Prices and poverty in India

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0. Introduction

In India, as in other countries, indexes of consumer prices perform many important functions. Millions of workers have their wages indexed to some measure of the price level. Just as important is the issue that is our main focus here, which is in the estimation of poverty. Indian poverty rates are defined as the fractions of people living in households whose real per capita total expenditure falls below the poverty line. Data on total expenditures are collected by the National Sample Survey (NSS) in money terms so that, for each new round of data, the real poverty line must be converted to current rupees by multiplying by an index of prices. Inaccuracy in the estimation of the index, for example overestimation of the price increase relative to the base, will result in corresponding inaccuracy of the poverty estimates, for example an underestimation in the rate of poverty reduction. At a time when the data show historically high rates of GDP growth without much reduction in poverty, especially rural poverty, it is important to establish the accuracy of the price and poverty calculations.

The measurement of inflation is not the only role of price indexes in measuring poverty in India. Price indexes are required, not only to establish the rates of inflation in the urban and rural sector of each state, but also to compare price *levels* between them. Finally, in a country where many states are larger than most nations in the world, price indexes are needed to make comparisons between states. Differences in poverty rates between Indian states affect the amounts of transfers from the center to the states, and influence discussions about poverty reduction strategies among international lenders such as the World Bank.

For purposes of tracking poverty over time, the two most important price indexes in India are the Consumer Price Index for Industrial Workers (CPIIW) and the Consumer Price Index for

Agricultural Labourers (CPIAL). In a simple average with a third index, the Consumer Price Index for urban non-manual employees, (a version of) the CPIIW is used for updating urban poverty lines, and (a version of) the CPIAL for updating rural poverty lines. Until it was revised in November 1995, the CPIAL was based on prices regularly collected from a sample of 422 villages, weighted using an expenditure pattern that dates back to 1960–61. By the time of the revision in 1995, which was later than any of the survey data used in this paper, the weights for the CPIAL were more than three decades out of date, an unusually long time period for any major price index anywhere in the world. It should also be noted that agricultural laborers, whose expenditure weights were collected in the 1960–61 survey, are only a fraction of the rural population. Even if the weights were not so old, their coverage would give cause doubts about their representativeness.

The CPIIW was revised in October 1988. Prior to that date, the base year was 1960, with weights derived from a survey of workers from 1958–59. Prices were collected from shops in a number of markets in 50 industrial centres throughout India. After October 1988, the weights were updated using a 1981–82 survey, with a new basis in 1982, some old centres were dropped and some new ones added, and the total rose to 70. For both indexes, and in order to maximize comparability over time, the specifications of items priced, the units, the shops, the markets, and the day and the time of the visits were held fixed throughout the life of the series. To the extent that there are problems with these price series, they are likely to come from the unusually long periods between revisions. Not only are the weights of these Laspeyres indexes long out of date by the time of transition, but there must also be concern about the continued representativeness of the villages, centres, and markets over such long periods. Whether or not the price indexes are

seriously affected is a ultimately an empirical question, though it is often supposed (for example in the comparable debate over the CPI in the United States) that Laspeyres indexes will increasingly overstate inflation as the base period recedes into the past, a tendency that will be exacerbated by the failure to pick up new goods (whose prices are often falling rapidly) and discard old (whose prices may be stagnant or even rising.)

The purpose of this paper is to provide an independent set of calculations of Indian price indexes using data for two year-long periods, 1987–88, and 1993–94. We provide estimates of the rate of inflation over the six year period for All India and for 17 of the largest states, by sector, plus Delhi. We also provide separate price indexes for the rural and urban sectors for each of the 17 states and for All India in both periods, as well as estimates of price levels across states by sector in each of the two periods. The sources of data for both prices and expenditure patterns are the 43rd and 50th rounds of the NSS, both of which collected extensive data on consumption of individual items. The use of expenditure surveys to calculate *weights* for consumer price indexes is standard practice throughout the world. The innovation here is the use of information from the surveys on the prices themselves. For most of the commodities in the NSS surveys, respondents are asked to provide information on how much they spent on the item and on the physical quantity purchased, for example 8 rupees on 2 kilos of rice. The ratio of expenditure to volume provides a measure of price, or more precisely, a measure of unit value.

Compared with the use of the CPIAL and CPIIW, this approach has both advantages and disadvantages. One strength is the size of the samples involved and their representativeness across states and sectors. More than 3.5 million pairs of expenditures and quantities are sampled in each of the two rounds, and the NSS samples are designed to be representative at the state and

sector level (and indeed beyond). In consequence, it is possible to construct, not only price indexes that track inflation over time, but also price indexes that compare price levels across states and sectors. A second advantage of unit values is that they relate to actual transactions, not to prices listed or reported by shops. Third, because the transactions are linked to the people who made them, it is possible to stratify prices and price indexes by socioeconomic characteristics, such as level of living, or occupation, or demographic structure.

There are two main disadvantages to the use of unit values. Not all goods and services have readily defined quantities. In particular, while unit values are available for most foods, for alcohol and tobacco, and for fuels, they are not collected for such items as transportation or housing. In India, the covered goods comprise between two-thirds and three-quarters of the budget, which makes the exercise worth doing, but which would obviously not be the case in a country such as the United States. Even so, when using price indexes constructed from unit values, it is always important to keep in mind the likely effects of the excluded categories, and in particular the effects on comparisons between urban and rural sectors of omitting the prices of housing and of transportation.

The second disadvantage is that unit values are not prices. Even when goods are defined at the maximum feasible level of disaggregation, many goods are not perfectly homogeneous, so that any given unit value will reflect, not only price, but the mix of varieties within the category. As a result, unit values differ from one purchaser to another in a way that is not caused by differences in prices. In particular, richer households have higher unit values than poorer households, a fact that has been used to study the choice of *quality* since Prais and Houtkakker (1955), see Deaton (1988, 1997, Chapter 5) for modern treatments. The quality problem can be

dealt with in part by disaggregating to the maximum extent permitted by the data. In the analysis below, we work with more than two hundred items of expenditure. Even so, the literature shows that the total expenditure elasticity of unit values is small, even for fairly broad aggregates of goods—such as "cereals" or "pulses." Beyond that, it is important to inspect the data on unit values and to document their price-like characteristics, for example that in a given round and state that a large number of people report the same unit value, and that the unit values have the appropriate patterns of variation over regions and seasons of the year.

The rest of this paper is organized as follows. In Section 1 below, we explain how the unit values and expenditure weights are calculated from the detailed survey data, and we provide summaries of the results and of the methods used to obtain them. Because there are so many observations, more than 7 million unit values, and because each must be examined before being incorporated into the price indexes, the data processing stage of this work has been both long and complex. Nevertheless, we have tried to provide enough detail to permit replication of our results, and our STATA code is available on request. Section 2 is also methodological, and presents the index number formulas used in the calculations, as well as the strengths and weaknesses of each. It also explains why some of the indexes are much more difficult to calculate than others, in particular, why the interstate comparisons of prices are likely to be much less reliable than comparisons over time, with comparisons between urban and rural prices somewhere in between. Section 3 presents the main results and compares the price index numbers calculated here with the two official price indexes. Section 4 considers the implications for the calculations of poverty rates between 1987–88 and 1993–94, as well as for the 1993–94 rates themselves under alternative assumptions about interstate and intersector price variation.

Section 5 offers some tentative conclusions, as well as an outline of the work that remains to be done.

Section 1: Using the NSS data to calculate unit values and expenditure patterns

The NSS samples from the 43rd and 50th Rounds are described in Table 1 which shows the distribution of sample households over states and sectors, as well as the total number of purchases recorded for the food, alcohol and tobacco, and fuel categories, the 228 detailed components of which are listed in Table A1. Table 1 lists information for All India, which is the complete sample, and for the 17 largest states plus Delhi; clearly it is only for urban Delhi that there are a significant number of sample households. There are 128,101 sample households in the 43rd Round and 115,354 in the 50th Round. By dividing the "purchases" column by the "households" column, we see that, on average, urban households, who have access to a wider range of goods and are typically better off than rural households, record expenditure on around 40 of the items used here, while rural households reported purchases of about 30 items. In total, over the two surveys, there are 8.3 million quantity/expenditure pairs available for analysis; as we shall see below, this number will be reduced somewhat as we proceed.

For each item of expenditure, household respondents are asked to report both the quantity and value of purchases over the last 30 days. The NSS records expenditures in considerable detail which is shown (for the goods used here and for the 50th Round) in Table A1. The comparable list of goods for the 43rd Round is almost identical apart from the important difference that goods bought from the public distribution system (PDS in the Table) are recorded separately from goods from other sources in the 50th Round but not in the 43rd. We have made no attempt to work with the data on clothing and footwear, where there is also some information on quantities

purchased, e.g. dhotis and sarees in meters, or shoes in pairs.

For a few of the commodities listed in Table A1, it is effectively impossible to measure quantities, and the questionnaire does not attempt to do so. These commodities (or commodity groups) are therefore dropped from the analysis. They are as follows: egg products, other fresh fruits, other beverages (Horlicks, etc.), biscuits and confectionery, salted refreshments, prepared sweets, other processed food, other drugs and intoxicants, dung cakes, gobar gas, and other fuel and light. Several of these fall into the "other" or residual category within a larger group; for example, other drugs and intoxicants is the residual category in a group that contains toddy, beer, liquor, ganja, and opium. As we shall see later, not only these but several other residual categories do not have well-defined units. The are also few cases where the units change between the two rounds. For example, lemons (guavas) were measured in kilograms (units) in the 43rd Round and in units (kilograms) in the 50th Round. We retain such items for comparisons between states or sectors within each round but, since we have no way of knowing how many lemons or guavas are in a kilo, we drop them when making comparisons between the two rounds.

For each consumption record, a unit value was calculated by dividing expenditure by quantity. The NSS collects data separately for commodities purchased in the market, for commodities produced or grown at home, and for commodities obtained as gifts or loans. Unit values were calculated by dividing the sum of the three kinds of expenditure by the sum of the three kinds of quantity. This procedure effectively weights each of three possible unit values by the shares of expenditure devoted to each. Working commodity by commodity, the unit values were then checked for plausibility as indicators of price. There is no foolproof way of doing this. Nevertheless, there are a number of obvious problems to guard against, and procedures can be

developed to detect them. One such is the difficulty of defining units for physical quantities. Expenditures are always measured in rupees, and the concept and its units are clear. For quantities, there is sometimes a choice of units; for example, items can be bought one by one, or by weight. There are also local variations in units, so that what works in one place may not work as well somewhere else. Some customary units are not well-defined in terms of weight; goods bought by the bunch, box, bag, or packet will be converted by the respondent or the enumerator, but the conversion may be less than accurate. To the extent that errors are made—eggs measured in units for some households, and in dozens for others—the unit values will have multi-modal distributions, with peaks corresponding to each distinct unit.

A second problem, which can also be detected by looking for multiple modes, is when two or more distinct goods are included within a single commodity. For example, if milk (liquid) and milk products (expensive sweets) are lumped together, the unit values will cluster around the milk price and the sweet price. While gross contamination is avoided by using the maximal detail, inspection of Table A1 shows that, even with so many items, there is still room for heterogeneity within many of the categories. If the compounded goods are sufficiently similar, the unit value may still give a useful indication of prices. The problem arises when there are spatial or temporal differences in the mixture, so that a compound of (cheap) A and (expensive) B is primarily A in state 1, but is primarily B in state 2.

Our procedures are part graphical, and part automatic. For each commodity, we draw histograms and one-way plots of the logarithms of the unit values, using each to detect the presence of gross outliers for further investigation. In some cases, outliers are isolated cases that result from errors of misreporting, miscoding, or misinterpretation of units, and are deleted. In

other cases, a problem with units or with contamination can be identified and corrected. An automatic method for outlier detection was also used, and unit values eliminated whose logarithm lie more than 2.5 standard deviations from the mean of logarithms. Note that this does not remove the need for the graphical inspection, since gross bimodality would not necessarily be detected by the standard deviation rule. Log unit values were also inspected for plausibility after deletion of outliers. The resulting distributions of unit values were also examined to assess how many purchases clustered at the median—if the unit values are close to being prices, we would expect substantial such clustering—and tested using analysis of variance for cluster (PSU), district, and subround (seasonal effects)—which should be present if variation in unit values is dominated by price variation rather than quality effects or product heterogeneity within the commodity group.

The data examination led to the deletion of a number of goods where unit values appeared not to be reliable, or where there were other unsolved problems of interpretation. Tables A2 through to A5 list the goods involved. Table A2 lists the goods omitted because the NSS instructions do not call for quantities to be collected; for reasons that we do not understand, quantity data exist for these commodities, but the associated unit values would have been deleted by our inspection procedures in any case. Tables A3 and A4 list the additional commodities that were excluded from the 43rd and 50th Rounds respectively. Most of these cases are "other" residual categories within larger subgroups, where the unit values showed dispersion to match the obvious heterogeneity in the definition of the group. Some are goods where there is clear evidence of bimodality (e.g. Liquid Petroleum Gas in the 43rd Round, where there is apparently more than one unit of measurement, but where we were unable to make a suitable correction.

There has apparently also been a black market in LPG in India, which may explain the price variation.) One or two of the goods lost (for example, cups of tea and coconuts) are important items in some states, there is no obvious reason for problems, and their loss is unfortunate. Table A5 lists the additional commodities that had to be eliminated in the comparisons between rounds, but not within them. In addition to the two goods whose units were changed according to the NSS documentation, there are five other commodities where the distributions of prices in the two rounds are so far apart that it seems likely that an undocumented change of units took place. (For example, coal gas is measured in "standard units" which perhaps changed in the intervening six years.)

Summary unit values were calculated from the "cleaned" data by commodity, by sector, by state, and by round. In addition to the 18 "large" states (as listed in Table 1), comparable calculations were made for All India. In preference to means, we use medians for the summary unit values, largely because of their greater resistance to any remaining outliers. The calculations of medians are weighted using the household multipliers supplied by the NSS; since purchases are assumed to be made at the household level, it is appropriate to weight using household weights.

For each household in the surveys, we calculated the share in the budget devoted to each commodity; more precisely, we used the total value of expenditures on the commodity (summing purchases, home production, gifts and loans, and other) divided by household total expenditure on all goods and services, constructed from the NSS–supplied per capita total household expenditure multiplied by household size. These budget shares were then averaged over all households in a given sector, state, and round, using as weights the NSS multipliers multiplied by

household size. There are three points to notice about this construction. First, we use means rather than medians; because the budget shares are automatically bounded between zero and one, there is less concern about the effects of an isolated undetected outlier. Second, the weighting scheme, by multiplying by household size, puts the weights on an individual, rather than household, basis. Because individuals—not households—are the appropriate units for welfare analysis, the commodity weights for price indexes, which is what the budget shares will become, are better computed on an individual than a household basis.

Third, the use of averaged budget shares will generate "democratic" price indexes (Prais, 1958, Pollak, 1991) rather than the "plutocratic" price indexes that are routinely produced by national statistical offices. The weights for the latter are aggregate consumers' expenditure on each commodity divided by the aggregate of consumers' expenditure on all commodities; as is easily shown, this ratio of aggregates is the average of the individual household ratios weighted by total household expenditure. As a result, the ratio of aggregates weights rich households more than poor households, hence the label of "plutocratic." Plutocratic indexes are not well suited for calculating the cost-of-living for poor people. Ideally, we might wish to use price indexes whose weights are tailored to the expenditure patterns of those near the poverty line, and it would be straightforward to do so using the NSS data. However, because Indian poverty lines are typically around the middle of the per capita expenditure distribution, democratic indexes will not differ much from poverty-line weighted indexes.

There is also a (minor) data problem associated with the construction of the budget shares. In the 43rd Round, there are six pairs of commodity items (jowar and jowar products, bajra and bajra products, maize and maize products, barley and barley products, small millets and small millets

products, and ragi and ragi products) where some expenditures are entered under one member of the pair, and some under another, so that it is only possible to work with the pair as a combined category, rather than with each separately. For each of these pairs, we work with the budget share of the two together, and with the unit value of the first. This appears to give sensible results.

Table 2 shows an illustrative selection of results, for thirteen commodities for the rural sectors of Uttar Pradesh and Kerala in the two rounds. These two states were chosen because their expenditure patterns are very different. Since it is clearly impossible to show all the commodities, we have selected for each case the thirteen most important defined by the size of their average budget shares. Clearly, which commodities have the largest budget share is neither robust to the degree of disaggregation nor to the definition of commodities, and we claim no significance for our choice other than that the goods are ones purchased by large numbers of households. The table list the commodity names, the units in which they are measured, the mean of their budget share over all households, the number of households recorded as making purchases of each, and the number of households deleted by the outlier elimination procedures. Finally, the last column in each panel shows the median unit values reported. A number of points are worth noting.

The most important single item in all four tables is the main staple, atta in UP, and rice in Kerala, followed by milk, cooking oil, and firewood. In Kerala, the PDS is an important source of rice; in 1993–94, 44 percent of rice expenditure was in PDS stores. Since rice from these stores was cheaper than rice purchased from other sources, more than half of rice by quantity came through the public system. Some atta in UP is also sold through the PDS, but the amounts are not important enough to show up in the table. (Note that PDS and other sources are not

separated in the 43rd Round, so that the bottom panel shows combined budget shares. Hence the 20.6 budget share of rice in Kerala in the 43rd Round should be compared with 10.8 plus 8.6 (19.6) percent in the 50th Round.)

The differences in the consumption patterns across the two states highlight the difficulty of making interstate price comparisons, as we shall see in more detail in Section 3 below. If we are to compare the price level in Kerala with the price level in UP, we will need to price atta in Kerala, which comprises more than 14 percent of the budget in UP, but which is rarely bought in Kerala, and whose price is irrelevant for most of its inhabitants. Similar issues arise for fresh fish, coconuts, and for coconut versus mustard oil. These differences of consumption patterns pose familiar problems for analysts of price indexes, although more usually for price comparisons between countries, not within them.

The table also shows the number of outliers is small relative to the numbers of original purchases in the data. Note also that the median unit values are often whole numbers. Large numbers of the purchases take place at or close to the numbers shown. For example, in UP in the 43rd Round (bottom left panel of the Table) 1,706 of the 4,862 recorded purchases of atta (or more than a third of total purchases when weighted) were at exactly 2 rupees per kilo. More than a half of purchases of liquid milk were at 4 rupees per liter, and although only 10 percent of purchases of mustard oil were at exactly 26 rupees, more than a half took place within 10 percent of 26 rupees.

Although it is difficult to use Table 2 to get an informal idea of price differences between Kerala and UP, it is straightforward to see the effects of inflation and to guess its extent. For many of the goods shown, prices in 1993–94 were between one and a half and twice their levels

in 1987–8. The relative ease of making intertemporal compared with spatial comparisons of prices will carry through to the more formal results in Section 3, where the estimates of price inflation will be more robust than the estimates of price differences across states or sectors.

Section 2: Alternative price indexes: theory

When price indexes are used to make comparisons over time, it is often the case that neither relative prices nor patterns of expenditure change very much between the two dates in the comparison. In such cases, different price indexes tend to look quite similar, and the choice of index is not of great importance. We shall see that this is the case here for comparisons of given sectors of given states between the two rounds. But relative prices and expenditure patterns are very different between states, and to a lesser extent between sectors within states, so that the precise choice of index is often important for these comparisons. In the calculations below, we work with four different indexes that are briefly presented and discussed here.

The Laspeyres index compares prices in period (state, sector) 1 with a base period (state, sector) 0 according to the formula

$$P_{10}^{L} = \sum_{k=1}^{n} q_{0k} p_{1k} / \sum_{k=1}^{n} q_{0k} p_{0k} \qquad (1)$$

where q's are quantities and p's are prices, where the first suffix on prices and quantities refers to the location (place) of the price, either base 0 or comparison 1, and the second suffix k refers to the commodity and runs over all n goods. The Paasche price index is written

$$P_{10}^{P} = \sum_{k=1}^{n} q_{1k} p_{1k} / \sum_{k=1}^{n} q_{1k} p_{0k}. \qquad (2)$$

For the purposes of the calculations of this paper, it is more convenient to write these indexes in terms of budget shares and price relatives. The budget share of good i in location 0 (say) is defined as

$$w_{0i} = p_{0i}q_{0i} / \sum_{k=1}^{n} p_{0k}q_{0k}. \tag{3}$$

These budget shares will be taken to be the (weighted) average of the comparable budget shares over all households in the state, sector, and round under consideration. By rearranging (1) and (2), we can easily show that

$$P_{10}^{L} = \sum_{k=1}^{n} w_{0k}\left(\frac{p_{1k}}{p_{0k}}\right) \tag{4}$$

while the Paasche index takes the form

$$P_{10}^{P} = \left[\sum_{k=1}^{n} w_{1k}\left(\frac{p_{1k}}{p_{0k}}\right)^{-1}\right]^{-1} \tag{5}$$

In both cases, the price relatives of the individual goods convey the price information, and the budget shares provide the weights, the base period for the Laspeyres and the comparison period for the Paasche.

Neither the Laspeyres nor the Paasche is particularly suitable for making comparisons between Indian states. As we saw in Section 1 using the illustrative comparison between Kerala and UP, consumption patterns different greatly across states even to the extent that a staple in one state may not be consumed at all in another. In consequence, prices for the staple in the "wrong" state are either not observed at all, or at best will be poorly measured. For example, for the 43rd Round, Table 2 shows that 4,862 rural households in UP bought atta, but only 272 rural

households in Kerala did so. Coconut oil, purchased by 2,354 households in rural Kerala, was purchased by only 5 households in UP. And even if the prices are available, and can be accurately measured, it is not clear that the price of coconut oil in UP, where people use mustard oil for cooking, is really relevant to calculations of the standard living. The usual way of thinking about this problem is to note that neither Laspeyres nor Paasche indexes do an adequate job of capturing consumer substitution, that when faced with differences in relative prices, consumers are likely to adjust their consumption patterns towards relatively cheap goods, and away from relatively more expensive ones. Of course, it also might be argued that the difference between UP and Kerala is not merely a difference in relative prices, but a difference in tastes or if not in tastes, in the environment, including not only the physical environment but such things as provision of public goods. If so, it is not clear that there exists any satisfactory basis for comparing price levels between them.

As noted long ago, the geometric mean of the Paasche and the Laspeyres, the Fisher Ideal Index, does a better job than either one in capturing substitution. The Fisher index is defined as

$$P_{10}^{F} = \sqrt{P_{10}^{L} P_{10}^{P}}. \tag{6}$$

We shall also use the Törnqvist price index, which is defined by

$$\ln P_{10}^{T} = \sum_{k=1}^{n} \frac{w_{1k} + w_{0k}}{2} \ln\left(\frac{p_{1k}}{p_{0k}}\right). \tag{7}$$

Because both the Fisher and the Törnqvist indexes use both sets of budget shares, they mute the negative effects of using one or other (the budget share of atta in UP to measure prices in Kerala, or the budget share of coconut oil to measure prices in UP.) More generally, both Törnqvist and Fisher Ideal indexes are *superlative* indexes, Diewert (1976), which means that they are exactly

equal to a true cost-of-living index number for some utility-based demand system that is general enough to provide a second-order approximation to preferences, or a first-order approximation to the demand system. It should be noted that superlative indexes deal with substitution effects better than they deal with income effects. Superlative indexes are only exact in the case of homothetic preferences (preferences not only have to be the same in Kerala and UP, but expenditure patterns in both should be the same at all levels of living), and when homotheticity is violated, offer an approximation only at some level of living intermediate between the two points being compared. It is not clear how this intermediate point should be interpreted, nor whether the superlative indexes answer the questions to which we most want answers. Even so, it is clear that, for comparisons between states and between sectors within states, it makes more sense to use Törnqvist or Fisher indexes than Paasche or Laspeyres.

Note that the Törnqvist and Fisher indexes have another advantage, which is that they satisfy the "reversal" test. If prices are (say) ten percent higher in UP than Kerala, or more precisely, if the price index for UP relative to Kerala is 110, then prices are ten percent lower in Kerala than in UP (or the price index for Kerala relative to UP is 100/110 = 90.9). Because of the change in weights as we move from one base to another, neither Laspeyres nor Paasche index has this property. Since the "reversal" property is so deeply ingrained in the way that we talk about prices, there is much to be said for index numbers that embody it.

Another, perhaps equally appealing, property is *not* satisfied by these index numbers. This is the "circularity" or "transitivity" property. Suppose that we have three situations, A, B, and C. We can calculate an index for B relative to A, and for C relative to B. If these are multiplied together, we get an "indirect" price index for C relative to A, in contrast to the "direct" estimate

that comes from comparing C with A in one step. Circularity is satisfied if these two indexes are the same. The failure of this property arises in the current context when we wish to combine urban to rural price indexes with state to All India indexes. Suppose, for example, that in the rural sector, UP has an index of 110 relative to 100 for All India, while in the urban sector, UP is 105 relative to 100 for All India. If the All India urban to rural price index is 115 (say), then the "indirect" route gives us an urban to rural price index for UP of 120.75 (115 × 105) to 110 (110 × 100) or 109.8. But we can also use the "direct" route to compare urban and rural prices in UP and there is no guarantee that we will get the same answer. As we shall see, this sort of "circularity" failure has caused problems in context of measuring poverty in India.

Section 3: Price indexes: results

Table 3 shows the results of possibly the greatest interest, the comparison of price levels between the two rounds, by state, and by sector. Following a format that will be applied in all the tables in this section, we show first the total share of the budget covered by all of the goods that go into the price indexes, averaged over all households included. The closer these numbers to unity, the more complete the price index. Since the various price indexes involve two sets of budget shares, the "base" and the "comparison," there are generally two sets of budget shares in the tables. We then present the four price indexes, Laspeyres, Paasche, Fisher Ideal, and Törnqvist. In most cases, the last two indexes are very close to one another, and since both have the "superlative" index property, they are our preferred estimates. In all cases, the code is written so as to exclude any good from the price indexes when in either base or comparison data set, there are less than 20 observations on its price. Although the choice of 20 is arbitrary, the results are not sensitive to

reasonable variations, and some such rule is required to eliminate cases where there are only one or two observations on a give price.

Table 3 shows that, for All India, goods comprising 74.6 percent of the budget were included in rural sector of the 43rd Round, falling to 70.7 percent in the 50th Round; the decline is to be expected from the operation of Engel's Law given an increase in real incomes. The shares covered are lower in the urban sector, 67.6 and 63.4 percent, which is again to be expected if urban areas are somewhat better off, and because of the relatively greater importance for urban consumers of items such as housing and transportation. With a few exceptions, these patterns of shares between the rounds and between urban and rural sectors are replicated across the individual states shown in the Table. In the rural sector, the covered share rose in only three states, Haryana, Himachal Pradesh, and Punjab, and in the urban sector, increased only in Delhi (where the covered share is lower than anywhere else.) Several states, particularly in urban sectors, show large decreases in the covered share. In the rural sector, Gujarat, Karnataka, Madhya Pradesh, and Maharashtra showed declines of more than 5 percentage points, while the same occurred in the urban sectors of Assam, Gujarat, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, and Maharashtra. While the share of the budget devoted to food is far from being an infallible guide to welfare, these results are consistent with an increase in well-being that is somewhat unevenly spread, and that is stronger in urban than rural sectors.

The All India (Törnqvist) price index shows an increase between the rounds of 69.8 percent for the rural sector, and of 73.8 percent in the urban areas. The CPIAL, which is the relevant comparison for the rural sector, increased by 76.3 percent, while the CPIIW, which is the relevant index for urban comparisons, increased by 75.1 percent. The differences between our

calculations and "official" numbers are not very large, but the direction of the difference, with the official prices overestimating inflation, appears in many of the entries in the Table, particularly for the rural sector. The Laspeyres index estimates more inflation than the two superlative indexes which allow for some substitution; in the urban sector, our All India Laspeyres is identical to the CPIIW while in the rural sector, the Laspeyres takes us only about a third of the way from the superlative indexes to the CPIAL. Across (most but not all of) the states, as for All India, our calculations show more overestimation of inflation in rural than in urban areas, so that recalculations of poverty rates in the next section will show more effect on calculated rural than urban poverty.

One possible reason why our calculations might systematically *understate* the rate of inflation would be if the rate of inflation of non-covered goods, including housing and transportation, has typically been higher than the rate of inflation of the covered goods. We do not currently have to hand the CPIAL and CPIIW disaggregated by commodity groupings. However, the Indian Labour Yearbooks show that, for All India, the all-items or general versions of the two prices indexes have been rising *less* rapidly than the food component alone. Hence, if we were to combine our indexes for the covered goods with the relevant components of the CPIAL and CPIIW for the non-covered items, the result would show less inflation than our current estimates. We plan to carry out these calculations on a state by state basis when we have the relevant data.

At the state level, our calculations show less inflation over the period than do the official indexes in all the states shown except for rural Jammu and Kashmir, Maharashtra, Orissa, and Tamil Nadu, and for urban Andhra Pradesh, Jammu and Kashmir, and Punjab. (Note that we do not currently have data on the official price indexes for Haryana nor Himachal Pradesh.) The

differences between the two sets of indexes are smaller in the urban areas, and the largest differences occur in the rural areas of a few states, notably Bihar, Kerala, Rajasthan, and Uttar Pradesh. It is worth noting that some of these states have relatively high poverty rates, where a reduction in the price level is likely to have the largest effects.

Indexes for urban prices relative to a rural base are presented in Table 4. The choice of which sector to use as base makes a difference to all but the two superlative indexes, although note that the Laspeyres index for rural relative to urban is the reciprocal of the Paasche index for urban relative to rural. For India as a whole, urban prices for covered goods were 11.4 percent higher than rural prices in the 43rd Round. By the 50th round, this difference had expanded to 15.6 percent. Note that this difference is qualitatively consistent with the results in Table 3, where the urban rate of inflation was calculated to be somewhat higher than the rural rate. There is some variation across states in urban–rural price differentials, and these variations seem to be stable over time. Urban Kerala is only slightly more expensive than rural Kerala; the same appears to be the case for Himachal Pradesh and Jammu and Kashmir in 1987–88, though less so in 1993–94. At the other end of the scale, the urban price differential was highest in Uttar Pradesh, West Bengal, Maharashtra, Madhya Pradesh, Punjab, and Haryana.

For many years, until the Expert Group Report of 1993, Indian poverty lines were set (in 1973–84 prices) at Rs 49 of per capita household expenditure for rural areas and Rs 57 for urban areas, a difference of 15 percent. Clearly, our estimates in Table 4, particularly for the later round, are consistent with such a difference. Of course, our estimates exclude between a quarter and a third of the budget, including important items like housing and transportation so that a fuller account of the budget would presumably raise the relative cost of living in urban areas.

There are no official price indexes for urban to rural differentials. Nevertheless, Table 4.1 of the 1993 Expert Group report presents a set of urban and rural poverty lines for each state in 1987–88 from which a set of implicit price deflators can be derived. These are listed in the penultimate column of Table 4 and were obtained by dividing the Expert Group's urban poverty lines by their rural poverty lines. We used the officially updated Expert Group lines for the 50th Round to derive the penultimate column in the bottom panel. (Note that the Expert Group did not derive these implicit price deflators from an explicit set of urban to rural price indexes. Instead, they started from the original urban poverty line, and adjusted it by a price index for the urban areas of the different states in Minhas, Jain, Kansal, and Saluja (1988). Similarly, they adjusted the original rural line by the statewise rural price differences from 1960–61 in Chaterjee and Bhattacharyya (1974). The implicit price indexes for urban relative to rural are therefore generated in an indirect manner that did not make them conform to other evidence or that placed limits on their plausibility, something that can be thought of as a failure of the circularity criterion.)

As we might expect, given that the non-covered goods include housing and transportation, the Expert Group's price differentials are always larger than those calculated in this paper. For All India, the urban prices are higher than rural prices by 43.4 percent, compared with 11.4 percent for the Törnqvist index, and this varies across states from a high of 73.5 percent in Andhra Pradesh to a low of only 15.3 percent in West Bengal. Of course, such variability is not in itself implausible, given the variability in the cost of housing from one place to another. (Even so, it seems surprising that the lowest differential should be in the state that contains India's largest city.) Another way of comparing our calculations with those of the Expert Group is to

work out the price index for non-covered goods that would be required to reconcile the two sets of results. We do this by calculating the price relative which, when inserted into a Törnqvist index with the covered goods, would yield a price index equal to the Expert Group's estimate. These numbers are shown in the last column. For All India, the price of uncovered goods in the urban areas would have to be 2.95 times its level in rural areas, and for individual states, the ratios range from 5.5 in Madhya Pradesh to only 1.2 in West Bengal. It is hard to accept that the high figures are correct, and thence not to conclude that the Expert Group's urban to rural price differentials are not too large. Indeed, they are sufficiently large as to cause measured poverty rates to be higher in urban than rural areas in several states where many observers have found the finding implausible, for example in comparison with other non-expenditure-based measures of poverty, such as levels of infant mortality or literacy.

Tables 5 and 6 present price indexes for differences in prices across states. For the reasons discussed in the theory section, these are the most difficult price indexes to compute, and are likely to be most sensitive to a few outliers, or to the fundamental problems of comparing groups of consumers whose tastes are very different. One symptom of these problems is the sensitivity of these calculations to the precise definition of the index. In these tables, the Paasche and Laspeyres tend to be further apart than in the urban rural or over time comparisons, and even the Törnqvist and Fisher indexes tend not to be the same. Rather than present the complete matrix of state by state comparisons, in which every state acts as a base for every other state, we have selected "All India" as the base, so that we have, as before, one index for each sector of each state. Table 5 shows the estimates from the 43rd Round; Table 6 those for the 50th Round.

According to these calculations, the differences in aggregate price levels across states are not

large, at least for the covered goods (for the cost of housing, matters may be different.) In 1987–88, only rural Gujarat, rural Assam, and rural Tamil Nadu are more than 5 percent more expensive than All India, and rural Uttar Pradesh, Andhra Pradesh, Madhya Pradesh, and Punjab are more than 5 percent less expensive. Among the urban areas, only Gujarat and Maharashtra are more than 5 percent above the All India estimate, and only Andhra Pradesh, Jammu and Kashmir, and Punjab are more than 5 percent less. By 1993–94, there is somewhat more dispersion in the price indexes. Rural Gujarat and Kerala are more than 10 percent more expensive than rural India as a whole, and Maharashtra, Punjab, Rajasthan, and Tamil Nadu are more than 5 percent more expensive. Madhya Pradesh and Uttar Pradesh are more than 5 percent below the average. In the urban sectors, in only Maharashtra is the price level more than 10 percent above the All India urban average, while Assam, Gujarat, and Delhi are 5 percent or more above. Andhra Pradesh, Madhya Pradesh, Orissa, and Uttar Pradesh are the states with the lowest urban prices. Nevertheless, it would not be hard to make the case that, given the difficulties of these measurements, and given the lack of evidence for large price differentials, it would be better to ignore interstate price differences in setting poverty lines, if only in the interests of transparency.

Once again, at least for the 43rd Round, it is possible to compare our results with the prices that are implicit in the poverty lines recommended by the Expert Group. Their Table 4.1 lists poverty lines by state and by urban and rural for 1987–88, so that by dividing each state's line by the All India line (within sectors) we can obtain a price index for comparison. The results are listed in the final column of Table 5. In both sectors, these Expert Group prices are positively correlated with those calculated here, with correlation coefficients around 0.3, but neither is

significantly different from zero. The Expert Group statewise price differences are taken from Chaterjee and Bhattacharyya (1974) and were calculated for 1960–61, so that there must be some question about their relevance after more than a quarter of a century, especially given the differential rate of inflation by state even over the relatively short period from 1987–88 to 1993–94 (Table 3) and the sizeable differences in the statewise price indexes between Tables 5 and 6.

Section 4: Consequences for poverty measurement

Even given a trial price index, there is no straightforward way to calculate its effect on estimated headcount ratios compared with the price index in current use. The problem lies in the need to choose a base year, and in the arbitrariness of any particular choice. In India, 1973–74 is frequently taken as base, and the poverty lines of 49 (rural) and 57 (urban) rupees per head in 1973–74 prices have nearly always been taken as the base from which different updating schemes start. Following in this tradition, the obvious way to assess the effects of different prices on poverty estimates, would be to start from the assumption that the price indexes in 1973–74 are correct, and then to calculate new price indexes for subsequent years. If it were the case that a Laspeyres index with fixed base were to slowly come adrift from another (for example superlative) index, then the differences in poverty counts would also drift apart over the years. Armed with all the expenditure surveys since 1973–74, it would be possible in principle to repeat the calculations of this paper, and to carry out the repricing exercise. However, we have so far worked with only two full expenditure surveys, 1987–88 and 1993–94, so that our only estimate of the rate of inflation is between those two years. In consequence, the only feasible calculation

of poverty rates is one that takes the 1987–88 rates as correct, and then compares the "official" poverty rates in 1993–94 with those calculated using the different price indexes. From this, we can compare the "official" and "experimental" changes in the head count ratio from 1987–88 to 1993–94. While this calculation is of considerable interest, and makes a first attempt to answer the question about whether rural poverty is falling more rapidly than officially documented, it is certainly not the only possible answer. With another choice of base year (such as 1973–74), the nominal poverty lines in 1987–88 would be different, and because the effects of poverty lines on poverty counts are not the same at different points in the distribution, the effects on the change in the poverty rates between the two years would also be different, even though the inflation rate between them were the same. The change in poverty rates between any two dates is not a unique function of the change in nominal poverty lines between them, but also depends on the level of the lines.

A further complication is that the general agreement on poverty lines in 1973–74 has largely broken down since the publication of the Expert Group Report, with different analysts updating their lines in different ways, so that there is no obvious starting point for our first survey in 1987–88. We have chosen to work with the most "official" of the lines, which are those put forward by the Expert Group, and subsequently adopted by the Planning Commission. Given our previous criticism of these lines, this may seem like an odd choice. But any choice is more or less arbitrary, and in the absence of a more thoroughgoing analysis, we prefer to look at the effects of redefinition in the vicinity of lines that are currently in use for policymaking within the Government of India.

Table 7 lists the nominal poverty lines for the two surveys, the associated head count ratios,

and the change in the head count ratios over the six year period. The poverty lines for 1987–88 are taken from Table 4.1 of the Expert Group Report, and those for 1993–94 from the update (using the same assumptions) in Government of India (1997). The headcount ratios were calculated using the individual record data from the 43rd and 50th Round; although they are not quite identical to the headcount ratios in the Expert Group Report and in GOI (1997) they are very close and recognizably calculations of the same thing. This replication is important to check that there are no major differences of definition or procedures between the official figures and the experimental ones to be calculated below. In substance, the Table shows the familiar picture of poverty rates falling in urban areas—by more than 7 percentage points for All India, and much more in some states—but with a much more modest decrease in the rural areas—only 2 percentage points for the country as a whole, and five of the states actually show *increases* in the rural poverty rate over the period.

Table 8 repeats the official price indexes, the CPIAL and the CPIIW, together with the price indexes that are implicit in the official poverty lines in Table 7, obtained by dividing the 1993–94 lines by the 1987–88 lines. The first two columns confirm that the rural poverty lines are indeed updated by the CPIAL; once again, the two sets of numbers are very close. Under the Expert Group procedures, the rural poverty lines are updated by a version of the CPIAL that is reweighted from its components using expenditure weights for the poor, but it is clear from the table that the reweighting makes very little difference, as would be expected given the high poverty rates in India. For urban poverty lines, the official guidelines use, not the CPIIW itself, but an average of the reweighted CPIIW and the CPI for urban non-manual employees (an index to which we currently do not have access). The last two columns of Table 7 show that this index

is rather different from the CPIIW, and that the differences vary greatly across states. For most states, the two indexes are similar, but there are some very large discrepancies, most notably 179.7 (CPIIW) versus 151.2 (Implicit price) in urban Assam, 168.6 versus 148.0 in Bihar, and 174.9 versus 160.2 in Kerala. We can think of no plausible explanations for why such differences should exist, and they have a major effect on the poverty counts. Referring back to Table 7, we see that the urban poverty rate in Bihar fell by 23 points, and that in Kerala by 21 points. There must surely be a possibility that these dramatic changes—as well as the size of the fall in urban poverty for the country as a whole—owe as much to the calculation of the price indexes as to reality.

Table 9 shows our own calculations of poverty rates using the inflation rates between 1987–88 and 1993–94 that were calculated in the earlier sections of this paper and that were reported in Table 3. In these first calculations, we are ignoring the other price indexes, those for interstate and intersectoral differentials; we take the 1987–88 Expert Group lines for each sector of each state as the base, and apply the Törnqvist inflation factors from the penultimate column of Table 3. In this way, we isolate the effects of the different calculated rates of inflation, leaving the urban-rural and statewise differentials for later.

The Table starts by examining the sensitivity to changes in the poverty lines of the head count ratios in both rounds. Since the head count ratio is the distribution function evaluated at the poverty line, the derivative of the ratio is the density evaluated at the same point. We have calculated these densities using a kernel smoother with a Gaussian kernel and with a bandwidth chosen according to Silverman's (1983) robust version of the optimal bandwidth. The density at the poverty line, multiplied by the poverty line, shows the derivative of the head count ratio with

respect to the logarithm of the poverty line, and the estimates for the two rounds are reported in the first two columns of the table. To interpret these numbers, note for example that the figure of 0.70 for rural Andhra Pradesh in the 43rd Round shows that a one percent decrease in the nominal poverty line (or equivalently a one percent decrease in the price deflator) would cause the head count ratio to fall by 0.70 percentage points, that is from the calculated head count ratio of 21.04 percent to 20.34 percent. All of these estimates fall between 0.46 (urban Haryana) and 1.17 (rural Assam). They are larger the larger is the density of the population at or near the poverty line and provide a rough rule of thumb for how much to expect differences in price indexes to affect the poverty rates.

Column 3 in Table 9 shows the difference (in percentage points) between the price indexes calculated in this paper and the change in the official price indexes from 1987–88 to 1993–94, where the official index is taken to be the CPIAL for rural and the CPIIW for urban; these figures are simply the difference between the last two columns in Table 3. Again we are looking only at inflation rates, making no correction for the interstate or intersectoral price differences. Column 4 repeats the head count ratio for 1993–94, as reported in Table 7, while Column 5 reports what the headcount ratio would be if the nominal poverty lines in 1993–94 were modified in line with the difference in price indexes reported in Column 3. For the rural poverty line, this is the obvious procedure; we replace the increase in the CPIAL (which updates the poverty lines from 1987–88 to 1993–94) by the price index calculated above and calculate the new head count ratio as the fraction of persons below the modified poverty line. For the urban sector, the official updating is done by an index that differs from the CPIIW. Nevertheless, we use the same general procedure, starting from the updated urban poverty lines for 1993–94, and modifying them by the

discrepancy between the CPIIW and the urban price index calculated here. The alternative, updating the urban poverty lines using our versions of the urban price index, would have much more dramatic results, raising poverty rates (particularly in Bihar and Kerala) where the Expert Group methodology generates low poverty lines for reasons that have nothing to do with the CPIIW, and we will show some such calculations in Table 10 below.

The last two columns show the modified head count ratios, as well as corresponding changes in the head count ratio. As is to be expected given the modest differences between our urban index and the CPIIW, there are only small differences in the urban poverty rates and in the changes in urban poverty. (But recall that we are taking as given the official indexes for Bihar and Kerala, which we find so hard to explain.) The differences are much more important in the rural sector. For All India, the reduction in the poverty rate from 1987–88 to 1993–94 moves from only 2 percentage points in the official counts to more than 5 percent according to our price indexes. Of course, the differences for some individual states, particularly Assam, Bihar, Kerala, Madhya Pradesh, Rajasthan, and Uttar Pradesh, are much larger, and in all these cases we find that the adoption of the new price indexes would cause measured poverty to have fallen more rapidly than in the official counts. If, as we suspect, the official estimates overstate the reductions in urban poverty in Bihar and Kerala, then the calculations in this paper would be consistent with the view that, between 1987–88 and 1993–94, there was no great difference in the rates of decline of urban and rural poverty in India.

Table 10 explores the effects of modifying the Expert Group lines for the urban-rural and interstate price differentials as measured in this paper. Again, we proceed in a series of steps. Column 1 shows the updated Expert Group headcount ratios for each state (other than Jammu

and Kashmir). This column replicates the data from Column 4 of Table 9. There is one new feature that is carried throughout the table. In the All India row, two sets of figures are presented, one labeled "direct" and one labeled "weighted average." The "direct" estimate, which follows the same procedure as in Tables 7 and 9, is the estimated percentage of people in (urban or rural) India below the All India (urban or rural) poverty line. In this calculation, the same poverty line is used for all households, irrespective of the state in which they live. The "weighted average" procedure, by contrast, counts people as poor when they are below their state and sector poverty line, obtained here by taking an average of the state headcount ratios, weighted by their shares in the population of these states. Because the small states and territories are excluded, the weighted averages have somewhat less coverage than the direct estimates; the state shown cover 98.6 percent of the rural, and 94.9 percent of the urban population. If the All India poverty lines were population weighted averages of the state poverty lines, and if coverage were complete, the direct estimates would be lower than the weighted averages because, for poverty lines below the mode, the headcount ratio is a convex function of the poverty line, so that the average of the headcount ratios lies above the headcount ratio of the average. But the state lines come from the All India line from the application of the price indexes, so the inequality result will not be true in general. However, the differences between te direct and weighted average estimates are usually small, much smaller than the other differences considered in this paper.

Column 2 of Table 10 (labeled "New 1") takes the updated Expert Group lines for the rural sector of each state as correct, but calculates the urban poverty lines by applying the urban-rural Törnqvist price indexes for 1993–94 shown in the bottom panel of Table 4. The associated headcount ratios are shown in this column; the top panel is unchanged by construction, but the

urban headcount ratios in the bottom panel are often dramatically different from the official ratios. For example, according to these estimates, only 9.6 percent of people in urban Andhra Pradesh are poor, as opposed to 38.8 percent in the official estimates. There are similar dramatic declines in measured urban poverty in Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa, and Tamil Nadu, and the All India rate of urban poverty falls from 33 percent to 27 percent. But this first step should not be taken too seriously. While it corrects for the almost certainly too large urban-rural price differences in the Expert Group lines, it takes their rural lines as correct, accepting their implicit interstate price differences. The low headcount ratio that we estimate for urban Andhra Pradesh (for example) owes as much to a low starting point in the rural line, as it does to a low price relative from urban to rural.

The next step is taken in Column 3, labeled "New 2." These estimates do a more comprehensive job of correcting the official calculations because they correct for state price differences as well as for sector differences. The calculations are done by starting with the Expert Group rural poverty line for All India in 1993–94, Rs 205.84. This number is used to generate rural poverty lines for each state by multiplying by the rural Törnqvist price indexes for states relative to All India for 1993–94 shown in the top panel of Table 6. The urban lines are then created, state by state, by multiplying by the urban to rural Törnqvist price differentials that are listed in the bottom panel of Table 4 (and that were already used in calculating Column 2.) Note that the same price indexes could be used differently, converting the All India rural poverty line to an urban poverty line using the All India urban to rural price index, and then applying the state to All India *urban* price indexes. Because circularity does not hold, the poverty lines derived in this way are different from those actually used, though here the differences are not important.

The "New 2" poverty rates are now closer to the official counts in the urban areas, though still often considerably less (21 percent in Andhra Pradesh versus 39 percent, 25 percent in Karnataka versus 40 percent), but are typically higher than the official counts in the rural areas. Our price indexes do not support the large interstate or intersectoral differences that are built into the official lines, so that our rural rates are typically higher and our urban rates lower.

The fourth column ("New 3") in Table 10 is a minor modification of the previous one. Instead of starting from the updated Expert Group All India rural poverty line for 1993–94 of Rs 205.8, we start from the corresponding 1987–88 estimate of Rs 115.3. This is updated to 1993–94 using the All India rural Törnqvist index of 169.8 (Table 3) to give a 1993–94 line of Rs 195.8. This All India rural poverty line then replaces Rs 205.8 as the base, and all poverty counts are thereby reduced compared with the previous column. These estimates, like those in the previous column, are the headcount ratios that come out of the price calculations in this paper, and we believe them to be both soundly based and sensible.

The fifth column ("New 43rd") reports the corresponding head count ratios for the 43rd Round. Again, we start from the All India rural poverty line of 169.8, apply the 43rd Round rural state to All India price indexes (top panel of Table 5) to get state level rural poverty lines, which are converted to urban poverty lines using the 43rd Round urban to rural price indexes (top panel of Table 4). These head count ratios are directly comparable to those from the 50th Round in the previous column ("New 3") and the changes in the last column are appropriate measures of the change in poverty between the two rounds. Perhaps most remarkably, these final estimates show a somewhat more rapid decline in the rural than in the urban headcount measure of poverty.

Section 5: Further work and preliminary conclusions

The calculations in this paper, although extensive in themselves, leave a great deal undone. In particular, it would be highly desirable to extend the calculations to both earlier periods and later periods. Among the large consumption surveys, the 38th Round (1983) is available and can be used in the same way as the 43rd and 50th Rounds. The 50th Round is the latest large consumption survey that is currently available, but more recent surveys contain a good deal of consumption information, and could be used to give less precise, but probably still adequate estimates of inflation, if not of interstate or intersectoral price differences. It would also be desirable to extend the indices to cover all of consumption, which could be done by incorporating the appropriate components of the disaggregated CPIAL and CPIIW indexes. Finally, it would be extremely desirable if the NSS itself were to make similar calculations, as a cross-check, and because independent investigators cannot hope to match the resources, knowledge, and expertise of the government statisticians.

In spite of the preliminary nature of the work, we would like to emphasize some tentative conclusions. First, the unit value data from the NSS consumption surveys are a viable data base for cross-checking other price indexes. Second, the results presented here show very close agreement between the rate of increase of the official CPIAL and CPIIW indexes and the prices reported by the large, national sample of respondents in the NSS surveys. Our calculations show little apparent bias in the CPIIW, but suggest that the CPIAL may have been growing too quickly, consistently with what might be expected from using a long outdated Laspeyres rather than a chain-linked or superlative index. If this conclusion is accepted, it is likely that the decline in rural poverty rates has been understated in the official poverty counts. Indeed, we are led to

suggest as a working hypothesis that, between 1987–88 and 1993–94, there was no great difference in the rate of decline of urban and rural poverty, at least according to the headcount measure.

Our calculations suggest rather more serious problems with the procedures for calculating poverty lines that come out of the Expert Group Report. The data examined here suggest that their urban lines are too high relative to their rural lines; we find no support in the NSS purchase data for the argument that urban prices are so much higher than rural prices. Nor do the purchase data generate interstate price indexes that are close to those incorporated in the Expert Group lines. Although interstate price differences are similar in 1993–94 and 1987–88, they are not identical, and so there is no reason to suppose that interstate price differentials from the early 1960s contain much useful information on price differentials today. There are difficult practical and conceptual problems with the computation of interstate price indexes in a country such as India, and there is a case based on transparency for not trying to do so. But if this case is not accepted, interstate price indexes should be calculated from the plentiful and recent NSS data. Doing so has dramatic effects on the distribution of poverty across the Indian states, and between the rural and urban sectors. Indeed, one of the main results of this paper is that current official practice causes much larger errors in calculating the distribution of poverty within the country than it does in calculating changes in overall poverty over time.

The Expert Group's recommendations are admirable in their attempt to use all the information available in order to improve the updating formulas for the poverty lines. But one unintended consequence of their recommendations has been to make the construction of the lines a great deal less transparent then used to be the case when there were only two lines, one urban and

one rural, which were held fixed in real terms, and updated using a single All India price index. Updating now involves three different price indexes, the CPIAL, the CPIIW, and the CPI for urban, non-manual employees, and the first two are reweighted in a way that makes the poverty lines increase at rates that are (somewhat) different from published price indexes. The base poverty lines that are updated are now also "corrected" for urban to rural price differences, and for interstate differences. As we have seen, these corrections are difficult to make, and any specific numbers are subject to challenge, so that one result has been that there are now several different sets of poverty lines in use by different agencies. Simplicity and transparency are also virtues, and it is legitimate to ask whether the complexity and lack of transparency in the Expert Group's procedures have generated enough additional accuracy to make them worthwhile.

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Table 1: Numbers of sample households and recorded purchases

	43rd Round				50th Round			
	Rural		Urban		Rural		Urban	
	households	purchases	households	purchases	households	purchases	households	purchases
Andhra Pradesh	6,015	193,490	3,421	122,804	4,908	171,913	3,644	140,384
Assam	3,290	111,468	1,171	40,560	3,199	123,150	880	36,946
Bihar	7,740	194,271	2,083	61,473	6,979	195,356	2,155	71,788
Gujarat	2,795	95,164	2,260	85,016	2,219	85,015	2,372	100,054
Haryana	1,165	37,079	634	22,995	1,040	35,445	697	25,249
Himachal Pradesh	1,835	56,633	459	15,226	1,875	59,905	400	14,664
Jammu and Kashmir	3,197	87,786	1,488	45,082	820	27,606	528	21,050
Karnataka	3,254	120,783	2,307	90,819	2,617	108,986	2,469	106,555
Kerala	3,358	118,107	1,432	49,704	2,555	100,884	1,830	71,601
Madhya Pradesh	6,294	183,849	2,888	104,703	5,313	167,681	3,233	125,399
Maharashtra	5,726	212,872	5,497	222,693	4,440	175,356	5,528	238,136
Orissa	3,493	95,524	1,151	36,628	3,338	105,351	1,037	38,571
Punjab	2,665	84,939	1,901	65,264	2,046	71,961	1,947	72,250
Rajasthan	3,607	89,735	1,734	55,111	3,097	86,723	1,799	60,134
Tamil Nadu	4,567	155,196	4,109	156,221	3,901	155,420	4,042	170,104
Uttar Pradesh	10,395	292,021	4,497	145,020	9,010	297,803	4,451	170,499
West Bengal	4,983	164,005	3,433	124,574	4,480	170,649	3,338	135,564
Delhi	66	2,685	1,130	47,505	61	2,045	985	33,517
All India	82,653	2,531,548	45,348	1,610,434	69,206	2,378,646	46,148	1,807,324

Notes: Households are the numbers of sample households in each round. Purchases are the numbers of recorded purchases of the list of commodities in Table A1.

Table 2: Selected budget shares and unit values, rural areas of two states, 43rd and 50th Rounds.

Rural Uttar Pradesh, 50th Round, 1993–94						Rural Kerala, 50th Round, 1993–94					
Commodity	units	mean share	no. of obs.	out-liers	median unit value	Commodity	units	mean share	no. of obs.	out-liers	median unit value
Atta	kg.	14.3	5,575	39	3.533	Rice: other sources	kg.	10.8	2,073	50	7.5
Milk (liquid)	litre	10.8	6,618	88	6	Rice: P.D.S.	kg.	8.6	1,916	27	5.52
Rice	kg.	9.2	7,186	169	6	Fresh Fish	kg.	5.8	2,158	30	17.6
Mustard Oil	kg.	3.9	8,627	278	30	Milk (liquid)	litre	4.6	1,776	37	8
Firewood & chips	kg.	3.4	4,871	107	0.7	Firewood & chips	kg.	4.6	2,061	49	0.6
Arhar (tur)	kg.	2.6	6,568	210	16	Coconuts	no.	4.5	2,334	25	4
Potatoes	kg.	2.5	8,797	187	3	Coconut oil	kg.	2.8	2,229	50	38
Bidis	no.	1.6	4,802	102	0.071	Tea	cup	2.5	1,698	32	1
Sugar (crystal)	kg.	1.5	5,529	145	12	Sugar: other	kg.	1.6	2,055	13	13.75
Gur (cane)	kg.	1.1	4,770	64	8	Sugar: P.D.S.	kg.	1.1	2,287	48	8.44
Urd	kg.	0.9	4,589	69	12	Bidis	no.	1.5	1,073	20	0.1
Goat meat	kg.	0.9	2,018	16	50	Leaf tea	gm.	1.4	2,248	52	0.065
Leaf tea	gm.	0.7	5,808	113	0.08	Cooked meals	no.	1.3	403	11	7
Rural Uttar Pradesh, 43rd Round, 1987–88						Rural Kerala, 43rd Round, 1987–88					
Atta	kg.	16.5	4,862	26	2	Rice	kg.	20.6	3,271	27	3.6
Milk (liquid)	litre	9.1	7,069	217	4	Coconuts	no.	5.6	3,157	34	3
Rice	kg.	8.9	8,077	130	3.2	Firewood & chips	kg.	5.4	2,984	43	0.43
Mustard Oil	kg.	4.7	9,826	96	26	Fresh Fish	kg.	5.3	2,777	36	10
Firewood & chips	kg.	3.5	6,845	127	0.5	Milk (liquid)	litre	3.9	2,286	27	4
Arhar (tur)	kg.	3.1	7,305	278	10	Tea	cup	2.7	2,681	34	0.5
Potatoes	kg.	2.3	10,090	59	1.5	Cooked meals	no.	2.5	1,055	33	3.333
Bidis	no.	1.6	5,978	205	0.0333	Sugar	kg.	2.3	3,224	50	5.6
Gur (cane)	kg.	1.5	7,319	235	3.5	Coconut oil	kg.	1.8	2,354	32	34
Sugar (crystal)	kg.	1.3	6,650	37	6.5	Bidis	no.	1.5	1,660	45	0.05
Kerosene	litre	1.1	9,884	156	3	Dried chillies	gm.	1.3	3,255	83	0.02
Urd	kg.	0.9	4,693	169	8	Leaf tea	gm.	1.3	2,857	35	0.0333
Vanaspati	kg.	0.8	2,574	16	26	Palm oil	kg.	1.3	2,034	33	17

Notes to Table 2:

In the 43rd Round foods purchased from the Public Distribution System (P.D.S.) are not distinguished from foods bought from other sources, see for example rice in Kerala in the 43rd Round versus rice in Kerala in the 50th Round. In the 50th round for U.P., the amounts shown for atta, rice, mustard oil, arhar, sugar, and urd are all purchases from sources other than P.D.S. In Kerala for the 50th Round, P.D.S. and other sources both appear in the table except for coconut oil, which is coconut oil from non P.D.S. sources.

Table 3: Price indexes for 1993–94 relative to 1987–88

	Budget 43	Budget 50	Las-peyres	Paasche Index	Fisher Ideal	Törn-qvist	CPI
Rural							CPIAL
Andhra Pradesh	69.9	68.5	177.5	174.1	175.8	175.9	177.3
Assam	81.9	81.6	174.8	172.5	173.6	173.7	181.6
Bihar	79.0	76.3	161.3	158.1	159.7	159.7	175.6
Gujarat	78.5	71.1	175.2	166.1	170.6	170.6	175.2
Haryana	68.5	69.3	175.7	173.0	174.3	174.2	..
Himachal Pradesh	68.4	69.2	171.6	162.9	167.1	167.1	..
Jammu & Kashmir	68.7	67.8	184.9	178.4	181.6	181.5	171.2
Karnataka	73.2	62.1	175.8	174.5	175.1	175.1	178.7
Kerala	69.7	68.5	174.7	169.4	172.1	172.3	186.4
Madhya Pradesh	75.9	70.9	174.7	169.1	171.9	171.9	179.8
Maharashtra	71.8	61.1	174.1	171.3	172.7	172.6	168.6
Orissa	79.9	79.1	167.4	162.1	164.7	164.6	159.9
Punjab	66.7	68.2	192.6	188.6	190.6	190.7	191.0
Rajasthan	72.7	68.1	169.4	164.2	166.8	166.9	186.1
Tamil Nadu	73.4	69.0	169.4	165.9	167.6	167.7	167.0
Uttar Pradesh	69.8	68.9	170.3	165.5	167.9	167.9	186.0
West Bengal	79.6	75.5	167.6	165.4	166.5	166.5	170.2
All India	74.6	70.7	171.7	167.9	169.8	169.8	176.3
Urban							CPIIW
Andhra Pradesh	64.8	62.4	179.7	174.6	177.1	177.2	175.9
Assam	72.4	66.4	179.4	175.9	177.6	177.7	179.7
Bihar	73.1	71.0	165.9	164.3	165.1	165.2	168.6
Gujarat	70.4	65.3	169.2	161.7	165.4	165.4	173.0
Haryana	68.5	60.5	178.6	176.7	177.6	177.6	180.6
Himachal Pradesh	62.1	58.7	179.7	170.8	175.2	175.2	..
Jammu & Kashmir	66.8	59.5	185.8	171.7	178.6	178.5	174.3
Karnataka	67.7	60.6	179.5	174.6	177.0	177.1	180.8
Kerala	69.0	63.4	175.5	171.2	173.3	173.5	174.9
Madhya Pradesh	72.2	63.9	173.5	168.2	170.8	170.9	174.1
Maharashtra	65.4	59.0	183.4	178.5	180.9	181.1	183.3
Orissa	70.7	66.6	169.1	166.5	167.8	167.8	178.7
Punjab	62.5	60.9	188.6	185.4	187.0	187.1	172.4
Rajasthan	67.1	64.5	173.7	169.9	171.8	171.8	173.1
Tamil Nadu	62.9	62.9	172.4	168.3	170.3	170.5	177.1
Uttar Pradesh	67.2	64.7	166.5	164.2	165.4	165.4	169.6
West Bengal	68.4	65.3	172.4	168.8	170.6	170.6	172.1
Delhi	55.8	56.9	180.1	170.5	175.2	175.7	177.1
All India	67.6	63.4	175.1	172.3	173.7	173.8	175.1

Note: Budget 43 and Budget 50 are the total shares of the budget (in percent) in the 43rd and 50th Rounds respectively of all the goods covered by the index. Data for All India are calculated from the complete survey, including those states and territories not listed separately, We do not have data for the CPIAL for Haryana nor for Jammu & Kashmir, nor the CPIIW for Jammu & Kashmir.

Table 4: Price indexes for Urban relative to Rural, 43rd and 50th Rounds

	Budget: urban	Budget: rural	Lasp-eyres Index	Paasche Index	Fisher Ideal Index	Törnq-vist Index	Expert Group Index	Un-covered price
43rd Round								
Andhra Pradesh	68.8	74.7	111.8	109.5	110.6	110.7	173.5	543.0
Assam	75.0	83.5	109.1	107.0	108.1	108.0	110.2	119.1
Bihar	75.5	80.4	108.5	107.7	108.1	108.1	133.9	285.6
Gujarat	72.7	80.0	106.3	104.5	105.4	105.4	152.7	504.9
Haryana	71.5	69.4	114.1	110.3	112.2	112.1	115.7	124.6
Himachal Pradesh	66.5	67.8	111.6	96.1	103.6	104.8	116.1	143.0
Jammu & Kashmir	72.5	72.5	104.6	102.8	103.7	103.8	166.8	159.4
Karnataka	71.4	77.2	110.4	108.9	109.6	110.0	163.9	519.4
Kerala	73.0	74.4	103.7	103.4	103.5	103.5	134.1	276.9
Madhya Pradesh	74.2	76.6	116.9	109.4	113.1	113.0	166.8	549.8
Maharashtra	69.1	73.8	114.9	113.1	114.0	114.1	159.5	369.2
Orissa	73.5	81.2	112.9	107.6	110.2	110.2	140.5	322.4
Punjab	64.7	68.6	115.6	110.8	113.2	113.2	116.4	123.2
Rajasthan	70.2	74.3	108.2	105.3	106.7	106.7	141.9	297.8
Tamil Nadu	68.8	79.3	109.7	108.4	109.0	109.0	147.9	353.0
Uttar Pradesh	69.7	71.8	120.0	116.1	118.1	118.1	135.1	187.0
West Bengal	71.9	81.8	112.9	112.4	112.6	112.7	115.3	124.3
All India	70.9	77.1	113.1	109.8	111.4	111.4	143.4	294.6
50th Round								
Andhra Pradesh	63.4	69.6	111.8	109.3	110.5	110.5	170.1	362.1
Assam	68.3	80.9	113.6	109.1	111.3	111.6	91.5	59.7
Bihar	71.7	77.0	112.6	112.3	112.5	112.5	112.4	112.2
Gujarat	67.6	74.6	106.9	103.4	105.1	105.2	147.1	295.8
Haryana	62.3	69.1	119.2	112.0	115.5	115.6	110.5	102.4
Himachal Pradesh	61.4	66.8	110.9	104.5	107.7	108.1	108.5	109.0
Jammu & Kashmir	58.2	67.1	109.2	104.9	107.0	107.0	n.a.	n.a.
Karnataka	64.3	69.1	111.3	109.9	110.6	110.6	162.3	323.8
Kerala	64.0	68.6	104.7	103.7	104.2	104.2	115.1	137.2
Madhya Pradesh	65.1	73.3	118.7	113.1	115.8	115.8	164.2	315.2
Maharashtra	61.7	67.4	121.2	115.4	118.3	118.2	168.5	298.5
Orissa	66.4	77.9	111.9	108.9	110.4	110.5	153.7	295.0
Punjab	62.8	68.5	116.3	112.0	114.1	114.2	108.5	99.46
Rajasthan	64.9	72.6	113.2	109.1	111.1	111.3	130.1	173.6
Tamil Nadu	63.3	70.1	111.0	108.5	109.8	109.7	150.9	261.7
Uttar Pradesh	66.2	69.2	118.3	114.5	116.4	116.5	121.4	131.7
West Bengal	65.3	75.4	119.6	115.0	117.3	117.5	112.1	102.7
All India	65.8	73.7	117.5	113.7	115.6	115.6	136.7	188.7

Table 5: Price indexes for States relative to All India, 43rd Round, 1987–88

	Share of budget	Laspeyres Index	Paasche Index	Fisher Ideal Index	Törnqvist Index	Expert Group Implicit
Rural						
Andhra Pradesh	75.5	98.3	90.9	94.6	94.0	79.6
Assam	84.3	108.1	104.2	106.1	106.7	110.4
Bihar	81.2	104.4	104.5	104.5	104.6	104.3
Gujarat	80.4	111.3	110.0	110.5	110.5	99.6
Haryana	70.4	104.0	94.7	99.3	98.9	106.5
Himachal Pradesh	70.8	103.9	100.0	101.9	101.6	106.5
Jammu & Kashmir	73.7	97.9	92.9	95.4	95.1	107.7
Karnataka	77.6	102.6	97.1	99.8	99.3	90.5
Kerala	74.7	111.5	99.2	105.2	104.9	113.2
Madhya Pradesh	77.8	96.6	92.9	94.8	94.2	92.7
Maharashtra	74.5	105.2	102.7	103.9	103.8	100.2
Orissa	82.4	99.1	94.3	96.7	96.6	105.2
Punjab	68.8	100.2	88.8	94.3	94.2	106.5
Rajasthan	75.3	112.2	97.7	104.7	103.9	101.8
Tamil Nadu	79.6	109.4	102.9	106.1	105.5	102.4
Uttar Pradesh	72.0	94.6	88.2	91.3	91.4	99.3
West Bengal	82.1	100.2	98.3	99.2	99.2	111.9
All India	71.0*	100.0	100.0	100.0	100.0	100.0
Urban						
Andhra Pradesh	69.0	96.8	91.4	94.1	94.0	96.3
Assam	75.0	104.4	101.0	102.7	103.0	84.8
Bihar	75.7	102.6	98.7	100.6	100.5	97.3
Gujarat	73.3	112.0	107.9	110.0	109.5	106.0
Haryana	71.7	102.8	100.3	101.6	101.5	85.8
Himachal Pradesh	66.7	101.0	94.9	97.9	98.2	86.1
Jammu & Kashmir	72.6	94.9	90.3	92.6	92.2	87.7
Karnataka	71.6	99.6	96.8	98.2	98.2	103.4
Kerala	73.1	103.0	92.4	97.5	97.6	105.8
Madhya Pradesh	75.6	100.4	96.6	98.5	98.2	107.8
Maharashtra	69.4	109.1	106.6	107.9	107.8	111.3
Orissa	74.0	96.3	91.5	93.8	94.0	103.0
Punjab	64.9	99.3	94.7	97.0	96.6	86.4
Rajasthan	70.5	106.8	97.5	102.1	101.5	100.7
Tamil Nadu	68.9	102.0	99.8	100.9	100.8	105.6
Uttar Pradesh	69.8	102.0	96.3	99.1	98.8	93.5
West Bengal	72.2	102.8	98.4	100.6	100.1	90.0
Delhi	60.2	105.1	102.2	103.7	102.8	106.5
All India	66.5*	100.0	100.0	100.0	100.0	100.0

Notes: * indicates the average over all the states. The implicit Expert Group price index is obtained from Table 4.1 of the Expert Group report by dividing the state poverty lines by the All India poverty lines.

Table 6: Price indexes for States relative to All India, 50th Round, 1994–94

	Share of budget	Laspeyres Index	Paasche Index	Fisher Ideal Index	Törnqvist Index
Rural					
Andhra Pradesh	71.1	104.8	93.5	99.0	97.9
Assam	81.9	114.4	104.6	109.4	109.3
Bihar	77.4	98.9	96.9	97.9	98.1
Gujarat	75.4	118.7	114.5	116.6	116.5
Haryana	69.7	107.2	99.8	103.4	103.3
Himachal Pradesh	74.2	107.4	101.6	104.5	104.5
Jammu & Kashmir	71.1	105.9	102.2	104.0	104.1
Karnataka	72.8	105.7	101.7	103.7	103.5
Kerala	68.7	119.5	105.7	112.4	112.7
Madhya Pradesh	74.2	95.6	93.0	94.3	94.2
Maharashtra	69.5	110.0	100.7	105.2	105.7
Orissa	80.0	99.0	87.4	93.0	92.8
Punjab	68.9	109.9	101.1	105.4	105.0
Rajasthan	73.3	112.2	100.7	106.3	105.5
Tamil Nadu	70.8	114.1	102.0	107.9	107.0
Uttar Pradesh	70.0	94.8	89.4	92.1	91.8
West Bengal	75.6	99.7	94.2	96.9	96.6
All India	66.9*	100.0	100.0	100.0	100.0
Urban					
Andhra Pradesh	63.6	98.0	90.9	94.4	94.0
Assam	68.6	109.1	102.4	105.7	105.9
Bihar	72.0	98.1	93.4	95.8	95.7
Gujarat	68.2	105.8	104.6	105.2	105.2
Haryana	63.0	101.6	100.1	100.9	100.9
Himachal Pradesh	61.7	101.4	97.3	99.4	99.3
Jammu & Kashmir	62.3	97.3	94.3	95.8	95.7
Karnataka	64.4	101.4	98.0	99.7	99.4
Kerala	64.1	106.8	94.9	100.7	100.5
Madhya Pradesh	65.6	95.6	94.0	94.8	94.8
Maharashtra	62.2	112.2	108.9	110.6	110.6
Orissa	67.7	93.8	87.1	90.4	90.6
Punjab	63.2	103.2	100.4	101.8	101.7
Rajasthan	65.6	104.9	95.8	100.2	99.7
Tamil Nadu	63.5	105.1	97.1	101.0	100.4
Uttar Pradesh	66.3	96.8	91.9	94.3	94.1
West Bengal	65.6	103.2	97.5	100.3	100.0
Delhi	58.6	109.3	103.4	106.3	106.3
All India	60.5*	100.0	100.0	100.0	100.0

Note: * indicates the average over all states.

Table 7: Official poverty lines and Head Count Ratios, 43rd and 50th Round

	Poverty lines 1987–88	Head Count Ratio 1987–88	Poverty lines 1993–94	Head Count Ratio 1993–94	Change in HCR
Rural					
Andhra Pradesh	91.94	21.04	163.02	15.89	–5.14
Assam	127.44	39.42	232.05	45.20	5.78
Bihar	120.36	53.91	212.16	57.95	4.04
Gujarat	115.00	28.56	202.11	22.16	–6.40
Haryana	122.90	15.34	233.79	28.25	12.91
Himachal Pradesh	122.90	16.68	233.79	30.36	13.68
Karnataka	104.46	32.62	186.63	30.10	–2.52
Kerala	130.61	29.45	243.84	25.37	–4.08
Madhya Pradesh	107.00	42.02	193.10	40.71	–0.31
Maharashtra	115.61	40.95	194.94	37.91	–3.04
Orissa	121.42	58.67	194.03	49.83	–8.80
Punjab	122.90	12.81	233.79	11.69	–1.12
Rajasthan	117.52	33.30	215.89	26.39	–6.91
Tamil Nadu	118.23	46.34	196.53	32.95	–13.39
Uttar Pradesh	114.57	41.92	213.01	42.32	0.40
West Bengal	129.21	48.80	220.74	41.18	–7.72
All India	115.43	39.18	205.84	37.21	–1.97
Urban					
Andhra Pradesh	159.50	44.51	278.14	38.82	–5.69
Assam	140.45	17.43	212.42	7.92	–9.51
Bihar	161.19	57.65	238.49	34.84	–22.81
Gujarat	175.57	39.94	297.22	28.27	–11.67
Haryana	142.15	17.63	258.23	16.46	–1.17
Himachal Pradesh	142.63	6.98	253.61	9.26	2.28
Karnataka	171.23	49.19	302.89	39.90	–9.29
Kerala	175.11	45.07	280.54	24.31	–20.76
Madhya Pradesh	178.44	47.26	317.15	48.08	0.82
Maharashtra	184.45	38.93	328.56	34.99	–3.94
Orissa	170.63	44.20	298.22	40.63	–3.57
Punjab	143.11	12.96	253.61	10.90	–2.06
Rajasthan	166.72	38.76	280.85	31.02	–7.74
Tamil Nadu	174.82	44.09	296.63	39.91	–4.18
Uttar Pradesh	154.78	45.21	258.65	35.09	–10.12
West Bengal	148.95	33.18	247.53	22.94	–10.24
All India	165.58	40.00	281.35	32.62	–7.38

Table 8: Official price indexes and implicit price deflators: 1993–94 versus 1987–88

	CPIAL	Implicit Rural Price Deflator	CPIIW	Implicit Urban Price Deflator
Andhra Pradesh	177.3	177.3	175.9	174.5
Assam	181.6	182.1	179.7	151.2
Bihar	175.6	176.3	168.6	148.0
Gujarat	175.2	175.7	173.0	169.3
Haryana	..	..	180.6	181.7
Karnataka	178.7	178.7	180.8	176.9
Kerala	186.4	186.7	174.9	160.2
Madhya Pradesh	179.8	180.5	174.1	177.7
Maharashtra	168.6	168.6	183.3	178.1
Orissa	159.9	159.8	178.7	174.8
Punjab	191.0	190.2	172.4	177.2
Rajasthan	186.1	183.7	173.1	168.5
Tamil Nadu	167.0	166.2	177.1	169.7
Uttar Pradesh	186.0	185.9	169.6	167.1
West Bengal	170.2	170.8	172.1	166.2
All India	176.3	178.3	175.1	169.9

Notes: The CPIAL and CPIIW are repeated from Table 3. The implicit rural and urban price deflators come from [Source} and from the Expert Group report, and are obtained by dividing the 1993–94 poverty lines (based on the Expert Group methodology) by the lines reported in the Expert Group report itself.

Table 9: Sensitivity of Head Count Ratios and Alternative Estimates

	ΔHCR 43	ΔHCR 50	ΔlnP	HCR50	HCR50 New	Change 43–50	Change 43–50 New
Rural							
Andhra Pradesh	0.70	0.56	–0.8	15.89	15.49	–5.14	–5.55
Assam	1.11	1.17	–4.4	45.20	39.86	5.78	0.44
Bihar	1.11	0.87	–9.1	57.95	48.63	4.04	–4.28
Gujarat	0.93	0.76	–2.6	22.16	20.44	–6.40	–8.12
Karnataka	0.84	1.00	–2.0	30.10	28.07	–2.52	–4.55
Kerala	0.92	0.66	–7.6	25.37	20.63	–4.08	–8.82
Madhya Pradesh	0.97	0.91	–4.4	40.71	36.51	–0.31	–5.51
Maharashtra	0.85	0.74	2.4	37.91	39.69	–3.04	–0.62
Orissa	0.93	1.03	2.9	49.83	52.60	–8.80	–6.07
Punjab	0.62	0.64	–0.2	11.69	11.51	–1.12	–1.30
Rajasthan	0.80	0.92	–10.3	26.39	17.82	–6.91	–15.48
Tamil Nadu	0.78	0.86	0.4	32.95	33.20	–13.39	–13.14
Uttar Pradesh	0.88	0.86	–9.7	42.32	33.72	0.40	–8.20
West Bengal	0.89	0.96	–2.2	41.18	39.12	–7.72	–9.68
All India	0.89	0.91	–3.7	37.21	33.90	–1.97	–5.28
Urban							
Andhra Pradesh	0.66	0.77	0.7	38.82	39.56	–5.69	–4.95
Assam	0.75	0.66	–1.1	7.92	7.84	–9.51	–9.59
Bihar	0.65	0.91	–2.0	34.84	32.96	–22.81	–24.69
Gujarat	0.96	0.62	–4.4	28.27	25.28	–11.67	–14.66
Haryana	0.72	0.46	–1.7	16.46	15.79	–1.17	–1.84
Karnataka	0.80	0.66	–2.0	39.90	38.74	–9.29	–11.35
Kerala	0.65	0.69	–0.8	24.31	23.93	–20.76	–22.14
Madhya Pradesh	0.77	0.69	–1.8	48.08	46.70	0.82	–0.46
Maharashtra	0.59	0.66	–1.2	34.99	34.05	–3.94	–4.88
Orissa	0.88	0.80	–6.1	40.63	36.21	–3.57	–7.99
Punjab	0.58	0.66	8.5	10.90	15.36	–2.06	2.40
Rajasthan	0.77	0.77	–0.8	31.02	30.79	–7.74	–7.97
Tamil Nadu	0.74	0.84	–3.7	39.91	36.68	–4.18	–7.31
Uttar Pradesh	0.80	0.82	–2.5	35.09	32.63	–10.12	–12.58
West Bengal	0.91	0.56	–0.9	22.94	22.48	–10.24	–10.70
All India	0.70	0.73	–0.7	32.62	32.05	–7.38	–7.95

Notes: ΔHCR is the estimated derivative of the head count ratio with respect t the logarithm of the updating price index. ΔlnP is the difference between our price index and the corresponding official index, and is the difference between the last two columns in Table 3. HCR50 is replicated from Table 7. HCR50 new is the head count ratio in 1993–94 when the updating indexes for the Expert Group methodology are modified by ΔlnP. The change for 43–50 is replicated from Table 7, and the new change 43–50 is the difference between the HCR43 (Tble 7) and HCR50 new.

Table 10: Official and alternative headcount ratios for 1993–94 and change since 1987–88

	Official	New 1	New 2	New 3	New 43rd	Change
Rural						
Andhra Pradesh	15.89	15.89	33.52	28.97	34.76	–5.79
Assam	45.20	45.20	41.65	35.22	35.93	–0.71
Bihar	57.95	57.95	53.33	48.37	54.18	–5.81
Gujarat	22.16	22.16	37.22	32.36	39.25	–6.89
Haryana	28.25	28.25	19.66	16.98	13.50	3.48
Himachal Pradesh	30.36	30.36	21.34	17.14	12.75	4.39
Jammu & Kashmir	n.a.	n.a.	13.66	10.13	15.18	–5.05
Karnataka	30.10	30.10	42.46	37.75	40.64	–2.89
Kerala	25.37	25.37	22.36	19.35	23.69	–4.34
Madhya Pradesh	40.71	40.71	41.24	36.55	43.48	–6.93
Maharashtra	37.91	37.91	46.74	42.65	44.10	–1.45
Orissa	49.83	49.83	47.89	43.36	50.08	–6.72
Punjab	11.69	11.69	8.56	6.16	6.61	–0.45
Rajasthan	26.39	26.39	26.84	22.88	35.09	–12.21
Tamil Nadu	32.95	32.95	43.26	38.16	48.67	–10.51
Uttar Pradesh	42.32	42.32	32.38	28.53	34.80	–6.27
West Bengal	41.18	41.18	29.35	24.88	35.96	–11.08
All India, direct	37.21	37.21	37.21	32.94	39.18	–6.86
All India, weighted average	37.21	37.21	37.21	32.84	38.29	–5.45
Urban						
Andhra Pradesh	38.82	9.61	20.78	17.67	23.60	–5.93
Assam	7.92	17.93	16.26	12.57	13.00	–0.43
Bihar	34.84	34.97	30.54	26.55	37.14	–10.59
Gujarat	28.27	8.08	17.76	14.59	20.12	–5.53
Haryana	16.46	18.99	14.85	10.55	12.81	–2.26
Himachal Pradesh	9.26	9.26	5.61	3.64	2.11	1.53
Jammu & Kashmir	n.a.	n.a.	3.89	2.88	4.97	–2.09
Karnataka	39.90	16.03	24.50	21.35	25.71	–4.36
Kerala	24.31	18.34	15.98	13.87	20.97	–7.10
Madhya Pradesh	48.08	20.83	21.22	18.22	22.47	–4.25
Maharashtra	34.99	15.67	20.65	18.14	21.69	–3.55
Orissa	40.63	18.97	17.89	14.90	19.47	–4.57
Punjab	10.90	14.19	9.11	7.75	6.66	1.09
Rajasthan	31.02	20.37	20.75	18.23	20.77	–2.54
Tamil Nadu	39.91	16.13	24.25	20.67	24.49	–3.82
Uttar Pradesh	35.09	32.13	24.20	21.45	30.66	–9.21
West Bengal	22.94	25.19	18.99	15.15	22.08	–3.62
All India	32.62	21.36	21.36	18.46	22.56	–4.10
All India, weighted average	33.87	19.55	21.15	18.11	22.45	–4.34

Notes: see next page

Notes to Table 10:

1. The first column, "Official." repeats the Expert Group poverty counts for 1993–94, and repeats column 4 of Table 7. In the second column, labeled "New 1" takes the Expert Group rural poverty lines as given, so that the rural figures are the same as in the first column. However, the urban poverty lines are calculated using the Expert Group rural poverty lines and multiplying by the urban to rural Törnqvist price indexes reported in the bottom panel of Table 4. The third column, labeled "New 2" uses only the All India rural poverty line (205.8, see Table 7) from the Expert Group method. The rural lines for each state are created from the All India line using the state Törnqvist price indexes from the top panel of Table 6, and the urban lines are created from the rural lines using the urban to rural price indexes as in column 2. Column 4, labeled "New 3," uses the All India Expert Group poverty line for 1987–88, 115.43, see Table 7. This is updated to 1993–94 using the All India Törnqvist rural price index, 169.8 from Table 3. The rural and urban state level poverty lines are then created as in column 3. Column 5, labeled "New 43rd" uses the corresponding procedure for the 43rd Round, starting from 115.34, and creating rural poverty lines from the state indexes from the 43rd Round, and converting to urban lines using the urban to rural price indexes for the 43rd Round. The final column, labeled "Change" is the Column 5 minus Column 4 and shows the estimated change in the head count ratios using the preferred methodology.

2. The All India headcount ratios are calculated using the All India poverty lines (urban and rural) for all households in the sample, so that they estimate the fraction of the rural(urban) population below the rural (urban) All India poverty line. An alternative procedure is to "add up" the numbers of poor in each state to get a All India total. These estimates are shown in the row marked "All India: weighted average" and are the state-level head count ratios weighted by the population share in each state. These estimates exclude small states and territories not explicitly listed. The states shown cover 98.58 percent of the rural and 94.88 percent of the urban population.

Table A1: List of commodities in 50th Round

Paddy	Urd - P.D.S.	Eggs	Mango	Cooked Meals
Rice - P.D.S.	Urd - other sources	Egg Products	Kharbooza	Cake, Pastry
Rice - other sources	Khesari - P.D.S.	Fish (fresh)	Pears (naspati)	Pickles
Chira	Khesari - other	Fish (dry)	Berries	Sauce
Khoi, Lawa	Peas	Fish (canned)	Leechi	Jam/Jelly
Muri	Soyabean	Other meat, etc	Apple	Other Proc Food
Other Rice Products	Other Pulses	Potato	Grapes	Pan, leaf
Wheat - P.D.S.	Besan	Onion	Other Fresh Fruits	Pan, finished
Wheat - other	Other Pulse Products	Radish	Coconut (copra)	Supari
Atta - P.D.S.	Milk, liquid	Carrot	Groundnut	Lime
Atta - other sources	Baby Food	Turnip	Dates	Katha
Maida	Milk, cond./Powder	Beet	Cashew Nuts	Other Pan ingred.
Suji, Rawa	Curd	Sweet Potato	Walnuts	Bidi
Seewai, Noodles	Ghee	Arum	Other Nuts	Cigarettes
Bread, Bakery	Butter	Other Root Veg.	Raisins(kishmish	Leaf Tobacco
Other Wheat prods	Ice-cream	Pumpkin	Other Dry Fruits	Snuff
Jowar - P.D.S.	Other Milk Products	Gourd	Sugar (crystal) PDS	Hookah Tobacco
Jowar - other	Vanaspati - P.D.S.	Bitter Gourd	Sugar (crystal) other	Cheroot
Jowar Products	Vanaspati - other	Cucumber	Khandsari	Zarda, Kimam, Serti
Bajra - P.D.S.	Margarine	Parwal/Patal	Gur (cane)	Other Tobacco prod
Bajra - other	Mustard Oil - P.D.S.	Jhinga/Torai	Gur (others)	Ganja
Bajra Products	Mustard Oil - other	Snake Gourd	Sugar Candy (misri)	Toddy
Maize - P.D.S.	Groundnut Oil, PDS	Other Gourd	Honey	Country Liquor
Maize - other	Groundnut Oil -other	Cauliflower	Sugar (others)	Opium, Bhangharas
Maize Products	Coconut Oil - P.D.S.	Cabbage	Sea Salt	Beer
Barley	Coconut Oil - other	Brinjal	Other Salt	Foreign Ref.Liquor
Barley Products	Gingelly Oil - P.D.S.	Lady's Finger	Turmeric	Other Drugs and
Small Millets	Gingelly Oil - other	Palak	Black Pepper	Intoxicants
Small Millets prods	Linseed Oil - P.D.S.	Other Leafy Veg.	Dry Chillies	Coke
Ragi	Linseed Oil - other	French Beans,	Garlic	Firewood and Chips
Ragi Products	Refined Oil - P.D.S.	Tomato	Tamarind	Electricity
Gram (whole grain)	Refined Oil - other	Peas	Ginger	Dung Cake
Gram Products	Palm Oil - P.D.S.	Chili (green)	Curry Powder	Kerosene - P.D.S.
Tapioca/Sago	Palm Oil - other	Capsicum	Other Spices	Kerosene - other
Tapioca (green)	Rapeseed Oil P.D.S.	Plantain (green)	Tea, cups	Matches
Mahua	Rapeseed Oil - other	Jackfruit (green)	Tea, leaf	Coal - P.D.S.
Jackfruit seed	Oil seeds	Lemon	Coffee, cups	Coal - other sources
Other Cereal Subs	Edible Oils (others)	Other Vegetables	Coffee, powder	Coal Gas
Arhar (tur) - P.D.S.	Goat Meat	Banana	Ice	L.P.G.
Arhar - other	Mutton	Jackfruit	Cold Beverage	Charcoal
Gram (split) - P.D.S.	Beef	Water Melon	Fruit Juice, Shake	Other Lighting Oils
Gram (split) - other	Pork	Pineapple	Coconut, green	Candles
Moong - P.D.S.	Buffalo Meat	Coconut	Other Beverages	Methylated Spirits
Moong - other	Other Meat	Guava	Biscuits & Confect	Gobar Gas
Masur - P.D.S.	Chicken	Singara	Salted Refreshment	Other Fuel and
Masur - other	Other Birds	Orange, Mausami	Prepared Sweets	Light

Table A2: List of commodities excluded because of lack of quantity data

Egg products
Other fresh fruit
Other beverages
Biscuits & confectionery
Salted refreshments
Prepared sweets
Other processed food
Other drugs and intoxicants
Dung cakes
Gobar gas
Other fuel and light

Table A3: List of commodities excluded from 43rd Round calculations

(in addition to those listed in Table A2)

Other wheat products
Ice cream
Other milk products
Other nuts
Other dried fruit
Ice
Fruit juice/shakes
Other pan ingredients
Other oil for lighting
LPG
Candles
Methylated spirits

Table A4: List of commodities excluded from 50th Round calculations

(in addition to those listed in Table A2)

Other cereal substitutes
Other spices
Ice cream
Other milk products
Other birds
Other meat, eggs, and fish
Other nuts
Coconuts
Tea (cups)
Coffee powder
Ice
Cold drinks
Cakes and pastries
Pan leaf
Other pan ingredients
Hookah tobacco
Opium
Toddy
Other oil for lighting

Table A5: List of commodities excluded from 43rd and 50th Round comparisons

(in addition to the union of commodities listed in Tables A4 and A5)

Goods whose units changed:

Lemons
Guavas

Goods whose units appear to have changed:

Coal gas
Cheroots
Zarda, kimam and serti
Other tobacco
Ganja