growth in developing economies.<sup>1</sup> However, in dualistic developing economies, one can expect the sectoral composition of growth to matter. Various strands of the development literature have examined this issue. One strand has questioned whether agricultural growth processes have helped the rural poor, many of whom are landless, while others have argued that the benefits of rising farm productivity are passed on in due course

through higher wage rates.<sup>2</sup> No less contentious is the role played by urban economic growth—whether it helps absorb surplus rural labor and unemployed urban workers or merely benefits urban elites.<sup>3</sup>

Among developing countries, India has the longest series of national household surveys suitable for monitoring poverty. The surveys are reasonably comparable over time since the basic survey instruments and methods have changed rather little (although we note, and address, some comparability problems). India thus provides rich time series evidence—uniquely so among developing countries—for testing and quantifying the relationship between living standards of the poor and macroeconomic aggregates.<sup>4</sup>

This paper aims to provide a “thick description” of India’s long-term progress against poverty, with special attention to the relationship with the sectoral pattern of growth. For that purpose, we have estimated a new data series on poverty spanning sixty

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<sup>1</sup> See Ravallion (1995), Dollar and Kraay (2002), and Dollar, Kleineberg, and Kraay (2013). Overviews of this literature can be found in Fields (1980) and Ravallion (2016, Chapter 8).

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<sup>2</sup> Contributions to this debate are cited in Ravallion and Datt (1996) and Datt and Ravallion (1998, 2011).

<sup>3</sup> See, for example, the discussion in Eswaran and Kotwal (1994).

<sup>4</sup> There have been some valuable subnational studies over long periods, notably the Village Studies started by ICRISAT in the 1970s, as studied most recently by Dercon, Krishnan, and Krutikova (2013).

years. This covers very different policy regimes, from the more closed and heavily regulated economy of the post-Independence period, to the period in which pro-market economic reforms began in earnest from around 1991. The first period saw relatively stable overall inequality measures with modest economic growth, while the second period saw a marked rise in inequality but with higher rates of growth. With the benefit of nearly two decades of post-1991 data, we believe there is now sufficient data to test the poverty implications of the new rate and pattern of growth in post-reform India. Attribution to reforms per se is problematic, but further scrutiny of the emergent properties of the changing growth process with respect to poverty reduction is clearly important.

The sectoral structure of economic growth in the post-1991 period is of obvious interest, as is the role played by population urbanization, including the [Kuznets \(1955\)](#) process that has been so influential in past thinking about the distributional implications of economic growth in poor countries. We provide a decomposition method that allows us to identify the difference between urbanization effects on poverty with constant within-sector distribution (as in the Kuznets process) versus changing within-sector distributions. We also provide a decomposition of poverty reduction by sector of net domestic product (NDP), which allows us to assess the changing contributions of growth in primary, secondary, and tertiary sectors of the economy.

We show that economic growth has come with a lower incidence of absolute poverty in India and that there has been an acceleration in the pace of progress against poverty. While there has been rising inequality within the rural and (especially) urban sectors, growth within sectors has delivered significant gains to poor people. The acceleration of poverty decline has come with faster growth and a non-declining responsiveness of poverty to growth.

Urbanization played a role, but not as assumed by Kuznets. Instead, urbanization came with distributional changes within sectors; these were pro-poor in the pre-91 period, but that has not been so since 1991. Urban growth has mattered more to poverty reduction in the post-reform period, with strong cross-sectoral effects, while the economic (NDP) sector has mattered far less.

## Background on the Issues

India's post-independence planners hoped that the country's urban-based industrialization would bring large gains to poor people.<sup>5</sup> That hope was largely shattered by the evidence of the slow pace of poverty reduction until the mid-1970s.<sup>6</sup> Some observers pointed to the slow pace of rural labor absorption associated with the more inward-looking and capital-intensive development path.<sup>7</sup> Inequality did not, however, trend upward in contrast to the predictions of the models of [Lewis \(1954\)](#) and [Kuznets \(1955\)](#).

The first four decades since Independence were also marked by a slow pace of both urbanization and economic growth. The urban population share rose from 17% in 1951 to 26% in 1991. This pace of urbanization is less than either South Asia as a whole or lower middle-income countries, and markedly slower than for China.<sup>8</sup> The trend rate of growth in India's Net Domestic Product (NDP) per capita in the period 1958–1991 was under 2% per annum.

The picture that emerges from the National Sample Surveys (that started in the 1950s) is that economic growth in India has been poverty reducing. [Ravallion and Datt \(1996\)](#) found that the elasticity of the poverty rate with respect to mean consumption was  $-1.3$  over 1958–1991. Given the modest rate of growth, avoiding rising inequality was key to this finding.

Using data up to the early 1990s, [Ravallion and Datt \(1996\)](#) found that rural economic growth was more poverty reducing, as was growth in the tertiary and primary sectors relative to the secondary sector. They also found that spillover effects across sectors reinforced the importance of rural economic growth to national poverty reduction. Urban growth and secondary sector growth came with adverse distributional effects, while urban growth brought little or no benefit to the rural poor. The slow progress against poverty reflected both a lack of overall growth and a sectoral pattern of growth that did not favor poor people.

<sup>5</sup> For a review of these debates see [Ravallion \(2016, chap. 2\)](#).

<sup>6</sup> See [Datt and Ravallion \(2002, 2011\)](#).

<sup>7</sup> See, e.g., [Bhagwati \(1993\)](#) and [Eswaran and Kotwal \(1994\)](#).

<sup>8</sup> Urban population shares can be found in [World Bank \(2018 and past issues\)](#).

Has this changed in the wake of the economic reforms that started in earnest in the early 1990s?<sup>9</sup> Trend growth in per capita income in the two decades since 1991 more than doubled that in the preceding four decades. However, there have also been signs of rising inequality, raising doubts about how much the poor have shared in the gains from higher growth rates, and concerns about the new development path.<sup>10</sup> There are reasons to be concerned about rising inequality even if poverty is falling contemporaneously; for example, high inequality today may impede future growth and poverty reduction (Ravallion 2007). However, if the rise in inequality we are seeing in India has come with little or no acceleration in the pace of poverty reduction then one can be seriously concerned about the country's new development path.

The paper revisits the implications for poverty of both the higher rate of growth and the new pattern of growth. The sectoral imbalance in India's post-reform growth would be a concern for poverty reduction if the model linking poverty to growth had remained the same, notably with the rural and agricultural sector contributing most to poverty reduction. Datt and Ravallion (2011) found early signs of change in the underlying model with an emerging pro-poor role of urban economic growth in the post-reform period up to 2005–06. However, they also concluded with a cautionary note: “While the rural poor have benefited more from urban economic growth in the post-reform economy, it can also be expected that they will be more vulnerable in the future to urban-based economic shocks.” It is now possible to span an extra six years of the post-reform period, allowing a more robust test for a change in the relationship between poverty and economic growth in India.

However, we also examine new issues. Datt and Ravallion (2011) did not study the composition of growth in terms of the primary, secondary and tertiary sectors. Nor did they isolate the role played by the Kuznets (1955) process. The paper takes up these neglected issues in addition to a more robust

examination of the changing poverty-growth relationship.

While we test for a structural break in 1991, it should also be noted that there had been prior steps toward reform in the early 1980s, with a more “pro-business” orientation (Rodrik and Subramanian 2005). Several other studies also point to growth acceleration starting around 1980 (Wallack 2003; Balakrishnan and Parmeswaran 2007). We thus also test whether the observed patterns are robust to an earlier structural break around 1980.

### Historical Data on Poverty in India

Following now well-established practice for India and elsewhere, a household's standard of living is measured by real consumption expenditure per person.<sup>11</sup> Using this measure of living standards, we have estimated a new and consistent series of poverty measures for the period 1951 to 2012, based on consumption distributions from fifty-one surveys conducted by the National Sample Survey Organization (NSSO). Given concerns about the reliability of the earliest rounds, for the main analysis we restrict ourselves to the period 1957–2012 (Rounds 11–68), giving forty-one observations including eighteen for the post-1991 period; the online supplementary appendix provides more detail.

While the NSS consumption surveys are highly comparable over time by international standards, there is one comparability issue in the rounds since the late 1990s. All survey rounds prior to the NSS 55th round for 1999–2000 used a uniform reference period of thirty days for all consumption items, but nine of the subsequent survey rounds have used a mixed-reference period (MRP), with longer (one year) reference for some (mainly non-food) items. All our regressions below thus include a control for MRP survey rounds.

### Poverty Lines and Price Indices

We use two poverty lines. One line is that originally defined by the Planning Commission (1979) and endorsed by

<sup>9</sup> For an overview of India's reform agenda since the early 1990s, see Ahluwalia (2002) and Kotwal, Ramaswami and Wadhwa (2011).

<sup>10</sup> Evidence of rising inequality in India since 1991 is reported in Ravallion (2000), Deaton and Drèze (2002), Sen and Himanshu (2004a, 2004b), Datt and Ravallion (2011), and Chancel and Piketty (2017).

<sup>11</sup> Consumption is probably a better indicator of living standards than current income in this context. For an overview of these arguments see Ravallion (2016, chap. 3).

**Planning Commission (1993)**. This line is anchored on a nutritional norm of 2400 calories per person per day in rural areas and 2100 calories for urban areas and corresponds to a per capita monthly expenditure of Rs. 617 and Rs. 922 (rounded to the nearest rupee) in rural and urban areas respectively at 2011–12 prices.<sup>12</sup> The second poverty line corresponds to the rupee value of the World Bank's international poverty line of \$1.25 per person per day at 2005 PPP dollars (**Ravallion, Chen, and Sangraula 2009**) and are equivalent to rural and urban per capita monthly expenditures of Rs. 732 and Rs. 1115 at 2011–12 prices. The second set of lines is thus about 20% higher than the first set of lines.

The nominal poverty lines for different NSS rounds use separate urban and rural price indices. We use the all-India Consumer Price Index for Industrial Workers (CPIIW) for the urban sector, and the all-India Consumer Price Index for Agricultural Laborers (CPIAL) for rural. Our final price indices also incorporate several adjustments aimed at constructing a consistent time series over the long period of analysis; these adjustments are described in the [online supplementary appendix](#).

### Poverty Measures

We use the headcount index as our primary measure of poverty, given by the percentage of the population living in households with a consumption per capita less than the poverty line. We provide this measure for both our upper and lower lines. The [online supplementary appendix \(tables A2–A10\)](#) also gives results for the upper line using the poverty gap index and the squared poverty gap index (**Foster, Greer, and Thorbecke 1984**), which better reflect distribution below the poverty line. Our qualitative results are generally robust to this choice (and we note any exceptions).

The level of poverty at date  $t$  can be additively decomposed using population weights. We will be interested in the urban-rural decomposition of the aggregate measure for date  $t$ :

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

where  $n_{it}$  and  $P_{it}$  are the population shares and poverty measures for sectors  $i = u, r$  for urban and rural areas, respectively. “Time” ( $t$ ) represents the ordering of the  $T$  survey rounds in time, which can differ from real time given the uneven spacing.<sup>13</sup>

### National Accounts

We use private final consumption expenditure and net domestic product and its sectoral components from the National Accounts Statistics (NAS). To mesh the NAS data with the poverty data from the NSSO, we have linearly interpolated the annual national accounts data to the mid-point of the survey period for different rounds.

There has been a rising gap between NAS and NSS consumption aggregates.<sup>14</sup> The NSS series does not fully reflect the large gains in mean consumption indicated by the NAS, especially from the early 1990s onward. The ratio of NSS-to-NAS consumption declined from about 70% in 1957 to 60% in 1991 and then steeply to 39% in 2011–12. We do not know how much of the gap is due to errors in NAS consumption versus NSS survey methods. However, it is notable that the MRP rounds of the NSS have helped close the gap between the NAS and NSS consumption aggregates. (The [online supplementary appendix](#) provides more detail.)

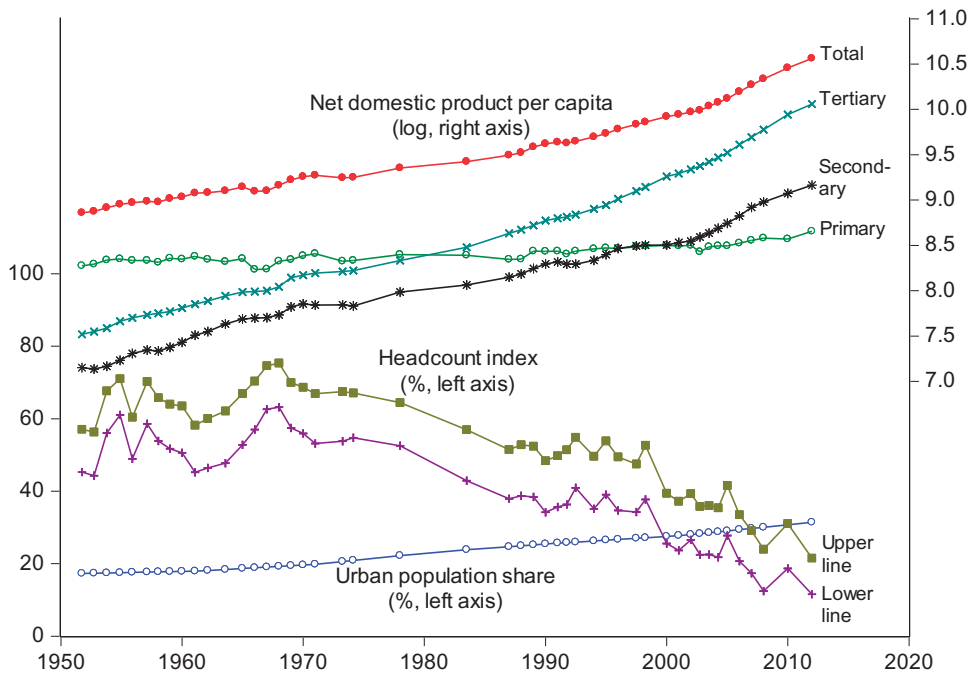
However, it is also important to note that the gap between the consumption aggregates from these two sources does not necessarily imply that the NSS overestimates poverty. Some of the gap is due to errors in NAS consumption, which is determined residually in India, after subtracting other components of domestic absorption from output at the commodity level. There are also differences in the definition of consumption, and there are things included in NAS consumption that one would not use in measuring household living standards.<sup>15</sup> Some degree of under-reporting, or selective compliance with the NSS's randomized selections, is inevitable. However, it

<sup>13</sup> Controlling for unequal time interval between survey rounds made little difference.

<sup>14</sup> The gap is not only found in India, but it is larger there than most other countries (**Ravallion 2003**).

<sup>15</sup> For further discussion of the differences between the two data sources, see **Sundaram and Tendulkar (2001)**, **Ravallion (2000, 2003)**, **Sen (2005)**, and **Deaton (2005)**.

<sup>12</sup> The original Planning Commission lines correspond to rural and urban per capita monthly expenditures of Rs. 49 and Rs. 57 at 1973–74 prices. At 2005 PPP, these lines have a value of \$1.03 per day in 2005.



**Figure 1. Net domestic product by sector and poverty rate**

Source and notes: Authors' calculations. Locally weighted smoothed scatter plots.

is expected that this is more of a problem for estimating the levels of living of the rich than of the poor.<sup>16</sup> We will look into the implications of the growing drift between NAS and NSS consumption in regressions that use (sectoral) growth variables from the NAS.

### Summary Statistics

A faster rate of economic growth since the early 1990s is evident from [figure 1](#). Much of the faster growth post-1991 has occurred in the “tertiary” sector of India’s economy, which is primarily services and trade. The growth rate of tertiary sector NDP per capita doubled from 3.1% per annum up to 1991 to 6.4% in the period thereafter.<sup>17</sup> The secondary sector also picked up, from 2.9% per annum to 4.5%.<sup>18</sup> So too did the primary sector,

but at a much lower level; the pre-1991 growth rate in primary NDP per capita was only 0.2% per annum, while it rose to 0.8% in the post-1991 period.<sup>19</sup> As one would expect, the share of the primary sector in NDP has fallen sharply from 55% in the early 1950s to 15% in 2012.

Faster NDP growth is also reflected in a significant acceleration in survey-based real consumption growth—from 0.6% per annum in the pre-1991 period to 2.0% in the post-1991 period ([table 1](#)). The urban and rural trends reveal a similar pattern; the NSS mean consumption growth rates are three times higher post-1991 in both rural and urban areas.

Higher growth rates post-1991 have come with rising inequality within urban and rural areas. [Figure 2](#) plots the indexes over time. Note that these are the “raw” values, without adjustment for the effect of MRP rounds.<sup>20</sup> In contrast to the pre-1991 period, significant positive trends in inequality emerged post-1991. The rise in inequality has been greater

<sup>16</sup> There is evidence from other sources consistent with that expectation; see [Banerjee and Piketty \(2005\)](#) on income under-reporting by India’s rich. [Chancel and Piketty \(2017\)](#) work with the benchmark scenario that surveys are a reliable source of information up to the 90th percentile of the distribution.

<sup>17</sup> These are OLS regression coefficients on time with log dependent variable; the standard errors are 0.04% and 0.2%, respectively.

<sup>18</sup> The standard errors are 0.1% and 0.3%, respectively.

<sup>19</sup> The standard errors are 0.05% and 0.2%, respectively.

<sup>20</sup> The [online supplementary appendix](#) gives the exponential trends for the Gini index adding controls for MRP rounds.

**Table 1. Exponential Trend Growth Rates in Poverty Measures and Means, 1957–2012**

	Whole Period: 1957/ 58–2011/12	Pre-1991	Post-1991	H <sub>0</sub> : Pre-91 Trend = Post-91 Trend F(1, 37) prob > F
<b>Poverty measures:</b>				
Lower line: national	–0.019 (–4.49)	–0.009 (–3.57)	–0.049 (–6.74)	21.17 0.000
Upper line: national	–0.013 (–4.28)	–0.006 (–3.31)	–0.036 (–6.55)	20.80 0.000
Lower line: rural	–0.019 (–4.01)	–0.008 (–2.81)	–0.053 (–6.43)	21.08 0.000
Upper line: rural	–0.013 (–3.80)	–0.005 (–2.53)	–0.038 (–6.06)	19.42 0.000
Lower line: urban	–0.018 (–6.30)	–0.012 (–6.62)	–0.038 (–7.41)	19.66 0.000
Upper line: urban	–0.014 (–6.08)	–0.009 (–6.34)	–0.031 (–8.22)	24.97 0.000
<b>Mean consumption/income:</b>				
Mean consumption per capita from NSS: national	0.009 (5.53)	0.006 (3.96)	0.020 (8.84)	18.56 0.000
Mean consumption per capita from NSS: rural	0.008 (4.79)	0.005 (3.08)	0.019 (7.67)	15.26 0.000
Mean consumption per capita from NSS: urban	0.010 (7.06)	0.007 (6.29)	0.021 (10.92)	26.9 0.000
Mean private cons. per capita from NAS	0.019 (12.07)	0.011 (15.45)	0.038 (13.94)	66.78 0.000
Mean net domestic product per capita	0.025 (17.28)	0.018 (27.45)	0.043 (18.27)	81.68 0.000

Note: Number of observations = 41. Growth trends based on regressions of log poverty measures log mean consumption/income on time to estimate exponential trends. Robust (heteroscedasticity and autocorrelation consistent) *t*-statistics in parentheses. Poverty measures are in percentages, mean consumption from NSS surveys is at constant rural 2011–12 prices (corresponding to the survey period for NSS 68th Round), mean private consumption and net domestic product per capita are from national accounts and also at constant 2011–12 prices. Regressions for poverty measures and mean NSS consumption also control for mixed reference period rounds of the NSS. Growth rates for pre- and post-1991 subperiods were estimated as parameters of a single regression, constrained to assure that the predicted values were equal in 1992.

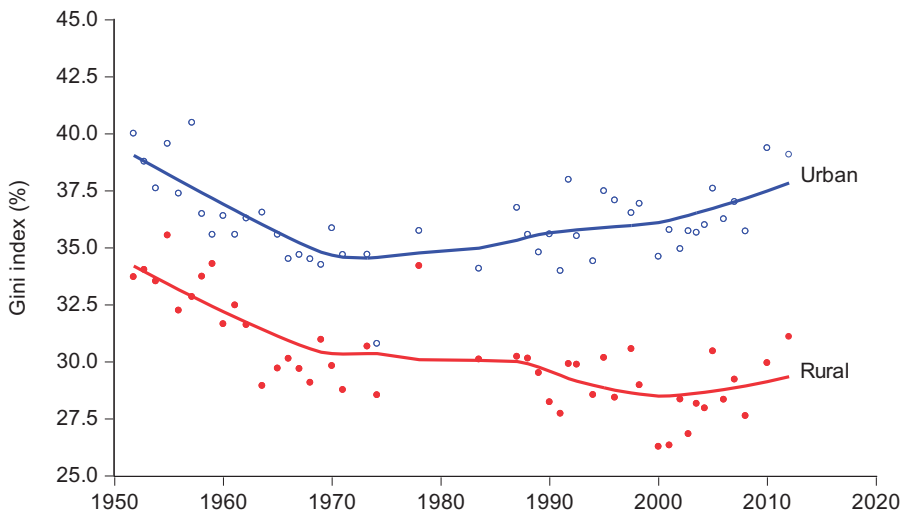
in urban areas. Intersectoral inequality has been generally rising too. We see from [figure 3](#) that the ratio of the urban mean consumption to the rural mean has been rising since 1970 (the early observations were volatile, and should probably be discounted), although with signs of levelling off and even decline since 2000. Controlling for MRP rounds, time trends in the ratio of real urban-to-rural mean consumption are similar pre- and post-91, with the ratio increasing at about 0.14% per annum in both periods. So the higher growth in the post-1991 period has come with generally rising consumption inequality, especially within sectors but also to some extent between them.

As can also be seen from [figure 1](#), poverty incidence showed no significant trend up to the mid-1970s, but fell after that. Despite the rise in inequality, a higher pace of poverty reduction is evident in the post-1991 period;

[table 1](#) provides the trend rates of growth. Our new series provides statistically robust indication of acceleration in progress against poverty post-1991 for both poverty lines ([table 1](#)). Over the fifty-five year period, the exponential trend decline (for the upper line) was 1.3% per annum.<sup>21</sup> For the period prior to 1991, the trend was 0.6%, while the corresponding post-1991 trend was 3.6%. The differences between the pre- and post-1991 trends are statistically significant ([table 1](#)). We also find a faster pace of poverty decline post-1991 in both rural and urban areas ([table 1](#)).

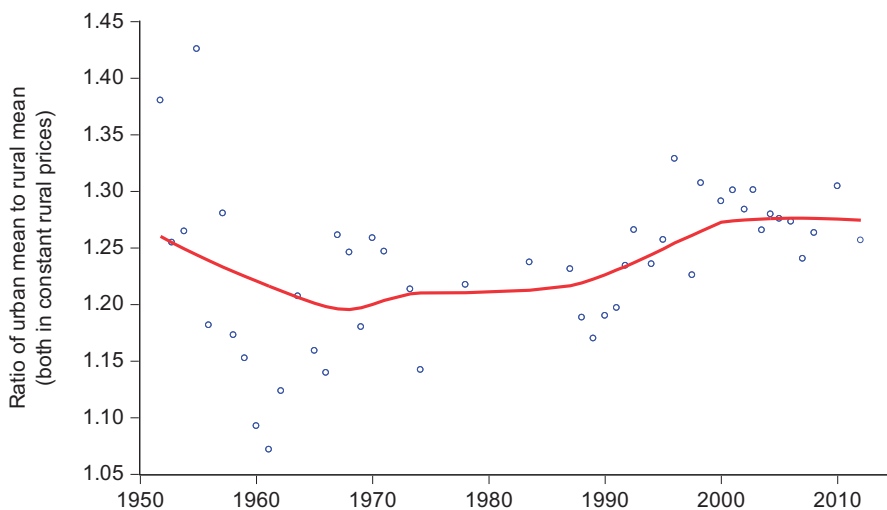
Historically, poverty measures have been higher in rural India. However, we find a

<sup>21</sup> Similarly to the NDP growth rates reported in the introduction, the growth rates were estimated as parameters of a single regression, constrained to assure that the predicted values were equal in 1992.



**Figure 2. Urban and rural inequality indexes**

Source and notes: Authors' calculations. Locally weighted smoothed scatter plots.



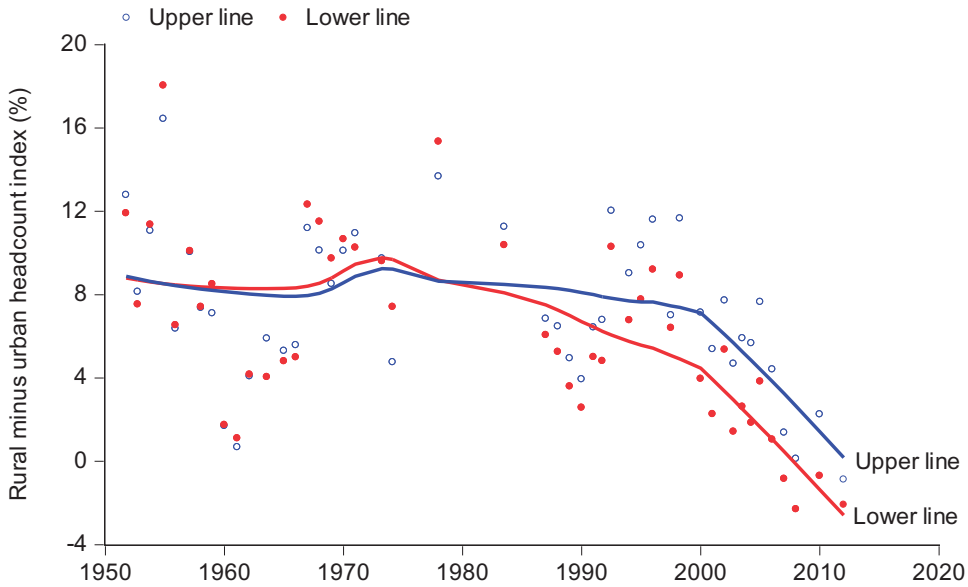
**Figure 3. Ratio of urban mean to rural mean consumption**

Source and notes: Authors' calculations. Locally-weighted smoothed scatter plots.

marked convergence of poverty measures between urban and rural areas. Figure 4 plots the difference between the rural and urban headcount indices. Intuitively, since growth rates in mean consumption were slightly higher in urban areas, the poverty convergence between urban and rural areas is a distributional effect, stemming in part from the fact that inequality has risen more within urban areas and in part from the fact that inequality was initially lower in rural areas,

allowing growth to be more poverty reducing in rural areas (Ravallion 2007).

The convergence process started around 1980, but has been noticeably more rapid since 2000. While it is only a conjecture at this stage, the fact that India's welfare programs (such as the Mahatma Gandhi National Rural Employment Guarantee Act [MNREGA] and public food distribution) have focused so much more on rural areas may well be a factor. The pattern we see is



**Figure 4. Convergence between rural and urban poverty measures**

Source and notes: Authors' calculations. Locally-weighted smoothed scatter plots.

also consistent with related evidence on the narrowing urban-rural wage gap (Hnatkovska and Lahiri 2013). Going forward, one implication of this sectoral poverty convergence is that the Kuznets process will contribute little to overall poverty reduction and may even be poverty increasing. The next section will look more deeply into the urban-rural pattern of growth and poverty reduction, including the role played by the Kuznets process.

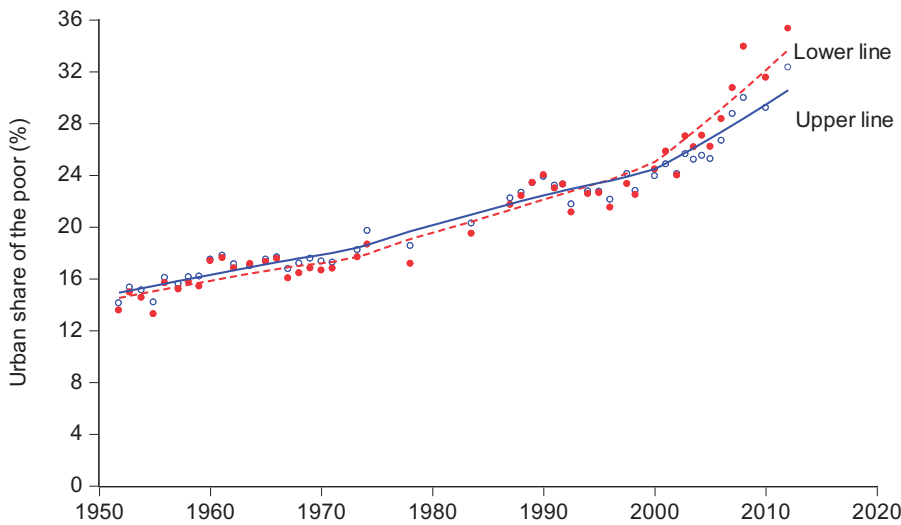
A further implication of these findings is that there has been a marked urbanization of poverty in India. India's urban population share has risen steadily over sixty years (figure 1), at about 1% per annum (0.25 percentage points per annum) over whole period. Even if rural and urban poverty had declined at the same rate, this would contribute to a rising share of urban poverty. The actual share of the urban poor rose faster on account of the trend towards convergence of rural and urban poverty rates. Figure 5 gives the proportion of the poor living in urban areas over time for both poverty lines. In the early 1950s, 14% of the poor lived in urban areas; by 2012 this had risen to 35% for the lower line and 32% for the upper line. This is consistent with the pattern found across other developing countries (Ravallion, Chen, and Sangraula 2007). Likely explanations are that rural migrants tend to be poorer than average

in the destination urban areas (as discussed in Ravallion 2016) and/or relatively poorer rural areas are reclassified as urban over time. Thus, the share of the poor in urban areas can rise (and indeed the urban poverty rate can rise) even though national poverty measures are falling. There is a sign of acceleration in the pace of the urbanization of poverty since 2000.

### Poverty and Economic Growth over 60 Years

Given that the mean and the Lorenz curve fully specify the cumulative distribution function, a poverty measure can be written as a function of the survey mean relative to the poverty line and the relative distribution of income, as represented by the Lorenz curve. When the poverty line is fixed in real terms, the poverty measure is a strictly decreasing function of mean consumption ( $\mu_i$ ) for any given relative distribution (although the elasticity can vary, depending on the initial mean and Lorenz curve). A higher growth rate may also entail a shift in distribution for or against the poor. In characterizing the overall poverty impact of growth, we are interested in the total effect of growth on poverty, allowing distribution to change, rather than the partial effect, holding distribution





**Figure 5: Urbanization of poverty**

Source and notes: Authors' calculations. Locally-weighted smoothed scatter plots.

constant.<sup>22</sup> We call this the “growth elasticity of poverty reduction,” or “growth elasticity” for short. Since these growth elasticities allow for distributional change, there is no theoretical presumption even about the sign of these elasticities, let alone whether they increase or decrease with faster growth.

We estimate these elasticities at the national level by the regression coefficient of  $\ln P_t$  on  $\ln \mu_t$  across the time series, allowing the error term to be autocorrelated and heteroskedastic. We view these regressions as descriptive, and we caution against a strict causal interpretation. There may well be latent factors affecting the pace of progress against poverty that are correlated with the growth in mean consumption. That also holds for the sectoral growth rates; for example, decreasing poverty measures may help stimulate services sector growth. The paper is in the spirit of locating proximate sources of changes in poverty within a decomposition framework and in the context of a changing poverty-growth relationship.

However, there is one source of bias that cannot be ignored in estimating the growth elasticity even when it is a purely descriptive parameter. Whenever both the dependent and independent variable of such a regression

are estimated from the same survey data the possibility arises of bias due to the fact that measurement errors in the survey can be passed onto both variables. When overestimating the mean, for instance, one will tend to underestimate poverty. The sign of the bias is theoretically ambiguous since measurement error in the independent variable will also induce an attenuation bias in the least squares estimate of the elasticity.

Recognizing this concern, we also provide an instrumental variables (IV) estimator, in which the IVs exclude any variables derived from the same survey as the dependent variable. The [online supplementary appendix \(table A11\)](#) provides standard tests of the first-stage of each IV estimator; the tests pass comfortably. Note that the IVs include (current and lagged) private consumption from the NAS. The key assumption here is that measurement errors in the NAS estimates of private consumption are not correlated with those in the NSS data. Since consumption in India's NAS is estimated residually (at the commodity level) rather than calculated using the NSS, this assumption is defensible. We also control for the use of mixed reference periods.

Table 2 gives our estimates of the elasticities with respect to three measures of growth: (i) consumption per person from the NSS; (ii) consumption per person from the NAS and population census; and (iii) NDP (“income” for short) per person, also from

<sup>22</sup> The partial elasticities are automatically negative; analytic formulae for the partial elasticities are found in [Kakwani \(1993\)](#). On the distinction between the partial and total elasticities in this context, see [Ravallion \(2007\)](#).

the NAS and census. We also give an “adjusted” estimate in which a control variable was added for the first difference of the log of the ratio of the consumer price index to the national income deflator (i.e., the difference in the rate of inflation implied by the two deflators). This was included to allow for possible bias in estimating the growth elasticity due to the difference in the deflator used for the national accounts data and that used for the poverty lines.

For the period as a whole, the national poverty measures responded significantly to growth in all three measures. The IV estimates are slightly lower than for OLS. The (absolute) growth elasticities are higher if one uses the NSS mean consumption, rather than the NAS estimate. The elasticities are lowest for per capita income. There are a few possible reasons. Intertemporal consumption smoothing may make poverty (in terms of consumption) less 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 playing a role in attenuating the elasticities using NAS growth rates. But an important reason for lower (absolute) elasticities with respect to NAS consumption or income has to do with the increasing divergence between NSS and NAS growth rates of mean consumption. Significantly faster growth in NAS means relative to NSS means is reflected in the lower elasticities with respect to the former.

When we split the period into two at 1991, we find appreciably higher (absolute) elasticities of poverty indices with respect to the survey mean in the post-1991 period; the difference in the estimated elasticities over the two periods is statistically significant.<sup>23</sup> The pattern of higher post-1991 elasticities is similar for all poverty measures, for upper and lower poverty lines and for the OLS as well as the IV estimates (table 2).

By comparison, we find that NAS-based growth of both income and consumption per capita indicate significantly higher (absolute) elasticities of poverty in the post-1991

period.<sup>24</sup> It is nevertheless notable how much difference there is in the elasticity based on the NSS consumption growth rates versus the NAS growth rates for the post-1991 period. The survey-based elasticities are about twice as high (in absolute terms) as the national accounts based elasticities. The much lower NAS elasticities reflect the increasing NAS-NSS drift post-91.

### Poverty and the Urban-Rural Pattern of Growth

Our proposed test for whether the sectoral composition of growth matters entails estimating the following regression equation:

$$(2) \Delta \ln P_t = \pi_u s_{ut-1}^{\mu} \Delta \ln \mu_{ut} + \pi_r s_{rt-1}^{\mu} \Delta \ln \mu_{rt} \\ + \pi_n (s_{nt-1}^{\mu} - s_{ut-1}^{\mu} n_{rt-1} / n_{ut-1}) \Delta \ln n_{rt} \\ + \varepsilon_t \text{ for } t = 2, \dots, T.$$

Here  $\Delta$  is the discrete-time difference operator (such that  $\Delta x_t \equiv x_t - x_{t-1}$ ),  $s_{it}^{\mu} = n_{it} \mu_{it} / \mu_t$  is sector  $i$ 's share of mean consumption at survey round  $t$ , and  $\mu_{it}$  is the mean consumption for sector  $i$ . The  $\pi$ 's are parameters to be estimated. To motivate this test regression, notice that, under the null hypothesis that  $\pi_u + \pi_r + \pi_n = \pi$ , equation (2) collapses to:

$$(3) \Delta \ln P_t = \pi \Delta \ln \mu_t + \varepsilon_t$$

Thus, under this null, it is the overall rate of growth that matters, not its composition. By testing that null hypothesis we determine whether the composition of growth matters. If this null is rejected, then the pattern of growth matters and the  $\pi_u$ ,  $\pi_r$  parameters can be interpreted as the impact of (share-weighted) growth in the urban and rural sectors, respectively, while  $\pi_n$  gives the effect of the population shift from rural to urban areas.

We also test whether economic growth in one sector has cross-effects on distribution in the other sectors. Here we can further decompose the rate of growth in average poverty (equation 2) into three components:

<sup>23</sup> These results are based on regressions of log poverty measures on log survey mean interacted with dummy variables for pre- and post-1991 periods, and a dummy variable for MRP 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.

<sup>24</sup> The difference between the two periods is not statistically significant for the squared poverty gap index, and for the poverty gap index it is significant only for the per capita income growth elasticity (online supplementary appendix table A4).

**Table 2. Elasticities of National Poverty Measures to Economic Growth in India, 1957–2012**

Elasticity of Poverty Measure with Respect to:	Mean Consumption Per Capita (NSS)				Mean Private Consumption Per Capita (NAS)				Mean NDP Per Capita (NAS)			
	OLS		IV		Unadjusted		Adjusted		Unadjusted		Adjusted	
	Elasticity	t-stat	Elasticity	t-stat	Elasticity	t-stat	Elasticity	t-stat	Elasticity	t-stat	Elasticity	t-stat
<b>Lower line</b>												
Whole period	-2.00	-11.5	-1.86	-21.2	-1.09	-11.9	-1.00	-9.3	-0.82	-7.7	-0.75	-6.4
Pre-1991	-1.56	-16.9	-1.55	-27.7	-1.09	-6.9	-1.04	-20.9	-0.67	-5.2	-0.68	-18.7
Post-1991	-2.69	-28.5	-2.66	-41.5	-1.38	-13.2	-1.37	-11.0	-1.24	-10.9	-1.22	-8.4
H <sub>0</sub> : pre-91 = post-91 elasticity												
prob > F(1, 35) or F(1, 34)	0.00	0.00	0.00	0.00	0.13	0.13	0.02	0.02	0.00	0.00	0.00	0.00
<b>Upper line</b>												
Whole period	-1.45	-10.8	-1.32	-19.3	-0.79	-10.8	-0.73	-8.4	-0.59	-7.2	-0.54	-5.9
Pre-1991	-1.13	-18.2	-1.11	-31.4	-0.77	-6.4	-0.73	-15.2	-0.47	-4.8	-0.48	-13.8
Post-1991	-1.99	-34.2	-1.98	-37.8	-1.02	-13.0	-1.01	-10.7	-0.92	-10.6	-0.90	-8.2
H <sub>0</sub> : pre-91 = post-91 elasticity												
prob > F(1, 35) or F(1, 34)	0.00	0.00	0.00	0.00	0.08	0.08	0.01	0.01	0.00	0.00	0.00	0.00

Note: Based on regressions of log poverty measures against log consumption or net product per person using 40 surveys spanning 1957/58-2011/12 (except 48th round for the crisis year 1992). All regressions include a control (dummy variable) for surveys that used a mixed-reference period. IVs for the survey mean regressions include lagged survey means (split urban and rural), interval between mid-points of survey periods, time trend, and current and lagged variables for: mean consumption from the national accounts, rural and urban CPIs, and rural population shares. The first-stage statistics are reported in the online supplementary appendix table A11. The “adjusted” estimates control for the difference in the rates of inflation implied by the CPI and the NDP deflator. T-statistics are based on heteroscedasticity and autocorrelation-consistent standard errors.

$$(4.1) \quad s_{ut-1}^P \Delta \ln P_{ut} = \pi_{uu} s_{ut-1}^\mu \Delta \ln \mu_{ut} \\ + \pi_{ur} s_{rt-1}^\mu \Delta \ln \mu_{rt} \\ + \pi_{un} (s_{rt-1}^\mu - s_{ut-1}^\mu n_{rt-1} / n_{ut-1}) \Delta \ln n_{rt} + \epsilon_{ut}$$

$$(4.2) \quad s_{rt-1}^P \Delta \ln P_{rt} = \pi_{ru} s_{ut-1}^\mu \Delta \ln \mu_{ut} \\ + \pi_{rr} s_{rt-1}^\mu \Delta \ln \mu_{rt} \\ + \pi_{rn} (s_{rt-1}^\mu - s_{ut-1}^\mu n_{rt-1} / n_{ut-1}) \Delta \ln n_{rt} + \epsilon_{rt}$$

$$(4.3) \quad (s_{rt-1}^P - s_{ut-1}^P n_{rt-1} / n_{ut-1}) \Delta \ln n_{rt} = \\ \pi_{nu} s_{ut-1}^\mu \Delta \ln \mu_{ut} \\ + \pi_{nr} s_{rt-1}^\mu \Delta \ln \mu_{rt} \\ + \pi_{nn} (s_{rt-1}^\mu - s_{ut-1}^\mu n_{rt-1} / n_{ut-1}) \\ \times \Delta \ln n_{rt} + \epsilon_{nt}$$

where  $s_{it}^P = n_{it} P_{it} / P_t$  for  $i = u, r$ , and  $\pi_j = \pi_{uj} + \pi_{rj} + \pi_{nj}$  for  $j = u, r, n$ . So summing equations (4.1), (4.2), and (4.3) yields equation (2). By interpretation, equation (4.1) shows how the composition of growth and population shifts impact on urban poverty; equation (4.2) shows how they impact on rural poverty; and equation (4.3) gives the impact on the population shift component of  $\Delta \log P$ . We estimate equations (4.1) and (4.2); equation (4.3) need not be estimated separately since its parameters can be inferred from the estimates of equations (4.1) and (4.2) using the adding-up restriction. As before, since our main interest is in a comparison of the pre- and post-reform periods, we allow the  $\pi$  parameters to differ across the two periods.

Table 3 presents our estimates of equations (2), (4.1), and (4.2), summarizing the poverty impact of the urban-rural composition of consumption growth. The first point to note from table 3 is that there is a significant structural break at 1991. The pre-91 and post-91 model parameters are significantly different from each other; the null of parameter equality is rejected in almost all cases in table 3. Beginning with results at the national level, for the pre-1991 period we confirm the earlier finding of Ravallion and Datt (1996) that the growth effects on poverty for the pre-1991 period are largely attributable to rural consumption growth, with virtually no contribution from urban growth, while the population urbanization process also contributes to

poverty reduction. Note, however, that the rate of population growth is virtually indistinguishable from a time trend (online supplementary appendix table A13 provides an alternative version of table 3 in which a time trend is used instead, and the results are very similar). So the (pre-1991) downward trend at given growth rates is likely to be picking up a pro-poor distributional effect.

With the post-reform structural break, this pattern has changed substantially. In the post-1991 period, while rural growth remains significant for poverty reduction, unlike the pre-1991 period, it is no longer the prime driver. The most notable change is that urban growth now has a significant impact on poverty. Thus, with additional recent data and also for an upper poverty line, we are able to confirm the emergence of a significant effect of urban consumption growth on national poverty as a striking feature of the post-1991 pattern of economic growth in India.

Also notable is the change in the sign of the population shift effect from being poverty-reducing pre-91 to becoming poverty-increasing post-91. (Again, this is indistinguishable from a time trend.) As this effect is estimated conditional on urban and rural mean consumption growth, it can be interpreted as picking up intrasectoral distributional effects correlated with the shift of population from rural to urban areas. The changing sign of this effect post-91 is indicative of the adverse distributional changes that have accompanied faster post-reform growth.

The last four columns of table 3 help unpack these shifting national patterns by urban and rural areas. Qualitatively, there is not much change between the pre- and post-91 periods in how urban and rural growth affected urban poverty, which was highly responsive to urban consumption growth, and generally unresponsive to rural growth.<sup>25</sup> The main change is quantitative: the effects of urban growth on urban poverty are much larger post-91.

By comparison, there are important changes for rural poverty in both qualitative and quantitative terms. The most notable change is that while in the pre-91 period urban growth had no discernible impact on rural poverty, a significant and large impact emerged post-91. Indeed, urban growth has a

<sup>25</sup> The poverty gap and squared poverty gap indices are exceptions in the pre-91 period (online supplementary appendix table A5).

**Table 3. Impacts on Poverty of the Urban-Rural Composition of Growth, 1957–2012**

		Change in Log Poverty Measure					
		National		Urban		Rural	
		Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat
<b>Lower line</b>							
Pre-91	Urban growth	0.200	0.30	−0.612	−4.73	0.566	1.00
Pre-91	Rural growth	−1.277	−11.1	−0.042	−1.39	−1.224	12.2
Pre-91	Pop. urbanization	−0.233	−2.76	−0.025	−2.02	−0.164	−1.98
Post-91	Urban growth	−6.399	−4.26	−1.839	−6.49	−4.618	−3.62
Post-91	Rural growth	−1.957	−3.59	−0.224	−1.38	−1.617	−3.49
Post-91	Pop. urbanization	0.259	1.30	0.087	1.29	0.175	1.09
R <sup>2</sup>			0.870		0.811		0.860
Pre91=Post91	prob.> <i>F</i> (2, 33)		0.000		0.002		0.000
Pre91=Post91	prob.> <i>F</i> (3, 33)		0.000		0.003		0.000
<b>Upper line</b>							
Pre-91	Urban growth	−0.023	−0.04	−0.624	−7.54	0.694	1.39
Pre-91	Rural growth	−0.940	−12.2	−0.014	−0.65	−0.921	−15.4
Pre-91	Pop. urbanization	−0.146	−3.47	−0.015	−1.84	−0.121	−3.32
Post-91	Urban growth	−3.590	−4.37	−1.244	−9.01	−2.423	−3.24
Post-91	Rural growth	−2.076	−7.41	−0.165	−1.68	−1.918	−7.37
Post-91	Pop. urbanization	0.195	2.47	−0.039	1.04	0.173	2.66
R <sup>2</sup>			0.905		0.850		0.900
Pre91=Post91	prob.> <i>F</i> (2, 33)		0.000		0.006		0.000
Pre91=Post91	prob.> <i>F</i> (3, 33)		0.000		0.005		0.000

Note: Number of observations = 40. Autocorrelation and heteroscedasticity consistent IV-GMM estimates of models, which also include a control for MRP survey rounds. IVs for urban and rural growth include lagged survey means (split urban and rural), interval between mid-points of survey periods, time trend, and current and lagged variables for: mean consumption from the national accounts, rural and urban CPIs, and rural population shares. The first-stage statistics are reported in the online [supplementary appendix](#) table A11. *F*(2, 33) tests for pre-91 urban and rural growth parameters being the same as those for post-91. *F*(3, 33) in addition also tests for the population urbanization parameter to be the same pre- and post-91. Log points (100Aln<sub>*t*</sub>) for the population urbanization term.

larger impact on rural poverty than urban poverty, suggestive of strong interlinkage effects between the two sectors post-91, such as through labor absorption. Rural growth has continued to be important for rural poverty reduction.

Taken together, these results suggest that the post-reform importance of urban growth for national poverty reduction is driven by urban poverty becoming more responsive to urban growth and even more importantly by the emergent and quantitatively substantial response of rural poverty to urban growth.

However, we warn against attributing these structural changes in the relationship between growth and poverty reduction to the reform process that started in 1991. As already noted, there had been steps toward reform ten years earlier. When we redo [table 3](#) using 1980 as the break year we find a similar pattern. (Full details are found in the [online supplementary appendix](#) tables A12, A14, and A15.) There is clear evidence that a break did occur, but its precise date is uncertain.

We can reject the null hypothesis that the rural-urban composition of growth does not matter for poverty reduction in virtually every case. [Table 4](#) gives the test statistics on whether the urban-rural composition of growth matters and whether the urban and rural growth effects are different. With the exception of rural poverty reduction post-91, in all other cases, the test statistics point to a significant role of the composition of growth.

Note that the estimates in [table 3](#) relate to the poverty effects of share-weighted urban and rural growth. In the estimation framework of [equations \(2\), \(4.1\), and \(4.2\)](#), the elasticities of poverty with respect to urban and rural growth are not constant but depend on the shares of urban and rural sectors in national consumption and national poverty. [Table 5](#) reports elasticities of poverty with respect to rural and urban growth. These results are presented for national poverty measures as well as separately for urban and rural areas, and for the two poverty lines.

There is a reversal in the relative magnitudes of urban and rural growth elasticities

**Table 4. Test Statistics on the Significance of the Pattern of Growth**

		National	Urban	Rural
<b>Lower line</b>				
<b>Pre-1991</b>				
H <sub>0</sub> : urban growth effect = rural growth effect	prob.> $F(1, 33)$	0.051	0.001	0.005
H <sub>0</sub> : pattern of growth does not matter	prob.> $F(2, 33)$	0.026	0.000	0.011
<b>Post-1991</b>				
H <sub>0</sub> : urban growth effect = rural growth effect	prob.> $F(1, 33)$	0.025	0.000	0.077
H <sub>0</sub> : pattern of growth does not matter	prob.> $F(2, 33)$	0.062	0.000	0.155
<b>Upper line</b>				
<b>Pre-1991</b>				
H <sub>0</sub> : urban growth effect = rural growth effect	prob.> $F(1, 33)$	0.133	0.000	0.004
H <sub>0</sub> : pattern of growth does not matter	prob.> $F(2, 33)$	0.010	0.000	0.002
<b>Post-1991</b>				
H <sub>0</sub> : urban growth effect = rural growth effect	prob.> $F(1, 33)$	0.152	0.000	0.606
H <sub>0</sub> : pattern of growth does not matter	prob.> $F(2, 33)$	0.032	0.000	0.019

**Table 5. Elasticities of Poverty with Respect to Urban and Rural Growth, 1957–2012**

		National		Urban		Rural	
		Elasticity	<i>t</i> -stat	Elasticity	<i>t</i> -stat	Elasticity	<i>t</i> -stat
<b>Lower line</b>							
Pre-91	Urban growth	0.05	0.30	-0.79	-4.73	0.16	1.00
Pre-91	Rural growth	-0.98	-11.10	-0.18	-1.39	-1.14	-12.15
Post-91	Urban growth	-2.13	-4.26	-2.37	-6.49	-2.07	-3.62
Post-91	Rural growth	-1.31	-3.59	-0.58	-1.38	-1.45	-3.49
<b>Upper line</b>							
Pre-91	Urban growth	-0.01	-0.04	-0.79	-7.54	0.20	1.39
Pre-91	Rural growth	-0.72	-12.2	-0.06	-0.65	-0.87	-15.37
Post-91	Urban growth	-1.19	-4.37	-1.65	-9.01	-1.08	-3.24
Post-91	Rural growth	-1.39	-7.41	-0.44	-1.68	-1.71	-7.37

Note: Elasticities are evaluated at means for the pre- and post-1991 periods using the parameter estimates reported in table 3.

between the two periods. From being lower in absolute terms than elasticities for rural growth in the pre-91 period, the urban growth elasticities are higher post-91, despite the still smaller share of the urban sector in national consumption and national poverty. Indeed, with the exception of the headcount index at the upper poverty line, the elasticities of rural poverty measures with respect to urban growth are even higher than those with respect to rural growth.

### A Unified Decomposition

It is of interest to probe further into the relative contributions of different components of

growth and population urbanization to observed poverty reduction over the pre- and post-reform periods. To assess this, we now combine analytic and regression-based decomposition methods.

In the development literature, the Kuznets effect refers to the impact on overall inequality of population urbanization holding the levels distribution constant within both the urban and rural sectors.<sup>26</sup> Thus, the

<sup>26</sup> This is in keeping with the argument of Kuznets (1955) and subsequent formalizations by Robinson (1976), Fields (1980), and Anand and Kanbur (1983, 1993).

population-urbanization effect in equations (2) and (4.1) combines the “Kuznets effect” of urbanization processes with within-sector distributional changes that are correlated with urbanization. We now separate the two—to see how much the pure Kuznets effect has contributed to poverty reduction in India, and its importance relative to intrasectoral distributional changes as well as intrasectoral growth. This requires a unified decomposition, combining the analytic and regression-based decompositions as developed below.

Returning to equation (1) and taking the differential, the analytic (exact) decomposition of the change in the poverty measure can be written as:

$$(5) \quad \Delta \ln P_t = s_{rt-1}^P \Delta \ln P_{rt} + s_{ut-1}^P \Delta \ln P_{ut} + s_{rt-1}^P \Delta \ln n_{rt} + s_{ut-1}^P \Delta \ln n_{ut} + s_{rt-1}^P \Delta \ln P_{rt} \Delta \ln n_{rt} + s_{ut-1}^P \Delta \ln P_{ut} \Delta \ln n_{ut}$$

Here the first two terms refer to the contribution of within-sector poverty change, the third and the fourth to the contribution of intrasectoral distributional change (correlated with population shift), and the last two to the contribution of the interaction between sectoral poverty change and population shift. Note that the first two terms are already estimated in regressions (4.1) and (4.2), which can be embedded in equation (5).

Next, consistent with the idea of the Kuznets effect, we hold distributions (and hence poverty measures) constant within both urban and rural areas while allowing for urbanization. This gives the Kuznets effect:

$$(6) \quad K_t \equiv (\Delta \ln P_t)_{\Delta P_u = \Delta P_r = 0} = s_{rt-1}^P \Delta \ln n_{rt} + s_{ut-1}^P \Delta \ln n_{ut} = (s_{rt-1}^P - s_{ut-1}^P n_{rt-1}/n_{ut-1}) \Delta \ln n_{rt}$$

Thus, the Kuznets effect is the same as the third and fourth terms in equation (5). Of course, the growth and urbanization processes also entail distributional changes within each sector. These effects are reflected in the population shift terms in equations (4.1) and (4.2). Collecting these terms, we can also define the following intrasectoral distributional effect (controlling for the means within each sector) as:

$$(7) \quad D_t \equiv [\pi_{un}(s_{rt-1}^\mu - s_{ut-1}^\mu n_{rt-1}/n_{ut-1}) + \pi_{rn}(s_{rt-1}^\mu - s_{ut-1}^\mu n_{rt-1}/n_{ut-1})] \Delta \ln n_{rt}$$

Equations (4.1) and (4.2) allow us to specify the effects of growth in mean consumption in the two sectors as:

$$(8.1) \quad G_t^r \equiv (\pi_{ur} s_{rt-1}^\mu + \pi_{rr} s_{rt-1}^\mu) \Delta \ln \mu_{rt}$$

$$(8.2) \quad G_t^u \equiv (\pi_{uu} s_{ut-1}^\mu + \pi_{ru} s_{ut-1}^\mu) \Delta \ln \mu_{ut}$$

Substituting into equation (5), the expected change in the (log) poverty measure (forming the expectation over the distribution of the error terms in equations (4.1) and (4.2)) is then given by:

$$(9) \quad E(\Delta \ln P_t) = G_t^r + G_t^u + D_t + K_t + I_t$$

where

$$(10) \quad I_t = s_{rt-1}^P \Delta \ln P_{rt} \Delta \ln n_{rt} + s_{ut-1}^P \Delta \ln P_{ut} \Delta \ln n_{ut}$$

is the interaction effect between changes in poverty and changes in population shares.

In summary, the total change in the poverty measure can be decomposed into four terms:

- i.  $G^r$  and  $G^u$  are the effects of rural and urban growth in mean consumption.
- ii.  $D$  is the within-sector distributional effect, controlling for growth in mean consumption within each of the urban and rural sectors.
- iii.  $K$  is the pure Kuznets effect holding within-sector poverty levels constant.
- iv.  $I$  is the interaction effects between sectoral poverty change and population shift.

While the Kuznets effect is poverty-decreasing, when distributions shift within sectors, the overall impact on poverty, controlling for the change in the mean, is theoretically ambiguous. The outcome depends on which segments of the rural distribution become urban, where they end up in the urban distribution, and how the relative distributions within each sector are changing. However, even in simple cases, such as when it is the rural nonpoor who move to urban areas, the inequality impacts are theoretically

ambiguous (Korinek, Mistiaen, and Ravallion 2006).

The four components in equation (9) can be readily computed for the pre- and post-1991 periods from the foregoing analysis. Thus, the annual rate of poverty reduction and its components for the pre- (post-) reform period are obtained by summing up equation (5) over the pre- (post-) reform period and dividing by the length of the pre- (post-) reform period. Components  $K$  and  $I$  are directly computed as the last four terms in equation (5), while  $G^r$ ,  $G^u$  and  $D$  are evaluated from the estimates of regressions (4.1) and (4.2) discussed earlier.

Table 6 presents the results of this unified decomposition. In the pre-1991 period, almost all the reduction in poverty comes from two sources: growth in rural mean consumption (45–46%) and intrasectoral distributional change ( $D$ ) component (48–52%). The Kuznets effect accounts for 3% or less of the overall reduction in the poverty, while urban growth contributes 6% or less (1% or less for the reduction in headcount index). In sharp contrast, during the post-1991 period, urban growth has played a much more important role (accounting for 63–84% of the decline in the national poverty), while rural growth has continued to be important (accounting for 47–70%). Against these effects, there was a poverty-increasing intrasectoral distributional change (increasing the poverty measures by 23–33% of the overall change), while the Kuznets effect was even less quantitatively important.

### Poverty and the Sectoral Structure of Net Domestic Product

Lastly, we explore how the relationship between poverty and the sectoral structure of national output has evolved over time. By decomposing the overall growth rate of net domestic product (NDP) into its components we can investigate how the composition of NDP growth has mattered to poverty reduction. Of course, the national accounts do not have an “urban-rural” breakdown, so this dimension is now latent.

We divide NDP per capita,  $y_t$ , into  $k$  sources as  $y_t = \sum_{i=1}^k y_{it}$ . Taking the differences over time, we can write the growth rate of NDP as the share-weighted sum of the growth rates across the  $k$  sources, that is,  $\Delta \ln y_t = \sum_{i=1}^k s_{it-1} \Delta \ln y_{it}$  where  $s_{it} = y_{it}/y_t$  is the share of NDP due to the  $i$ 'th source.

(This uses the approximation that  $\Delta y_t/y_{t-1} \cong \Delta \ln y_t$ .) Given that the NDP data are annual (unlike the NSS data used in the last section to study the urban-rural pattern of growth), we can now test for a one-year lag in the effect of growth. We allow for sectorally differentiated impact of growth by estimating a regression equation of the following form:

$$(11) \quad \Delta \ln P_t = \sum_{i=1}^3 \pi_{0i} s_{it-1} \Delta \ln y_{it} + \sum_{i=1}^3 \pi_{1i} s_{it-2} \Delta \ln y_{it-1} + \gamma X_t + \epsilon_t$$

Here,  $i = 1, 2, 3$  denotes the primary, secondary and tertiary sector respectively, and  $X$  denotes controls (discussed further below). In the special case in which  $\pi_{0i} = \pi_0$  and  $\pi_{1i} = \pi_1$  for  $i = 1, 2, 3$ , the above equation collapses to a simple regression of the rate of poverty reduction on NDP growth and its lag ( $\Delta \ln y_t$  and  $\Delta \ln y_{t-1}$ ), with the controls. Thus testing the null hypotheses  $H_0: \pi_{ji} = \pi_j$  ( $j = 0, 1$ ) for all  $i$  tells us whether the composition of growth matters. We also allow the  $\pi$  parameters to differ across the pre-91 and post-91 periods, thus allowing us to separately test for growth composition effects for the two periods.

Our estimates of equation (11) are reported in table 7. There was no sign of a significant lagged effect of NDP growth, so we dropped the corresponding lagged terms in equation (11). We give both the unrestricted model in table 7 and the model with data-consistent restrictions imposed. Again we control for changes in whether the survey used a uniform or mixed recall period as well as changes in the ratio of the consumer price index and the NDP deflator.

Similar to the results for urban-rural growth, there is a marked contrast between the two periods. For all three measures we find that the sectoral pattern of NDP growth mattered in the pre-1991 period. Growth in both the primary and tertiary sectors was poverty reducing, but this was not so for the secondary sector. Note that the coefficients on secondary and tertiary are of similar magnitude but opposite in sign. This suggests that it is really the difference in the growth rates between the two sectors that matters. Given that those working in the secondary sector pre-1991 are likely to be relatively well off



**Table 6. Decomposition of Change in National Poverty Measures for the Pre- and Post-Reform Periods**

	Total Change in Poverty	Total Predicted Change in Poverty	Components of Predicted Change in Poverty:					Interaction Between Sectoral Poverty Change and Population Shift
			$G^R$ Rural Growth	$G^U$ Urban Growth	$D$ Intrasector Distributional Change	$K$ Population Shift Holding Intrasector Distributions Constant (Kuznets effect)	$I$	
<b>Lower line</b>								
<b>Pre-91</b>								
Annual percentage change	-1.38	-1.61	-0.72	-0.01	-0.84	-0.05	0.00	
Share of pred. annual change		<b>100.0</b>	<b>44.5</b>	<b>0.5</b>	<b>52.2</b>	<b>2.9</b>	<b>-0.1</b>	
<b>Post-91</b>								
Annual percentage change	-6.47	-6.15	-2.88	-5.16	1.90	-0.02	0.01	
Share of pred. annual change		<b>100.0</b>	<b>46.9</b>	<b>83.9</b>	<b>-30.9</b>	<b>0.4</b>	<b>-0.2</b>	
<b>Upper line</b>								
<b>Pre-91</b>								
Annual percentage change	-0.90	-1.16	-0.53	0.01	-0.60	-0.04	0.00	
Share of pred. annual change		<b>100.0</b>	<b>45.7</b>	<b>-1.0</b>	<b>52.0</b>	<b>3.2</b>	<b>0.1</b>	
<b>Post-91</b>								
Annual percentage change	-4.79	-4.67	-3.26	-2.93	1.55	-0.04	0.01	
Share of pred. annual change		<b>100.0</b>	<b>69.8</b>	<b>62.7</b>	<b>-33.1</b>	<b>0.9</b>	<b>-0.2</b>	

**Table 7. Impacts of the Sectoral Composition of Growth on the Poverty Rate, 1957–2012**

Variable or statistic	Change in Log Headcount Index (Lower Line)				Change in Log Headcount Index (Upper Line)			
	Unrestricted model		Restricted model		Unrestricted model		Restricted model	
	Coeff.	<i>t</i> -ratio	Coeff.	<i>t</i> -ratio	Coeff.	<i>t</i> -ratio	Coeff.	<i>t</i> -ratio
<b>Pre-91 variables:</b>								
Primary sector growth	-1.138	-4.59	-1.143	-4.58	-0.823	-3.41	-0.817	-3.43
Secondary sector growth	4.496	2.71	4.510	2.75	2.941	2.64	2.921	2.66
Tertiary sector growth	-3.582	-3.20	-3.581	-3.28	-2.395	-3.30	-2.396	-3.42
<b>Post-91 variables:</b>								
Primary sector growth	-1.965	-0.22			-2.053	-0.33		
Secondary sector growth	-1.637	-0.32			-0.548	-0.15		
Tertiary sector growth	-1.510	-1.07			-1.360	-1.33		
NDP growth			-1.551	-2.79			-1.199	-2.95
<b>Variables common to both periods:</b>								
Change in log ratio of CPI to NDP deflator	1.224	4.44	1.235	4.22	0.847	4.08	0.831	3.76
Change in binary var. for an MRP estimate	-0.320	-4.73	-0.321	-5.45	-0.219	-4.91	-0.224	-5.56
Number of observations	40		40		40		40	
R <sup>2</sup>	0.656		0.655		0.660		0.658	
Wald test of restrictions: prob > $F(2, 32)$								
Pre-91: $\pi_1 = \pi_2 = \pi_3$	0.002				0.008			
Post-91: $\pi_1 = \pi_2 = \pi_3$	0.999				0.977			

Note: The table gives least squares estimates with heteroscedasticity and autocorrelation-consistent standard errors.

compared to the tertiary sector, the pattern seen in these results can be interpreted as an effect of inequality on poverty reduction, whereby higher secondary sector growth relative to tertiary implies greater inequality and hence higher poverty.

By contrast, we find that the pattern of growth does not matter in the post-1991 period; instead, it is the overall rate of growth that drives poverty reduction. By implication, the most notable change is the significant poverty-reducing effect of secondary sector growth. A plausible explanation is the rapid growth in the labor-intensive construction sector during this period.

As we noted with respect to table 3, we cannot say with confidence that 1991 was the break year. A similar pattern to table 7 is obtained if we move the break date a decade earlier to 1980. (Details are found in the online supplementary appendix.)

#### NAS-NSS Drift

As noted in the second section, there has been a growing drift between the series on consumption derived from NAS and that from the

NSS, with the drift being particularly pronounced since the 1990s. If the drift is reasonably neutral to sector, then our main conclusion will not alter. However, insofar as the drift may reflect “missing” growth in the surveys, then it is likely that this missing component is higher for the fastest growing sectors, in particular, the tertiary sector in the post-91 period. There is thus a concern that, absent any control for the drift, the sector-neutrality result could be biased by the drift being correlated with the tertiary sector growth rate.

To test for this possibility we reestimated equation (11) adding a control for the drift between NAS and NSS mean consumption. Here our reasoning is as follows. Let the true values of the poverty and growth variables be denoted with a \*. Then, the regression specification (suppressing sectoral terms) in terms of the true data is:

$$(12) \quad \Delta \ln P_t^* = \pi_0 \Delta \ln y_{it}^* + \pi_1 \Delta \ln y_{it-1}^* + \epsilon_t$$

The true values are related to the observed values by  $\Delta \ln P_t^* = \Delta \ln P_t + v_t^P$  and

$\Delta \ln y_t^* = \Delta \ln y_t + v_t^P$ . The gap between the NAS and NSS mean consumption is taken to be an indicator of the measurement errors, such that  $v_t^i = \delta^i \Delta \ln(C_t/\mu_t)$  for  $i = P, Y$  where  $\delta^i < 0$ , and  $C$  and  $\mu$  are NAS and NSS mean consumption, respectively. Ignoring the lagged  $(C/\mu)$  term (which turned out to be insignificant when included) the estimated model then takes the form:

$$(13) \quad \Delta \ln P_t = \pi_0 \Delta \ln y_{it} + \pi_1 \Delta \ln y_{it-1} + (\pi_0 \delta^Y - \delta^P) \Delta \ln(C/\mu)_t + \epsilon_t$$

Motivated by this argument, we also estimated an augmented version of equation (11) including a control for  $\Delta \ln(C/\mu)_t$ . We only summarize the results here. The augmented model indicated a slightly higher coefficient on tertiary-sector growth. We also found a stronger lagged effect of NDP growth, as in equation (11). However, it remained the case that we could not reject the null hypothesis that the sectoral composition of growth did not matter in the post-1991 period. Our main finding of the sector-neutrality of the poverty effects of the post-1991 growth process is robust to controlling for the drift between the NSS and NAS series.

Despite this sector-neutrality of the poverty effects of growth rates, the implied sectoral growth elasticities of poverty measures are different as they also depend on sectoral NDP shares. These sectoral growth elasticities evaluated at mean sectoral NDP shares for the two periods are shown in table 8. The growth elasticity for the primary sector has declined in absolute terms in the post-91 period, reflecting in part the rapid decline in the share of primary sector in NDP. The most notable change across the two periods is in the elasticity for secondary sector growth, which switches sign from positive to negative before and after the reform process started. With this change, the growth elasticities for primary and secondary sectors are of similar magnitude in the post-reform period.<sup>27</sup> The tertiary sector has the highest (absolute) elasticity for all three measures and both periods. While the gaps in elasticities for different sectors have narrowed, the tertiary sector's

elasticity in the post-91 period is still about twice as high as those for the primary and secondary sectors. This reflects both the changing nature of the growth process as well as the large structural transformation of the Indian economy over the last two decades with the secondary and tertiary sectors now accounting for much larger shares of national output and employment. By the same token, the post-91 sector-neutrality of marginal poverty impacts need not be an enduring result as the process of structural change in the economy continues.<sup>28</sup>

### Decomposition by Sector

As before, neither the marginal poverty effects in table 7 nor the elasticities in table 8 tell us how much each sector's growth contributed to observed poverty reduction in the two periods. For instance, the contribution of growth in a sector with high (absolute) elasticity to poverty reduction could be low if that sector is experiencing little growth. However, we can run a poverty-growth accounting for the two periods resorting to a decomposition of observed poverty changes by sectoral output growth using our estimates of equation (11). Similar to the rural-urban decomposition, this decomposition is implemented by summing up equation (11) over the two periods and dividing by the respective lengths of the two periods but with one difference. Note that  $y_{it}$  in equation (11) is the sector's output normalized by the national population ( $N_t$ ). We thus do not have an analog of population shifts across sectors in this model. In light of this, it is more meaningful to identify the contribution of aggregate (rather than per capita) output growth in each sector. On noting that  $\Delta \ln y_{it} = \Delta \ln Y_{it} - \Delta \ln N_t$  (where  $Y_{it}$  denotes aggregate output of sector  $i$ ), these aggregate sector output contributions are evaluated using terms such as  $\pi_{0i} s_{it-1} (\Delta \ln y_{it} + \Delta \ln N_t)$ .

The resulting decompositions in table 9 indicate that primary sector output growth contributed 39–44% of the total poverty reduction net of the impact of population growth in the pre-1991 period, while the combined contribution of secondary and tertiary sector growth was 58–63%. By contrast, in

<sup>27</sup> Overall, in the post-91 period, the primary and secondary sectors accounted for roughly similar shares of output—23% and 25% of NDP, respectively. The share of the tertiary sector in NDP rose sharply from 35% in the pre-1991 to 52% in the post-1991 period.

<sup>28</sup> Nor should one presume sector-neutrality were the output sectors to be further disaggregated, something we are unable to investigate with our data set.

**Table 8. Elasticities of Poverty with Respect to Sectoral Components of NDP, 1957–2012**

	Sector's Share of NDP	Lower Line		Upper Line	
		Elasticity	<i>t</i> -stat	Elasticity	<i>t</i> -stat
<b>Pre-91</b>					
Primary sector growth	0.416	<b>-0.48</b>	-4.58	<b>-0.34</b>	-3.43
Secondary sector growth	0.237	<b>1.07</b>	2.75	<b>0.69</b>	2.66
Tertiary sector growth	0.347	<b>-1.24</b>	-3.28	<b>-0.83</b>	-3.42
<b>Post-91</b>					
Primary sector growth	0.228	<b>-0.35</b>	-2.79	<b>-0.27</b>	-2.95
Secondary sector growth	0.253	<b>-0.39</b>	-2.79	<b>-0.30</b>	-2.95
Tertiary sector growth	0.519	<b>-0.80</b>	-2.79	<b>-0.62</b>	-2.95

Note: Elasticities are evaluated at means for the pre- and post-1991 periods using the parameter estimates of the restricted model reported in table 7.

the post-1991 period, the primary sector's contribution declined to about 9%, with the combined contribution of the secondary and tertiary sectors rising to 87%. Tertiary sector growth has been the prime source of post-reform poverty reduction accounting for more than 60% of the total decline in poverty over this period. The changing nature of the growth process and the structural transformation (itself related to the growth process) have dislodged primary sector growth as the main driver of poverty reduction in India.

These findings complement our results on the rural-urban composition of growth in the previous section. Changes in India's labor markets since around 2000 have likely played a key role. There has been a tightening of rural casual labor markets, with rising real wage rates, and also a narrowing of the urban-rural wage gap (Hnatkovska and Lahiri 2013).<sup>29</sup> Three factors appear to be in play here. First, schooling has expanded, thus reducing the supply of unskilled labor, especially in rural areas.<sup>30</sup> Second, there has also been a decline in female labor-force participation rates (Klasen and Pieters 2015). Third, there has been a construction boom across India, especially in (rural and urban) infrastructure. In 1993–94, the construction sector accounted for only 3.2% of employment for rural males, but by 2011–12 this had risen to 13%.<sup>31</sup> The

shift of labor out of agriculture to the non-farm sectors has been more rapid since the 1990s.<sup>32</sup> The shift has been to construction and services and also to manufacturing, to a smaller degree. Jacoby and Dasgupta (2015) suggest that rising labor demand from construction has contributed to higher wages of unskilled labor relative to skilled labor within rural areas, as well as rising rural relative to urban wages (for male workers).

The combination of a lower supply of unskilled labor and rising demand for that labor in construction, transport, and other services is likely to have been a driving force in higher casual wages, in both farm and nonfarm sectors and compressing the urban-rural wage gap. The process has also been helped by the labor market effects of the expansion of the rural employment guarantee program, MNREGA (Imbert and Papp 2015; Berg et al. 2018). It may be conjectured that (like China) India has reached its Lewis Turning Point, at which point the rural labor surplus is fully absorbed and real wages rates start to rise. However, that may be premature as the structural transformation of employment has lagged significantly behind the structural transformation of output, and the agricultural sector continues to be the source of employment for nearly half the working population.

## Conclusions

Several key findings on the long-term evolution of poverty and growth in India emerge

<sup>29</sup> Hnatkovska and Lahiri (2013) also show that the narrowing of the wage gap persists when one controls for education and occupation.

<sup>30</sup> Dercon, Krishnan and Krutikova (2013) point to the role played by human capital accumulation and nonfarm rural development in reducing rural poverty in India, drawing on evidence from village-level surveys spanning 1975–2006.

<sup>31</sup> These are our estimates based on the NSS 50th and 68th employment-unemployment survey rounds. For further discussion of the tightening of rural labor markets in recent times, see Chand and Srivastava (2014).

<sup>32</sup> The share of agriculture, forestry and fishing in total (usual status) employment declined from 76% in 1993–94 to 49% in 2011–12 (Jacoby and Dasgupta, 2015). Also see Chand and Srivastava (2014).

**Table 9. Decomposition of Change in National Poverty Measures for the Pre- and Post-Reform Periods (by NDP Sector)**

	Total Change in Poverty	Total Predicted Change in Poverty	Total Predicted Change in Poverty Without Population Growth	Components of Predicted Change in Poverty:					NA Deflator-CPI Drift	
				Primary Sector NDP Growth	Secondary Sector NDP Growth	Tertiary Sector NDP Growth	Primary Sector NDP Growth	Secondary Sector NDP Growth		Tertiary Sector NDP Growth
<b>Lower line</b>										
<b>Pre-91</b>										
Annual percentage change	-1.38	-1.06	-2.45	-1.08	5.26	-6.69	0.07			
Share of predicted annual change			<b>100.0</b>	<b>44.4</b>	<b>-215.1</b>	<b>273.6</b>	<b>-2.8</b>			
<b>Post-91</b>										
Annual percentage change	-6.47	-7.63	-10.24	-0.94	-2.42	-6.45	-0.37			
Share of predicted annual change			<b>100.0</b>	<b>9.2</b>	<b>23.6</b>	<b>63.0</b>	<b>3.6</b>			
<b>Upper line</b>										
<b>Pre-91</b>										
Annual percentage change	-0.90	-0.78	-1.80	-0.78	3.41	-4.47	0.05			
Share of predicted annual change			<b>100.0</b>	<b>43.1</b>	<b>-189.6</b>	<b>249.0</b>	<b>-2.6</b>			
<b>Post-91</b>										
Annual percentage change	-4.79	-5.87	-7.89	-0.73	-1.87	-4.99	-0.25			
Share of predicted annual change			<b>100.0</b>	<b>9.3</b>	<b>23.7</b>	<b>63.3</b>	<b>3.1</b>			

from our analysis. First, India's long-run progress against absolute poverty is evident when using data spanning nearly six decades from 1957 to 2012. This is found in both urban and rural areas.<sup>33</sup> Rural poverty measures—historically higher than for urban areas—have been converging with urban measures over time.<sup>34</sup> There has been a marked urbanization of poverty, from about one-in-eight of the poor living in urban areas in the early 1950s to one-in-three today.

Second, even though a trend decline in poverty started to emerge around the mid-1970s, the pace of poverty reduction accelerated post-1991, with a five- to sixfold increase in the proportionate rate of decline in the incidence of poverty relative to the preceding thirty-five years. The acceleration in rural poverty decline was even higher than that for urban poverty. This happened alongside the significant increase in inequality both within and between urban and rural areas, in contrast with a decline in rural inequality and no trend in urban inequality pre-91. Despite the increase in inequality, we find post-91 responsiveness of poverty to growth (measured by the growth elasticity of poverty reduction) in the aggregate to be no less than in the preceding period.

Third, there was a significant change in the relationship between poverty reduction and economic growth around the time of the economic reforms. We cannot be certain precisely when this change occurred. The year 1991–92 stands out as a candidate, when a wide range of economic reforms were initiated. However, there had been steps toward reform in the 1980s, and the evidence we find of a structural break is just as strong if we move the break date back ten years. All we can say with confidence is that something quite striking happened in the trajectory of India's poverty measures and their relationship to growth around this time.

Fourth, the most notable elements of the structural break have been the changes in the relationship between poverty and the rural-urban and the economic sector (output) composition of growth. In the post-reform period, urban growth emerged as a major driver of

national poverty reduction. Urban poverty has become significantly more responsive to urban growth, but (even more importantly) urban growth has become significantly more rural poverty reducing. This is in sharp contrast to the prior pattern, when urban growth had little or no impact on rural poverty. In parallel, there was a change in the poverty-reducing effects of growth of output in different sectors of the economy. Unlike the pre-91 period, when only primary and tertiary sector growth contributed to poverty reduction, after 1991 all three sectors have had a significant impact, and we cannot reject the hypothesis of uniform marginal impacts.

Fifth, our decomposition results reflect these changes in the poverty-growth relationship. The pre-91 poverty decline was almost entirely driven by rural growth and favourable distributional changes; the contribution of urban growth was negligible. Post-91, rural growth, although still important, has been displaced by urban growth as the most important contributor to the (more rapid) poverty decline, even though higher growth has come with adverse distributional effects. The contribution of primary sector growth has rapidly dwindled from accounting for about two-fifths of the total poverty decline pre-91 to less than 10% of the total (and larger) poverty decline post-91. The tertiary sector alone has contributed over 60% of the post-91 poverty reduction. The secondary sector growth, aided by India's construction boom since 2000, has contributed about a quarter.

Sixth, the classic Kuznets process—a shift of population from rural to urban areas without changes in rural or urban distributions—played very little role in poverty reduction in either period. This reflects in part the slow rise in the share of India's urban population and the relatively small and shrinking differences in rural and urban poverty rates. But if the urbanization process is interpreted broadly to encompass both faster population and economic growth in urban areas, its contribution to poverty reduction in post-reform India has clearly been important.

Overall, our results reflect both the changing nature of the growth process and the structural transformation of the Indian economy. In relation to the growth process, both urban-rural and sectoral (output) growth-poverty relationships are suggestive of stronger intersectoral linkages in the economy, whereby growth in one sector transmits its

<sup>33</sup> In the online [supplementary appendix](#) we show that it is also higher for the poverty gap and squared poverty gap indexes, reflecting gains to those living well below the poverty line.

<sup>34</sup> The squared poverty gap index for urban India has actually overtaken that for rural India in recent years.

gains elsewhere.<sup>35</sup> At the same time, structural transformation, with the secondary and tertiary sectors now accounting for much larger shares of national output and employment, has amplified the significance of growth in the nonagricultural and urban economy for poverty reduction.

This does not imply that agricultural growth is no longer important for poverty reduction. Until such time that structural transformation of employment catches up with the transformation of output, there will be an important role for the agricultural sector. Our results on the growing contribution of the nonagricultural and urban economy to national poverty reduction indicate that the catch up has started, but faster growth in agricultural productivity can substantially hasten the process.

### Supplementary material

[Supplementary materials](#) are available at *American Journal of Agricultural Economics* online.

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<sup>35</sup> The analysis of inter-state trade and inter-state movement of people presented in the recent Economic Survey 2016–17 also suggests that the Indian economy is internally more integrated than may have been hitherto presumed (Government of India 2017).

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