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# Poverty in India since 1983: New Poverty Counts and Robust Poverty Comparisons

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*This is the third in a set of papers discussing Poverty Lines (PL) and poverty aggregates in India published in this journal (Dubey and Palmer-Jones, 2005a; 2005b). In earlier papers we criticised the Unit Value based CPIs and the method of computing PLs from these UV CPIs which have been proposed as an improvement over the official CPIs used to compute PLs and poverty by the Indian Planning Commission (PC) (Deaton and Tarrozi, 1999; Deaton, 2003a). We proposed some improvements but noted remaining lacunae. In this paper we report these PLs and the poverty aggregates we have calculated from them (without adjustment to the 55th Round).*

*Our results suggest somewhat higher PLs in western India compared to eastern and central India, as do those of Deaton. This translates into only slightly more poverty because the distributions of per capita expenditure dominate these comparisons in relation to variations in poverty lines. Our urban PLs are higher than Deaton's but still lower than the Official PLs; they are lower in smaller than larger towns. Our poverty counts are higher than Deaton's but lower than the OPCs. Hence our state poverty counts generally lie between the OPCs and Deaton's.*

*"Robust" poverty comparisons using stochastic dominance tests largely confirm the rankings of states by simple poverty aggregates, but do not overcome the problems with the use of inaccurate expenditure deflators. That there are such problems suggested by the relatively low correlations between these poverty aggregates and some other indicators of well-being that can be drawn from the Indian Census and the Indian Demographic and Health Surveys. We conclude that poverty counting may be useful to confirm that there is a lot of poverty, but are of little value in analysing policies to address ill-being, at least using current practices.*

*Several priorities emerge for improvements to current practices for measuring poverty; the two most important are a radical overhaul to the official price indexes and changes in the NSS Consumer Expenditure Survey so that it can be used to produce credible welfare comparisons. The changes to the CPIs will involve both the production of the price data and the compilation and updating of weights. The CES need changes to both the survey schedule and the compilation of welfare aggregates. Maintaining continuity with earlier series on poverty should not be the over-riding concern, since this series is clearly thoroughly flawed and it is unlikely that widely agreeable comparisons can be salvaged. A final conclusion must be that existing explanations of levels and changes in poverty using traditional poverty calculations will need reconsideration in the light of uncertainty as to validity the current poverty estimates.*

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The work on which this paper is based was largely funded under R8256 of the Social Science research Committee of the Department for International Development of the UK Government. Dr. Kunal Sen and Professor Ashok Parikh of the University of East Anglia were collaborators in this project. Though in the study we carried out this exercise for both India and Bangladesh, in this paper we discuss the issues surrounding Indian debates; work on Bangladesh will be reported elsewhere. Access to official price data was provided by Officials at Labour Bureau, Shimla. Data from the 38th, 43rd and 50th Rounds of the NSS were made available by NSSO under the collaborative agreement between the Overseas Development Group and the NSSO. We gratefully acknowledge their support. The views put forward here are not necessarily endorsed either by DFID of the NSSO, or indeed by our collaborators.

## I Introduction

The levels of and change in poverty in India especially in the 1990s is a question that has elicited great interest from researchers and policy makers in India, as well as, around the World (Economic and Political Weekly, 2003; Sen and Himanshu, 2004; Bhalla and Das, 2004; Deaton and Kozel, 2004). Commentaries on poverty levels and trends in India in this period are framed in the broader context of economic liberalization and its impact on poor, so firm conclusions as to these trends and levels would be of great interest for pro-poor policy. Two major issues have emerged; firstly, concerning the consumer price indexes used to commensurate expenditures in different domains so that poverty lines reflecting the same standard of living can be established and secondly, whether the expenditure figures for the 55th round are comparable with earlier rounds. We are mainly concerned with the former issue and its implications. While we are sceptical of the validity of adjustments that have been made to 55th Round poverty aggregates (Popli, Parikh and Palmer-Jones, 2005 in this journal), we suggest they mainly affect the temporal rather than spatial comparisons involving that Round. We do not make any adjustments to the 55th round apart from using the Mixed Recall Period calculation of Monthly Per Capita Expenditure when explicitly comparing the 55th with earlier rounds.

In the last two papers we have argued that, while the Official Poverty Lines produced by the Indian Planning Commission are suspect[1], the Unit Value Consumer Price Index (UV CPI) based Poverty Lines (PL) calculated and used in poverty calculations by Deaton and his associates (Deaton and Tarrozi. 1991; Deaton and Dreze, 2002; Deaton, 2003a & b) serve mainly to underscore the problem with the Indian price data rather than to provide credible alternative poverty lines. We have pointed out that the unit values calculated from NSS data are subject to many errors; most significantly, the unit values are multimodal as a rule rather than exception and the UV CPIs cover only about two-thirds of expenditures recorded in the Consumer Expenditure Surveys (CES).

In addition to this, there is considerable intra-state spatial variation in UVs and in the budget shares covered by UV items (and hence in UV CPIs), as well as, variations by expenditure group. The assumption that prices of left out commodities (non-UV items) change in the same proportion as UV CPIs is probably not tenable. Further, the weights used in CPI calculations need to reflect actual differences in expenditure patterns around poverty lines appropriate in each domain (since poverty clearly varies greatly) rather than (democratic) averages. Equally important are the differences between rural and urban expenditure patterns, particularly the difference in the share of expenditure on items not included in the UV CPIs (non-UV items), which make Deaton's urban-rural PL differentials of around 15 per cent, unrealistic. We have suggested some remedies, some of which can be more readily implemented than others; however, a large area of uncertainty remains both as to the appropriate prices and weights to use for non-UV items, how to deal with the different share of expenditure that they constitute in different domains and what to do about "environmental" variables (public goods, the environment and culture) that have an effect on the transformation of consumption into well-being.

Our main motivation in revisiting the poverty counts in India, not withstanding the caveats entered above, lies in the possibility of triangulation with other indicators of well-being, as well as, comparison with existing assessments of poverty. In order to keep

[1] *See also* Sen, and Saith, 2005 for recent accounts of some of the problems.

our calculations in the larger context of Indian poverty debate we find that within the last ten years five different sets of poverty ratios have been in circulation. These include poverty incidence in India and Indian states by Dubey and Gangopadhyay, 1998 (D&G), for 1987-88 and 1993-94; Deaton and Tarozzi, 1999 (D&T); for 1987-88 and 1993-94; Deaton, 2003a, for 1999-2000 (also Deaton, 2003b) for 1987-88, 1993-94 and 1999-2000); Sundaram and Tendulkar, 2003a & b) for 1993-94 and 1999-2000; and Sen and Himanshu, 2004a & b (S&H), for 1987-88, 1993-94 and 1999-2000. Besides these, revised official poverty incidence for India and Indian states were released by the Planning Commission in 1997 for the period 1973-74 to 1993-94 (GOI, 1997) covering five quinquennial rounds of NSS survey and again in 2001 for the 55th round GOI (2001).

In countries where the population experiences levels of deprivation that are common in India, the absolute concept of poverty, for all its problems, is relevant and health and nutritional indicators are likely to be highly correlated with a proper measure of this concept. The Indian Census and the large-scale Demographic and Health Surveys can provide estimates of some such variables at the levels of disaggregation, which the NSS Consumer Expenditure Surveys (CES) allow and hence bear comparison with welfare aggregates such as, poverty computed from the CES. If these indicators are not well associated with the poverty indicators then this provides a *prima facie* case that the latter are faulty[2].

Like other researchers and official agencies concerned with Indian poverty, we use household level data collected by the National Sample Survey Organisation (NSSO). We use the 4 quinquennial thick rounds of the NSS CES including the 38th Round conducted in 1983, the 43rd, in1987/88, the 50th in 1993/94 and the 55th in 1999/00. For each of these rounds we calculate poverty incidences for all-India (including only the major states[3]), as well as, for the major states individually, divided into rural and urban sectors; we also calculate poverty for each NSS Region within the major states again for the rural and urban sectors and for each town-size within each NSSR[4]. Including a focus on the 1980s, as well as, the 1990s allows us to begin to evaluate the methods and results reported by other researchers which, some argue, may be preferred to the official poverty ratios.

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[2] Some authors argue that relationships between health and nutrition variables and standard of living will be contingent (e.g. Micklewright and Ismail, 2001). An appropriate operationalisation of the concept of poverty as a measure of the extent of ill-being, in such an absolutely poor arena as India, that does not correlate well with health and nutritional status clearly does render the poverty measures suspect, especially when an appropriate conceptualisation is offered that supports this view (as in Dubey and Palmer-Jones, 2005b). Suppose it is argued that when public expenditure is included with the poverty measure in the explanation of nutritional status a higher level of explanation of health and nutritional statuses is achieved. We would respond that (a) then it is clear that the poverty aggregate is not a satisfactory measure of well-being on its own, since public expenditure must also be included to obtain a high level of explanation and (b) it is rather unlikely that the relationships among these variables is stable over space or time (or, rather, that it is contingent on other variables). Hence, policy conclusions drawn from any one such model are likely to be rather specific to particular domains and thus not a particularly good basis for policy conclusions for other domains.

[3] We exclude minor states and Union Territories because there are not sufficient observations in the CES to reasonably compute UVs and we do not adopt the practice of either using the PLs of a neighbouring major state (D&G), or of merging them with a neighbour to calculate UVs.

[4] We accept that the sample sizes from the central sample alone for many NSSR are small for the calculation of UVs, UV CPIs and PLs; the adjustments for non-UV items have to the same for all NSSR within a state as the sub-groups of the official price CPIAL and CPIIW for non-UV items are not available at NSSR levels. Nevertheless, the NSSR level calculations are relevant as illustrations of the possible outcomes when poverty is calculated at a more disaggregated level than is usually done.

The rest of this paper is organized in the following manner. In the next section we compare our poverty lines with those used by the PC and Deaton. This is followed by the discussion of a new set of estimates of poverty in India and their sensitivity to methods and domains of calculation. Section IV compares the poverty counts with the robust poverty measures based on stochastic dominance and suggests an apparently novel way of presenting the issue of uncertainty over poverty lines. Section V compares various poverty counts with other welfare indicators and Section VI summarizes and draws conclusions and recommendations.

## II Measurement of Poverty: PLs and Expenditure Distribution

We have expressed reservations about the methods of constructing poverty lines used by others and also about the improvements we have suggested (Dubey and Palmer-Jones, 2005a & b); nevertheless it is useful to show the patterns that arise. The overall impression is of considerable similarity in the rankings of geographical areas and over time, although there are some notable re-rankings. The similarities in rankings of areas are greater in the rural than the urban sector. Nevertheless, there are significant differences in the levels of poverty lines and of poverty between the results produced by different authors. Ours are more similar to Deaton's than to the Official Poverty Lines and counts, not surprisingly, but in the urban sector we calculate poverty nearer on the whole to the Official counts than Deaton's. None of this is particularly surprising, given that we use very similar methods for the rural sector to Deaton, but in the urban sector our preferred PLs are significantly greater.

### *Poverty Lines*

In this section we present our PLs for comparison with the Official PLs and those produced by Deaton. Of the several PLs that we calculated, we present only those which mimic Deaton's method using our UVs computed at NSSR level and those which were computed including the adjustment for the different share of non-UV items in expenditure in different domains. Our poverty lines that mimic Deaton's method but are based on the OPLR38 are termed "rpj"; in the urban sector these do not include our allowance for the higher non-UV share. When we include the different shares of non-UV items in the urban sector they are termed "rpj1"; and when the urban PLs are compute for towns of different size they are termed "rpj2". We do not present our PLs computed using the different non-UV CPIs taken from the non-UV sub-group indexes of the official CPIAL and CPIIW, as we do not consider the results to be sufficiently robust.

### *State Poverty Lines*

Table 1 provides three sets of PLs computed at state level. Those for the rural and urban sectors are also shown in Maps 1 & 2. In the rural sector PLs based on UV CPIs are somewhat higher in the western and to some extent southern regions than OPLs. In the urban sector the spatial patterns appear more similar between the different PLs, notwithstanding the differences in levels. These spatial differences in the rural sector and differences in levels in the urban sector with the OPLs may be due in part to the omission of non-UV items, as well as, to differences in the CPIs of UV items; they are further evidence that the issues of CPIs and PLs need further examination.

To take the issue of urban PLs further; one of the major objections of D&T to the OPLs is that urban OPLs in some states are implausible. Figure 1 shows that our urban PLs are higher Deaton's, but are still generally not as high as the Official Poverty Lines.

This result follows from our criticism of Deaton's method that it underestimates the expenditure required in urban areas on items that are not included in the UV CPIs. The NSS data show that when deflated using the UV CPIs urban consumers spend significantly more on non-UV items (less on UV items; see Table 2). To accept Deaton's method, which makes no allowance for this difference other than that resulting from the difference in UV CPIs, either one must assume that urban consumers can reduce their expenditure on UV items compared to rural consumers to make room for the higher expenditure on non-UV items, or one must accept that they are able to attain the same standard of living while cutting back considerably on food and fuel, or that under Deaton's procedure they are at a lower standard of living in urban areas compared to rural at his PLs[5].

Table 1: State Poverty Lines, 38th - 55th Rounds

| | State50 | Rural | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | | Opl | deaton | rpj | Opl | deaton | Rpj | rpj2 |
| 38th | All-India | 89.50 | | 89.50 | 115.65 | | 99.05 | 109.06 |
| | Andhra Pradesh | 72.66 | | 82.19 | 106.43 | | 88.92 | 105.80 |
| | Assam | 98.32 | | 93.63 | 97.51 | | 104.52 | 106.78 |
| | Bihar | 97.48 | | 94.17 | 111.80 | | 103.95 | 101.77 |
| | Gujarat | 83.29 | | 96.51 | 123.22 | | 102.44 | 108.11 |
| | Haryana | 88.57 | | 91.45 | 103.48 | | 97.02 | 108.48 |
| | Himachal Pradesh | 88.57 | | 87.33 | 102.26 | | 99.24 | 118.25 |
| | J&K | 91.75 | | 84.96 | 99.62 | | 84.17 | 97.51 |
| | Karnataka | 83.31 | | 95.67 | 120.19 | | 101.03 | 108.47 |
| | Kerala | 99.35 | | 96.00 | 122.64 | | 98.87 | 102.14 |
| | Madhya Pradesh | 83.59 | | 82.89 | 122.82 | | 92.27 | 106.57 |
| | Maharashtra | 88.24 | | 94.46 | 126.47 | | 109.56 | 107.82 |
| | Orissa | 106.28 | | 90.24 | 124.81 | | 101.09 | 113.40 |
| | Punjab | 88.57 | | 84.79 | 101.03 | | 97.97 | 100.70 |
| | Rajasthan | 80.24 | | 88.29 | 113.55 | | 95.11 | 106.84 |
| | Tamil Nadu | 96.15 | | 93.47 | 120.30 | | 103.21 | 109.08 |
| | Uttar Pradesh | 83.85 | | 81.74 | 110.23 | | 93.39 | 101.59 |
| | West Bengal | 105.55 | | 91.79 | 105.91 | | 99.25 | 115.07 |
| | New Delhi | 88.57 | | 92.73 | 123.29 | | 88.21 | 107.75 |
| 43rd | All-India | 115.20 | 115.20 | 115.72 | 162.16 | 128.33 | 129.13 | 143.17 |
| | Andhra Pradesh | 108.29 | 91.94 | 109.79 | 151.88 | 119.87 | 121.59 | 132.84 |
| | Assam | 122.92 | 127.44 | 124.10 | 126.60 | 132.75 | 134.23 | 149.78 |
| | Bihar | 120.50 | 120.36 | 122.35 | 150.25 | 130.26 | 132.81 | 140.06 |
| | Gujarat | 127.30 | 115.00 | 128.02 | 173.18 | 134.17 | 137.08 | 159.93 |
| | Haryana | 113.93 | 122.90 | 115.86 | 143.22 | 127.72 | 130.49 | 129.78 |
| | Himachal Pradesh | 117.04 | 122.90 | 118.48 | 144.10 | 122.66 | 122.47 | 141.01 |
| | J&K | 109.56 | 124.33 | 111.12 | 148.38 | 113.72 | 115.49 | 125.35 |
| | Karnataka | 114.39 | 104.46 | 113.68 | 171.18 | 125.83 | 125.15 | 138.88 |
| | Kerala | 120.84 | 130.61 | 122.94 | 163.29 | 125.07 | 127.83 | 127.51 |
| | Madhya Pradesh | 108.52 | 107.00 | 110.70 | 178.35 | 122.63 | 124.65 | 131.61 |
| | Maharashtra | 119.58 | 115.61 | 120.10 | 189.17 | 136.44 | 136.60 | 152.44 |
| | Orissa | 111.28 | 121.42 | 111.66 | 165.40 | 122.63 | 124.15 | 135.74 |
| | Punjab | 108.52 | 112.90 | 109.89 | 144.98 | 122.84 | 124.85 | 134.83 |
| | Rajasthan | 119.69 | 117.52 | 123.15 | 165.38 | 127.71 | 127.12 | 142.48 |
| | Tamil Nadu | 121.54 | 118.23 | 120.65 | 165.82 | 132.47 | 132.74 | 146.68 |
| | Uttar Pradesh | 105.29 | 114.57 | 106.32 | 154.15 | 124.35 | 124.50 | 132.72 |
| | West Bengal | 114.28 | 129.21 | 115.66 | 149.96 | 128.79 | 130.11 | 149.14 |
| | New Delhi | 122.90 | | 124.87 | 176.91 | 131.92 | 124.59 | 142.54 |

Contd...

[5] An alternative is to assume that in urban areas there are sufficient "free" public goods to make up the difference. However, it might be more reasonable to assume that on balance urban consumers have fewer public goods if open access and common pool resources are also taken into account.

Table 1: State Poverty Lines, 38th - 55th Rounds

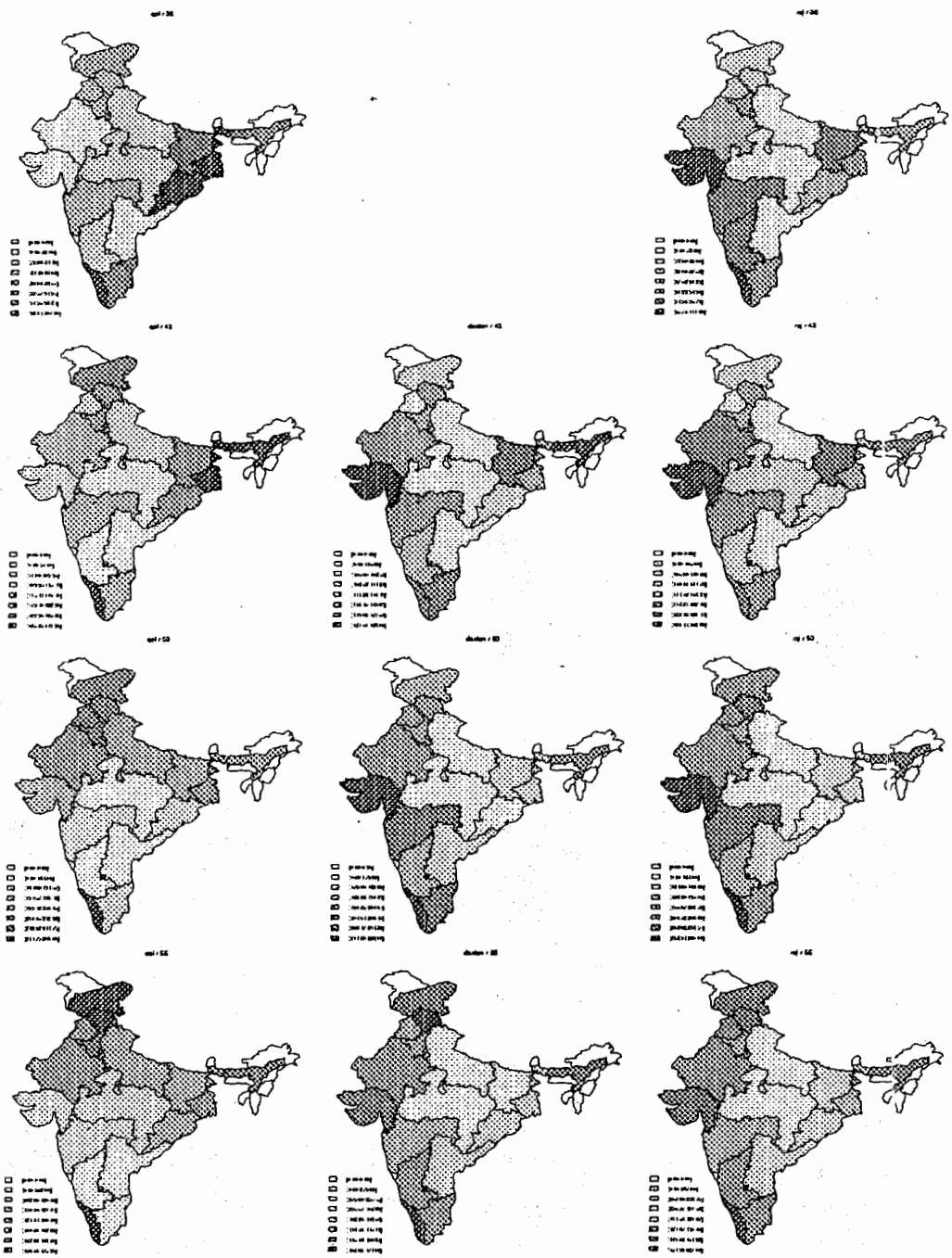
| | State50 | Rural | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | | Opl | Deaton | Rpj | opl | deaton | rpj | rpj2 |
| 50th | All-India | 205.84 | 195.61 | 197.16 | 281.35 | 226.12 | 230.35 | 264.76 |
| | Andhra Pradesh | 163.02 | 191.50 | 192.68 | 278.14 | 211.61 | 214.29 | 241.51 |
| | Assam | 232.05 | 213.80 | 217.22 | 212.42 | 238.60 | 244.02 | 297.77 |
| | Bihar | 212.16 | 191.89 | 191.89 | 238.49 | 215.88 | 214.38 | 236.97 |
| | Gujarat | 202.11 | 227.89 | 229.50 | 297.22 | 239.74 | 237.06 | 275.76 |
| | Haryana | 233.79 | 202.06 | 204.54 | 258.23 | 233.59 | 233.86 | 266.27 |
| | Himachal Pradesh | 233.79 | 204.41 | 208.88 | 253.61 | 220.97 | 225.78 | 278.52 |
| | J&K | 233.79 | 203.63 | 205.27 | 253.61 | 217.88 | 218.08 | 250.11 |
| | Karnataka | 186.63 | 202.46 | 201.87 | 302.89 | 223.92 | 225.78 | 251.70 |
| | Kerala | 243.84 | 220.45 | 224.20 | 280.54 | 229.71 | 234.02 | 249.46 |
| | Madhya Pradesh | 193.10 | 184.26 | 186.20 | 317.16 | 213.38 | 213.99 | 248.67 |
| | Maharashtra | 194.94 | 206.76 | 211.01 | 328.56 | 244.39 | 248.81 | 288.09 |
| | Orissa | 194.03 | 181.53 | 179.12 | 298.22 | 200.59 | 203.19 | 242.50 |
| | Punjab | 233.79 | 205.39 | 208.00 | 253.61 | 234.56 | 238.38 | 265.94 |
| | Rajasthan | 215.89 | 206.37 | 208.06 | 280.85 | 229.69 | 227.34 | 260.43 |
| | Tamil Nadu | 196.53 | 209.30 | 207.53 | 296.63 | 229.60 | 228.09 | 253.29 |
| | Uttar Pradesh | 213.01 | 179.57 | 185.01 | 258.65 | 209.20 | 210.28 | 233.55 |
| | West Bengal | 220.74 | 188.96 | 191.37 | 247.53 | 222.03 | 224.11 | 262.93 |
| | New Delhi | 233.79 | | 246.62 | 309.48 | 240.37 | 243.18 | 312.39 |
| 55th | All-India | 327.56 | 302.22 | 307.03 | 454.11 | 347.85 | 355.05 | 419.39 |
| | Andhra Pradesh | 262.94 | 308.26 | 308.29 | 457.40 | 343.09 | 344.79 | 415.91 |
| | Assam | 365.43 | 338.48 | 341.00 | 343.99 | 377.41 | 381.36 | 467.91 |
| | Bihar | 333.07 | 295.57 | 304.82 | 379.78 | 320.10 | 333.05 | 367.16 |
| | Gujarat | 318.94 | 335.76 | 340.10 | 474.41 | 367.66 | 371.83 | 472.13 |
| | Haryana | 362.81 | 309.47 | 318.99 | 420.20 | 356.82 | 367.25 | 448.39 |
| | Himachal Pradesh | 367.45 | 359.64 | 344.28 | 420.20 | 375.82 | 381.93 | 482.11 |
| | J&K | 367.45 | 346.64 | 341.08 | 420.20 | 362.93 | 361.83 | 429.54 |
| | Karnataka | 309.59 | 321.26 | 321.91 | 511.44 | 365.59 | 365.11 | 448.12 |
| | Kerala | 374.79 | 372.33 | 377.24 | 477.06 | 384.62 | 391.22 | 406.52 |
| | Madhya Pradesh | 311.34 | 287.71 | 292.94 | 481.65 | 319.93 | 331.37 | 386.89 |
| | Maharashtra | 318.63 | 318.54 | 319.78 | 539.71 | 383.84 | 386.11 | 446.10 |
| | Orissa | 323.92 | 299.19 | 298.11 | 473.12 | 311.16 | 314.29 | 346.20 |
| | Punjab | 362.68 | 315.21 | 325.01 | 388.15 | 349.26 | 358.80 | 388.60 |
| | Rajasthan | 344.03 | 322.47 | 326.12 | 465.92 | 351.49 | 360.5 | 418.30 |
| | Tamil Nadu | 307.64 | 335.16 | 334.56 | 475.60 | 364.65 | 365.05 | 425.96 |
| | Uttar Pradesh | 336.88 | 279.25 | 287.30 | 416.29 | 318.90 | 330.18 | 371.06 |
| | West Bengal | 350.17 | 305.54 | 312.94 | 409.22 | 342.21 | 353.37 | 430.86 |
| | New Delhi | 362.68 | | 383.54 | 505.45 | 400.43 | 372.50 | 392.06 |

Table 2: Average Budget Shares of UV Items

| Round | Rural | | Urban | |
|---|---|---|---|---|
| | Base | State | Base | State |
| 38 | 69.31 | 73.89 | 64.07 | 68.23 |
| | (5.92) | (7.28) | (3.03) | (4.03) |
| 43 | 68.27 | 71.81 | 62.23 | 66.30 |
| | (3.94) | (6.87) | (2.73) | (4.11) |
| 50 | 69.01 | 71.46 | 62.71 | 62.71 |
| | (3.92) | (5.87) | (3.31) | (3.31) |
| 55 | 63.05 | 64.52 | 53.82 | 56.05 |
| | (2.92) | (7.15) | (1.79) | (4.61) |

Notes: bases are all-India; figures in brackets are standard deviations across states.

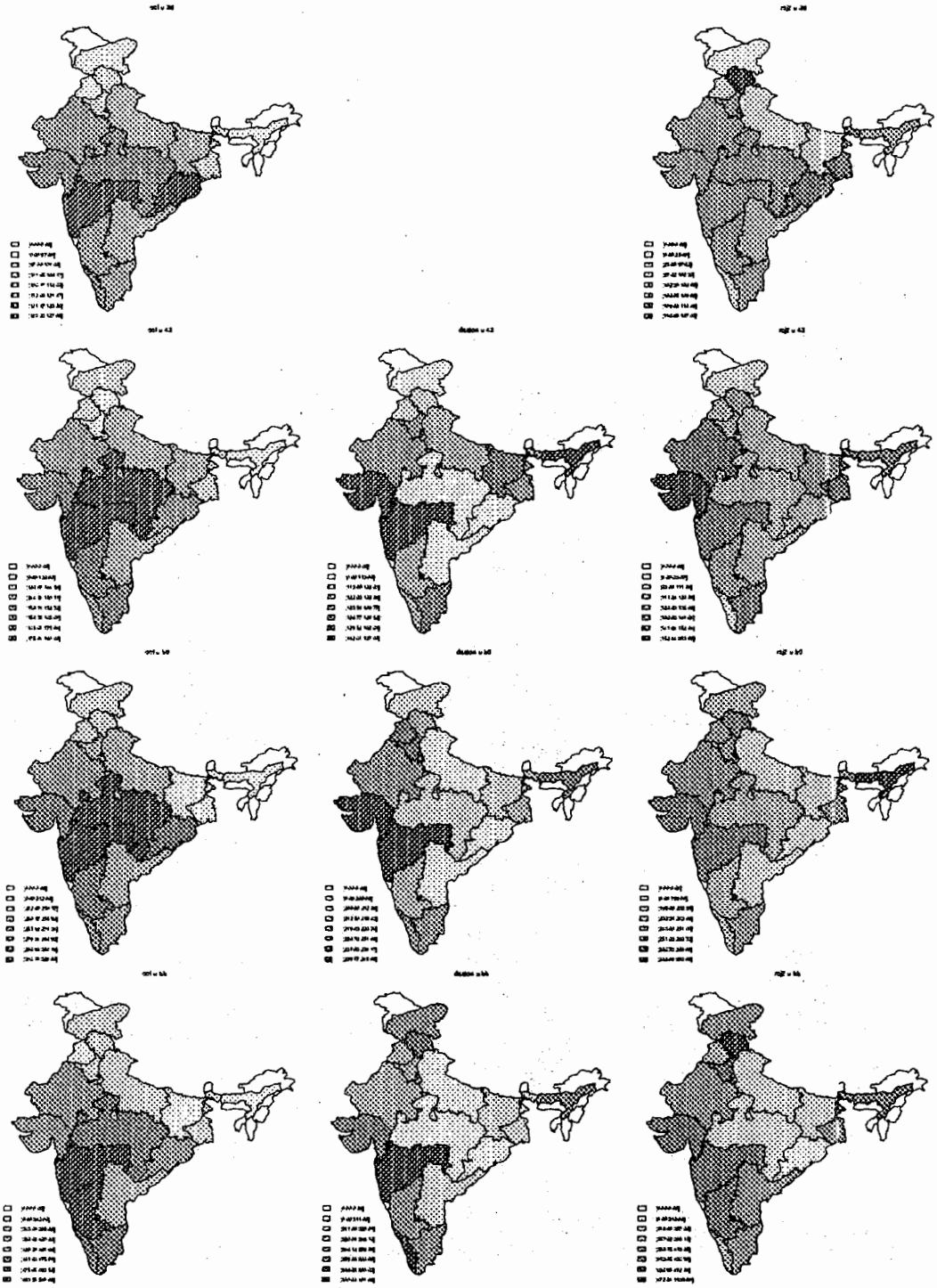
Map 1: State Rural Poverty Lines, by Author[1]



Rows are rounds from top 38th, 43rd, 50th & 55th;
The columns are PLs (L-R) OPL, Deaton and RPJ2,
there are no data for Pakistan Administered Kashmir, and smaller states and UTs

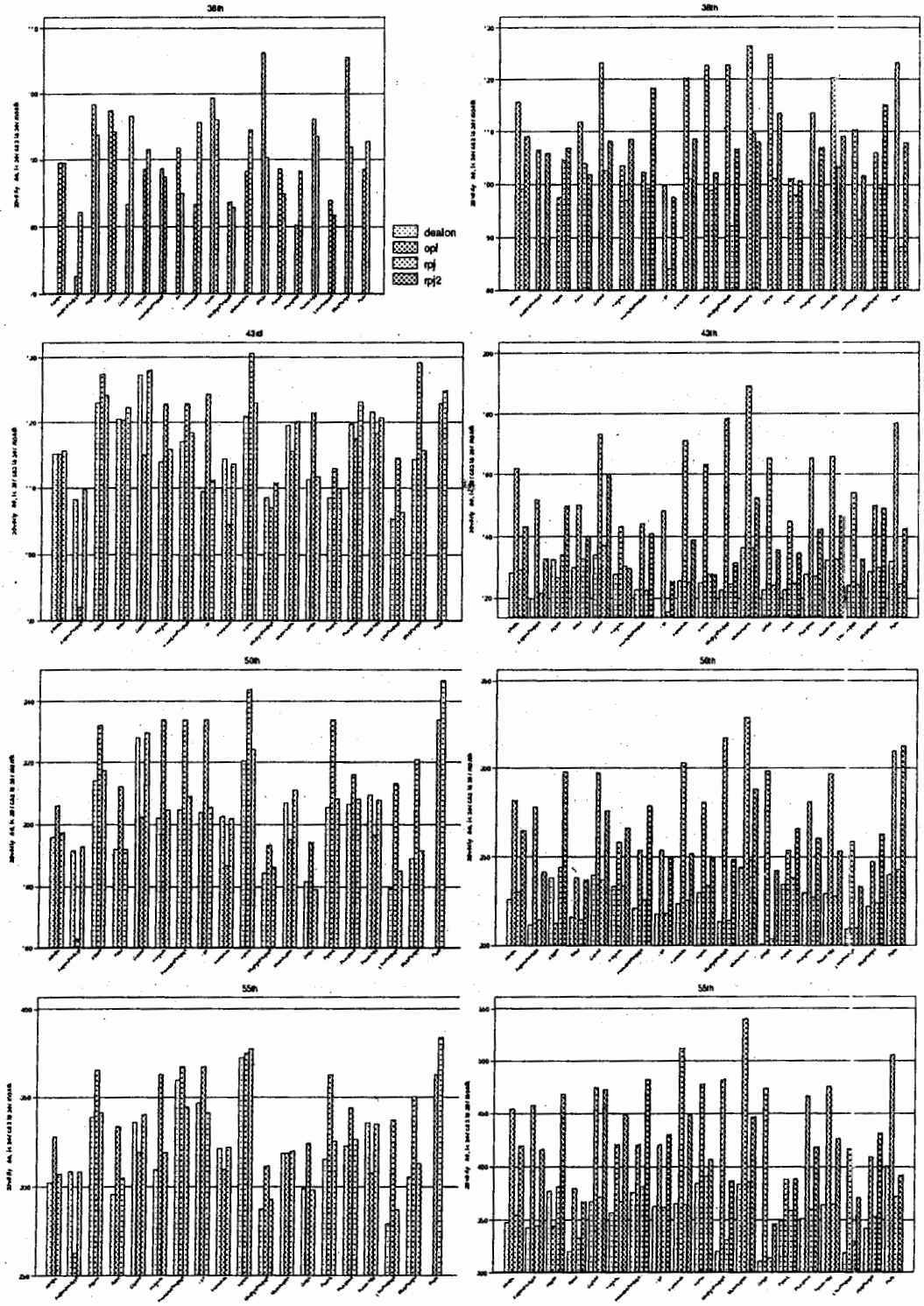
[1] Scales vary between panels to provide six quantiles; the first category are for NSSR for which there are no data.

Map 2: State Urban Poverty Lines, by Author



Rows are rounds from top 38th, 43rd, 50th & 55th;
The columns are PLs (L-R) OPL, Deaton and RPJ2,
there are no data for Pakistan Administered Kashmir, and smaller states and UTs

Figure 1: Rural & Urban Poverty Lines, by Author, Round & Sector




PLs are in the order: (1) Deaton (2) OPL (3) RPJ1 (4) RPJ2

there are no Deaton PLs in the 38th round, and no RPJ2 PLs in the rural sector - see text for explanation

We make the latter assumption and make adjustments to the UV based PLs to take account of the higher share of expenditure that urban consumers make when their expenditure on UV items is the same in real terms as that in rural areas. We also did not accept Deaton's assumption that the CPI of items excluded from the UV CPIs is the same as those of UV CPIs; in some calculations we made further adjustments based on the CPIs of sub-groups of the CPIAL and CPIIW that encompass the non-UV items. However, the effect was minimal compared to the adjustment for higher non-UV shares and given the criticisms of the official CPIs that have emerged, use of these non-UV CPIs did not seem warranted and we do not present them here. Notwithstanding the differences in levels of PLs, the spatial patterns of poverty lines are not grossly dissimilar as shown by the correlation coefficients among PLs from different authors (Maps 1 & 2).

*Town-size Poverty Lines*

We argued in the first paper in this series that the UV CPIs differ significantly by size of towns (Dubey and Palmer-Jones (D&P), 2005a); this arises both because of different UV CPIs and because of differences in the shares of non-UV items which in our calculations has a significant effect on Poverty Lines. Table 3 shows the lower UV CPIs and the higher shares of expenditure on UV items in smaller towns. However, since UV CPIs and hence PLs differ by NSSR within states in the urban sector it would seem sensible to compute UV CPIs, PLs and poverty for towns of different size within NSSR. A small town in an NSSR that has low poverty would probably have lower poverty than a similarly sized town in a NSSR that has high poverty[7]. Smaller towns also have lower UV CPIs (and PLs) also when calculated by state (i.e. pooling all towns of the same size in the same state). We have done the calculations in both ways. Smaller towns in the same NSSR (and State) have lower Poverty Lines both because the prices are more similar to the rural prices in the same domain and because they tend to have a higher share of expenditure covered by UV items so that our adjustment to take account of the higher share in urban areas, of items not included in UV CPIs, has less effect.

Table 4 shows the all-India PLs by Town Size, showing significantly higher PLs in larger towns in each round. This result occurs at each level of aggregation even when the calculations are done at NSSR level. We can summarize the Poverty Lines for towns of different size using the NSSR calculations in the regression results shown in Table 5. The dependent variable is the PL of each town size computed at NSSR level; *qn* refers to the PL for quartile n (2, 3, 4 and 2&3 combined); *tn* refers to town size *n*. The RHS terms are dummies for round, quartile and town size. The PLs rise with size of town size and the differential rises at each round (Map 3).

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[7] This indeed turns out to be the case: the regression of the town size UV CPIs on the UV CPI of the rural sector by NSSR is highly significant,

torn_ts = 36.23+ 606*torn_r + 2.64*ts2 + 5.49*ts3+7.88*ts4 -4.24*50$^{th}$-3.03*55$^{th}$ -1.61*q4 ; rsq 0.51, n:3714

with all coefficients significant at p< 0.000. torn_ts is the Tornqvist town size UVCPI *vs.* all-India urban base, torn_r is the rural UVCPI *vs.* all-India Rural base, ts2, ts3, ts4 and 43$^{rd}$, 50$^{th}$ & 55$^{th}$ are town size and round dummies and q4 is a dummy for the UV CPIs for the top quartile.

Table 3: Town Size UV CPIs, Budget Shares and Poverty Lines (state level calculations)

| | UV CPIs and shares of UV Items | | | |
|---|---|---|---|---|
| | Town Size | | | |
| | <=50,000 | 50,000 – 2000,0002 | 200,000-1,000,0003 | >= 1,000000 |
| Round | | UV CPIs | | |
| 38 | 97.64 | 100.58 | 104.2 | 102.6 |
| 43 | 97.22 | 100.57 | 103.72 | 103.54 |
| 50 | 94.39 | 97.92 | 100.35 | 105.97 |
| 55 | 97.65 | 101.36 | 102.06 | 105.58 |
| Total | 96.74 | 100.13 | 102.58 | 104.66 |
| | | State Urban Budget Shares of UV Items | | |
| 38 | 65.4 | 62.72 | 61.42 | 58.62 |
| 43 | 68.04 | 64.57 | 67.52 | 62.01 |
| 50 | 64.87 | 61.23 | 60.82 | 58.74 |
| 55 | 58.05 | 55.62 | 54.49 | 51.21 |
| | | All-India Urban Shares of UV Items | | |
| 38 | 57.84 | 56.83 | 56.32 | 58.67 |
| 43 | 60.24 | 59.04 | 59.51 | 61.45 |
| 50 | 57.05 | 56.21 | 56.67 | 57.39 |
| 55 | 51.01 | 51.46 | 51.16 | 51.8 |

Table 4: Town Size Poverty Lines (simple average over States, whole population)

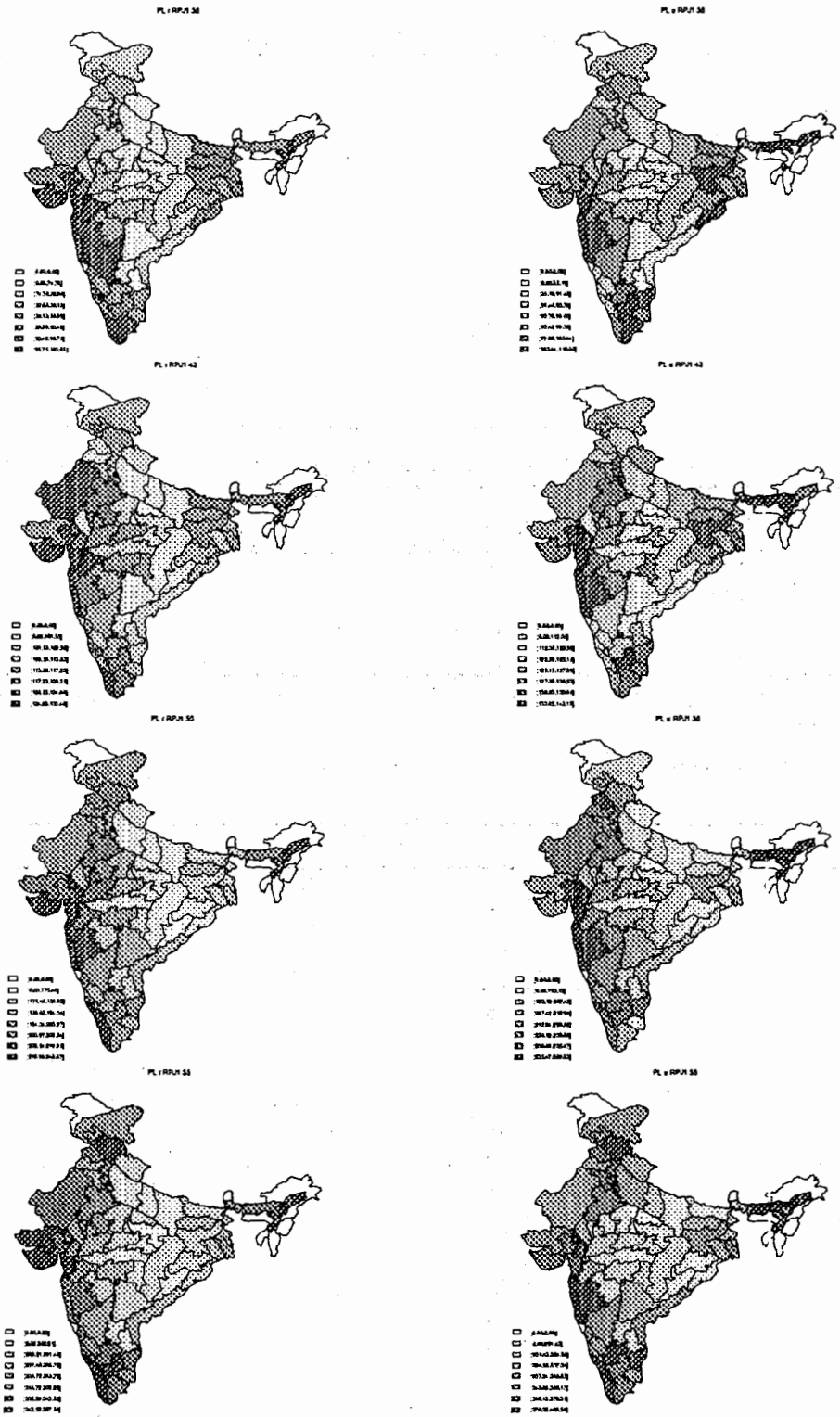
| | Town Size | | | |
|---|---|---|---|---|
| Round | <=50,000 | 50,000 – 2000,0002 | 200,000-1,000,0003 | >= 1,000000 |
| 38 | 106.49 | 109.7 | 113.64 | 111.9 |
| 43 | 140.01 | 144.84 | 149.37 | 149.11 |
| 50 | 251.37 | 260.79 | 267.25 | 282.22 |
| 55 | 411.94 | 427.6 | 430.56 | 445.37 |

Note: The differences between town sizes are statistically significant at p<0.038, < 0.003, < 0.000, < 0.011 in the four rounds.

Table 5: Regression Coefficients of Town Size PLs on Round, Quartile and Town Size Variables

| pl_ts_Dummies | Coef. | Std. Err. | t | P>t |
|---|---|---|---|---|
| t2 | 3.17 | 2.16 | 1.47 | 0.14 |
| t3 | 7.45 | 2.29 | 3.25 | 0.00 |
| t4 | 8.17 | 3.85 | 2.12 | 0.03 |
| 43 | 38.43 | 2.10 | 18.34 | 0.00 |
| 50 | 142.78 | 2.15 | 66.54 | 0.00 |
| 55 | 301.84 | 2.07 | 145.87 | 0.00 |
| t2*43 | 1.25 | 3.12 | 0.40 | 0.69 |
| t2*50 | 4.10 | 3.14 | 1.31 | 0.19 |
| t2*55 | 7.68 | 3.05 | 2.51 | 0.01 |
| t3*43 | 2.10 | 3.31 | 0.63 | 0.53 |
| t3*50 | 7.11 | 3.37 | 2.11 | 0.04 |
| t3*55 | 11.20 | 3.30 | 3.40 | 0.00 |
| t4*43 | 2.71 | 5.46 | 0.50 | 0.62 |
| t4*50 | 25.90 | 5.08 | 5.10 | 0.00 |
| t4*55 | 26.54 | 4.84 | 5.49 | 0.00 |
| q2 | -24.96 | 1.34 | -18.59 | 0.00 |
| q3 | -10.11 | 1.37 | -7.41 | 0.00 |
| q4 | 11.68 | 1.37 | 8.51 | 0.00 |
| q5 | 49.43 | 1.35 | 36.55 | 0.00 |
| c | 100.94 | 1.59 | 63.58 | 0.00 |

Map 3: Poverty Lines of NSSR by Round



Authors Poverty Lines - columns are rural (left) and urban; rows are rounds from 38th at the top (see text)

*Expenditure Distributions*

Poverty counts arise from interaction of expenditure distributions with poverty lines; either can in principle affect the poverty counts. Given the PLs, the poverty counts are determined by the cumulative density function of the welfare aggregate, in our case, as with the Official Poverty Counts and Deaton's Poverty Counts, we use Monthly Per Capita Expenditure (MPCE) computed from the unit records of the CES so as to as nearly replicate the results reported in official publications and by Deaton.

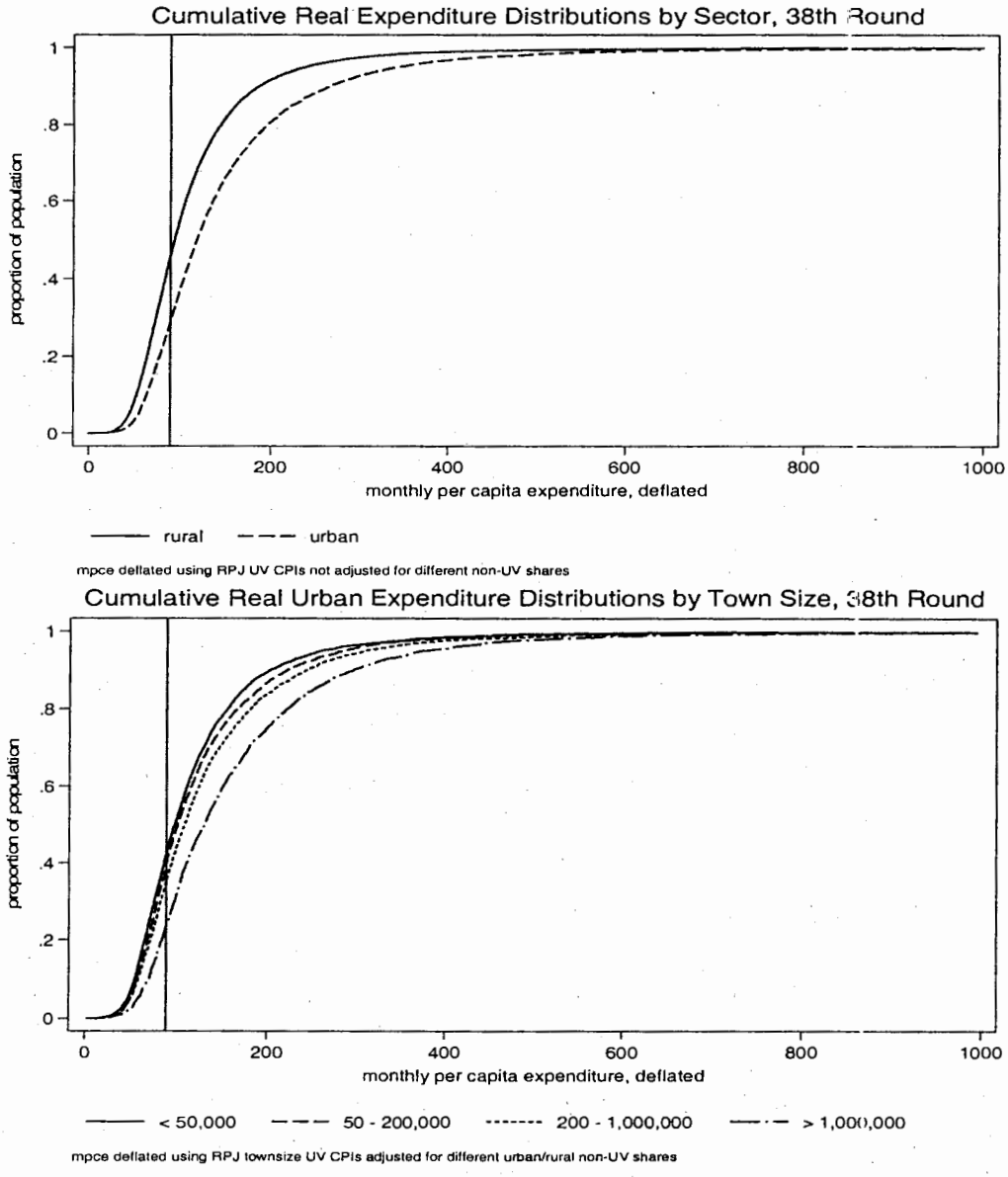
We have not used the MPCE provided with the official data but recalculated MPCE using our data sets. In some cases it appears our data are not identical to the variable for MPCE provided with the data. However, the differences appear small. We recalculate MPCE because (a) given our experience of differences in raw data in various releases by NSS, we should use the same data as used to compute the UV CPIs and (b) there are different ways in which MPCE could be calculated (see for example Deaton and Zaidi, 2002) and at a later date we may implement such an alternative, or alternatives. The method employed to compute MPCE in the official Indian literature uses all reported expenditures adjusted to a monthly equivalent (for example dividing data reported for the previous year by 12). In the $38^{th}$ – $50^{th}$ rounds this is not necessary as all blocks of data are reported for the previous 30 days (as well as, for other reporting periods for some blocks of items); hence, the so called Uniform Recall Period (URP) definition of MPCE can be employed. In the case of the $55^{th}$ round not all items were reported for the previous 30 days so it is not possible to use the URP definition and we have used a Mixed Recall Period (MPR) definition, summing those items reported at 30 days with the remainder which are reported for the previous 365 days (divided by 12). As a result the $55^{th}$ Round poverty aggregates are not strictly comparable with the earlier rounds[8]. The MPCE computed using the MRP definition in previous rounds are higher than by the URP method in the same round so that the $55^{th}$ Round poverty counts are likely to be low by comparison with previous rounds computed using the URP definition.

*National Level Expenditure Distributions*

Figure 2 shows the expenditure distribution in the rural and urban sectors and for four city sizes for the $38^{th}$ Round. Since the region of these curves where poverty lines fall are clearly ranked, these domains will be ranked by HCR the same regardless by the absolute value of PLs, as shown by D&G. For example, if OPL>DPL>RPJ PL, then $HCR_{OPL}>HCR_{DPL}>HCR_{RPJ\ PL}$; that is the national level poverty rankings are not affected by the PLs. Similarly, for a given PL, the HCRs in different town sizes will follow the same pattern, i.e. $HCR_{t1}> HCR_{t2}> HCR_{t3}> HCR_{t4}$

[8] As noted elsewhere we do not adjust the $55^{th}$ Round results on account of the inclusion in that round of 7 day recall questions on the same survey sheet for Block 5 items because we are yet to be convinced there is a useful method of doing so (see Popli *et al.*, 2005). It is possible to compute a Mixed Recall Period MPCE for the earlier rounds, however, as with the URP, these may still not be strictly comparable as there are many differences between the survey schedules in different rounds. In addition to different combinations of recall periods, the list of items listed on the survey schedules is not the same. Aggregate expenditures will differ if the lists of items explicitly listed differ. As Bhalla and Das (2004) have pointed out, in none of the rounds are the combinations of different recall periods and layouts of the survey schedules the same; if "contamination" of data reported for one recall period by asking for the same items at another recall period is possible and is affected by the exact layout of the questions (in parallel on the same sheet, on adjacent sheets, or in a separate section after all items have been reported at another recall period) then there must be questions about the comparability of the expenditure data in all the thick (and most of the thin) survey surveys.

## Figure 2: CDFs of MPCE, 38th Round



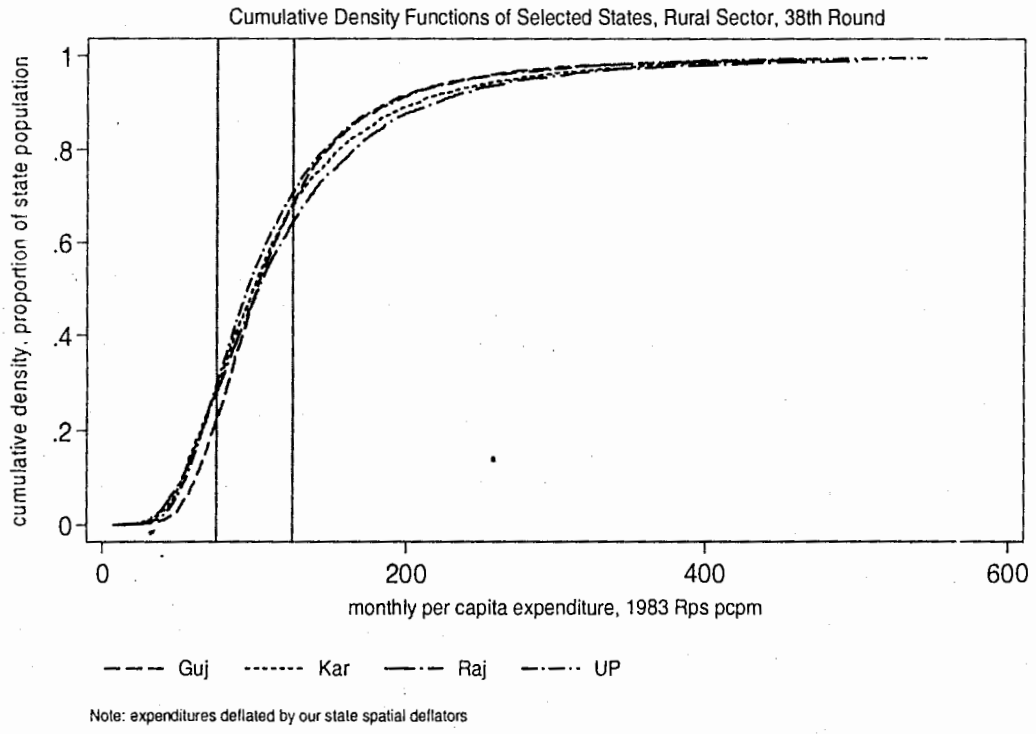

For the urban sector Figure 2 shows that the expenditure distribution in smaller towns is similar to the rural distribution. The use of a single PL for entire urban sector, as has been the case in all the poverty studies, could result is distorted urban poverty counts.

*State Level Expenditure Distributions*

At state level (and also NSSR) the situation is quite different; for these spatial domains CDFs intersect, in many cases within the ranges of potential PLs, as shown for selected states in the 38th Round in Figure 3; a similar pattern occurs in other rounds, not necessarily between the same states. These characteristics suggest that comparisons of poverty between many states should be treated with some caution. In a following section

we show that stochastic dominance cannot be established at any order of dominance between many states.

Figure 3: Intersecting CDFs of MPCE for Selected States in the 38th Round, Rural Sector




## III Poverty Incidence

In this section we discuss the poverty ratios obtained using the PLs described above, subject to the caveat that such comparisons are not robust to even quite small changes in the procedures for calculating the CPIs and PLs.

### *Poverty Incidence at the All-India Level*

Our poverty lines show some differences from the Official Poverty Counts (OPC) as do Deaton's. Table 6 presents the results at aggregate level. In the rural sector, our HCRs are not very different from OPCs in the 38th and 43rd Rounds but in the 50th and 55th they lie between Deaton's and the OPCs. This is also generally the pattern in the urban sector for rpj2 PLs while rpj1 PCs are fairly similar to Deaton's.[9] At the national level (for major states only) it is also the case that our PCs are close to the OPCs in the 38th and 43rd Rounds but between the OPCs and Deaton's in the 50th and 55th for rpj2 while rpj1 is close to Deaton's.

[9] Recall that rpj2 PL is our preferred PL (the urban PLs used in Table 6 have been calculated at town size level by NSSR).

Table 6: National Poverty Counts at Different Poverty Lines by Sector and Round

| Round | Rural | | | Urban | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | opl | Deaton | rpj | opl | Deaton | rpj1 | rpj2 | opl | Deaton | rpj | rpj2 |
| 38 | 0.461 | | 0.458 | 0.416 | | 0.344 | 0.368 | 0.45 | | 0.438 | 0.444 |
| 43 | 0.394 | 0.388 | 0.399 | 0.394 | 0.223 | 0.278 | 0.298 | 0.394 | 0.351 | 0.377 | 0.382 |
| 50 | 0.373 | 0.325 | 0.336 | 0.331 | 0.177 | 0.235 | 0.266 | 0.363 | 0.288 | 0.319 | 0.325 |
| 55 | 0.269 | 0.214 | 0.224 | 0.244 | 0.094 | 0.124 | 0.227 | 0.263 | 0.184 | 0.215 | 0.215 |

Notes: (1) Our calculations are in all cases from the Unit Records of NSS data that we have using OPL and Deaton PLs from Deaton, 2003a and our PLs; (2) Rpj1 poverty counts are calculated at NSSR level in the Deaton style for both rural and urban sectors using our UV CPIs; (3) Rpj2 poverty counts are computed using the same rural PLs as in Rpj1 and urban poverty lines adjusted for differences in non-UV shares between urban and rural areas, with urban poverty computed by Town Size at NSSR level. When computed at state level there is little difference in the national urban poverty levels.

Another important point that emerges is that temporal change in poverty is brought about by the adjustments in PLs. Our, as well as, Deaton's calculation suggest that there had been significant decline in poverty counts between 43rd and 50th rounds. This decline in poverty counts is very similar to that reported by D&G, who, while not using UVs, calculated PLs based on consumption expenditure weights for the population around the poverty line emphasising the importance of using appropriate expenditure weights based on expenditure patterns of population groups corresponding to poverty lines (D&P, 2005a)[10].

*Poverty Incidence: Major States*

Table 7 shows the HCRs for all Major states in each round. We can use Davidson and Duclos (2000) to test the significance of differences in HCRs (and PG and PGsq) between States at a common PL; we deflate MPCE by implicit state spatial PLs and for our PLs we use the all-India Rural PL (89.5 Rps. pcpm.) as the reference PL for all domains. Most (59 per cent) comparisons of the HCRs computed using our (rpj1) PLs between states using this methodology turn out to be significant at $p < 0.001$)[11] and even more at $p<0.05$. However, this does not translate into robust conclusions about poverty rankings as shown by the intersecting CDFs we have already illustrated, or when the poverty line deflators are called into question using the stochastic dominance approach as shown in the next section.

An overview of the differences between our PCs and OPCs can be gained by comparing the rankings of states by HCRs (Table 8 compares our Poverty Counts and the OPCs). Broadly there is considerable agreement about rankings of states between all the methods of computing PLs (Figures 4 & 5). The Spearman correlations are shown in Table 9; generally Deaton's and our rankings are more similar than either with the OPCs and the urban rankings are less similar than the rural.

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[10] While we have calculated UVs and UV CPIs for different expenditure groups (quartiles 1 to 4) we do not use these in order to make our results as comparable with those of other authors. In addition, given the lack of a clear method to anchor PLs in different domains and account for different "environments" (Dubey and Palmer-Jones, 2005b) we do not think any great purpose would be served by presenting and discussing these results here. This is a criticism that extends to the use of "normative" expenditure bundles as in some implementations of the Cost of Basic Needs method of setting poverty lines (*see* D&P, 2005b).

[11] Using the MRP definition of MPCE, 2662 (72.6 per cent) and 791 (45 per cent) in the rural and urban sectors respectively out of 1734 possible comparisons. Similar results are obtained using the URP definition of MPCE.

Table 7: State Head Count Ratios by Round Author and Sector

| State | | OPL | | Rpj | | | |
|---|---|---|---|---|---|---|---|
| | | rural | urban | Rural | Urban | rpjts 1 | rpjts 2 |
| Andhra Pradesh | 38 | 0.255 | 0.346 | 0.347 | 0.209 | 0.209 | 0.276 |
| Assam | 38 | 0.447 | 0.222 | 0.389 | 0.279 | 0.277 | 0.330 |
| Bihar | 38 | 0.651 | 0.487 | 0.632 | 0.421 | 0.418 | 0.495 |
| Gujarat | 38 | 0.289 | 0.390 | 0.424 | 0.218 | 0.210 | 0.337 |
| Haryana | 38 | 0.214 | 0.279 | 0.202 | 0.225 | 0.230 | 0.343 |
| Himachal Pradesh | 38 | 0.163 | 0.095 | 0.151 | 0.083 | 0.082 | 0.143 |
| J&K | 38 | 0.271 | 0.169 | 0.180 | 0.074 | 0.071 | 0.135 |
| Karnataka | 38 | 0.340 | 0.405 | 0.438 | 0.278 | 0.275 | 0.331 |
| Kerala | 38 | 0.389 | 0.450 | 0.354 | 0.284 | 0.282 | 0.348 |
| Madhya Pradesh | 38 | 0.494 | 0.531 | 0.497 | 0.287 | 0.293 | 0.397 |
| Maharashtra | 38 | 0.457 | 0.407 | 0.515 | 0.278 | 0.278 | 0.358 |
| Orissa | 38 | 0.685 | 0.518 | 0.542 | 0.358 | 0.342 | 0.408 |
| Punjab | 38 | 0.135 | 0.217 | 0.119 | 0.201 | 0.199 | 0.278 |
| Rajasthan | 38 | 0.348 | 0.376 | 0.407 | 0.253 | 0.248 | 0.347 |
| Tamil Nadu | 38 | 0.531 | 0.490 | 0.511 | 0.367 | 0.361 | 0.418 |
| Uttar Pradesh | 38 | 0.469 | 0.511 | 0.447 | 0.358 | 0.349 | 0.455 |
| West Bengal | 38 | 0.637 | 0.336 | 0.520 | 0.293 | 0.287 | 0.352 |
| Delhi | 38 | 0.041 | 0.285 | 0.041 | 0.076 | 0.086 | 0.189 |
| Andhra Pradesh | 43 | 0.209 | 0.411 | 0.356 | 0.241 | 0.237 | 0.314 |
| Assam | 43 | 0.397 | 0.113 | 0.381 | 0.157 | 0.145 | 0.226 |
| Bihar | 43 | 0.536 | 0.520 | 0.555 | 0.395 | 0.386 | 0.489 |
| Gujarat | 43 | 0.285 | 0.385 | 0.376 | 0.183 | 0.179 | 0.305 |
| Haryana | 43 | 0.127 | 0.184 | 0.138 | 0.130 | 0.133 | 0.195 |
| Himachal Pradesh | 43 | 0.110 | 0.072 | 0.145 | 0.017 | 0.019 | 0.063 |
| J&K | 43 | 0.258 | 0.149 | 0.179 | 0.048 | 0.048 | 0.095 |
| Karnataka | 43 | 0.346 | 0.490 | 0.436 | 0.234 | 0.240 | 0.317 |
| Kerala | 43 | 0.317 | 0.385 | 0.262 | 0.189 | 0.196 | 0.255 |
| Madhya Pradesh | 43 | 0.420 | 0.473 | 0.450 | 0.209 | 0.209 | 0.309 |
| Maharashtra | 43 | 0.408 | 0.404 | 0.457 | 0.203 | 0.206 | 0.265 |
| Orissa | 43 | 0.585 | 0.425 | 0.518 | 0.230 | 0.218 | 0.286 |
| Punjab | 43 | 0.087 | 0.138 | 0.075 | 0.073 | 0.077 | 0.120 |
| Rajasthan | 43 | 0.332 | 0.376 | 0.362 | 0.207 | 0.208 | 0.270 |
| Tamil Nadu | 43 | 0.462 | 0.402 | 0.464 | 0.262 | 0.259 | 0.309 |
| Uttar Pradesh | 43 | 0.425 | 0.450 | 0.359 | 0.286 | 0.279 | 0.363 |
| West Bengal | 43 | 0.487 | 0.337 | 0.385 | 0.237 | 0.231 | 0.302 |
| Delhi | 43 | 0.000 | 0.167 | 0.013 | 0.039 | 0.039 | 0.063 |

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Table 7: State Head Count Ratios by Round Author and Sector

| State | | OPL | | Deaton | | Roj | |
|---|---|---|---|---|---|---|---|
| | | r | u | R | U | r | u |
| Andhra Pradesh | 38 | 0.255 | 0.346 | . | . | 0.362 | 0.339 |
| Assam | 38 | 0.447 | 0.222 | . | . | 0.380 | 0.284 |
| Bihar | 38 | 0.651 | 0.487 | . | . | 0.623 | 0.420 |
| Gujarat | 38 | 0.289 | 0.390 | . | . | 0.424 | 0.261 |
| Haryana | 38 | 0.214 | 0.279 | . | . | 0.237 | 0.320 |
| Himachal Pradesh | 38 | 0.163 | 0.095 | . | . | 0.154 | 0.186 |
| J&K | 38 | 0.271 | 0.169 | . | . | 0.191 | 0.146 |
| Karnataka | 38 | 0.340 | 0.405 | . | . | 0.451 | 0.346 |
| Kerala | 38 | 0.389 | 0.450 | . | . | 0.361 | 0.315 |
| Madhya Pradesh | 38 | 0.494 | 0.531 | . | . | 0.486 | 0.405 |
| Maharashtra | 38 | 0.457 | 0.407 | . | . | 0.522 | 0.300 |
| Orissa | 38 | 0.685 | 0.518 | . | . | 0.531 | 0.460 |
| Punjab | 38 | 0.135 | 0.217 | . | . | 0.116 | 0.216 |
| Rajasthan | 38 | 0.348 | 0.376 | . | . | 0.418 | 0.332 |
| Tamil Nadu | 38 | 0.531 | 0.490 | . | . | 0.507 | 0.401 |
| Uttar Pradesh | 38 | 0.469 | 0.511 | . | . | 0.446 | 0.441 |
| West Bengal | 38 | 0.637 | 0.336 | . | . | 0.516 | 0.395 |
| Delhi | 38 | 0.041 | 0.285 | . | . | 0.041 | 0.191 |
| Andhra Pradesh | 43 | 0.209 | 0.411 | 0.345 | 0.231 | 0.357 | 0.303 |
| Assam | 43 | 0.397 | 0.113 | 0.357 | 0.133 | 0.368 | 0.226 |
| Bihar | 43 | 0.536 | 0.520 | 0.536 | 0.376 | 0.552 | 0.449 |
| Gujarat | 43 | 0.285 | 0.385 | 0.388 | 0.158 | 0.397 | 0.309 |
| Haryana | 43 | 0.150 | 0.184 | 0.130 | 0.117 | 0.137 | 0.126 |
| Himachal Pradesh | 43 | 0.167 | 0.072 | 0.125 | 0.015 | 0.137 | 0.063 |
| J&K | 43 | 0.258 | 0.149 | 0.150 | 0.033 | 0.162 | 0.073 |
| Karnataka | 43 | 0.346 | 0.490 | 0.426 | 0.251 | 0.418 | 0.313 |
| Kerala | 43 | 0.317 | 0.385 | 0.252 | 0.181 | 0.267 | 0.189 |
| Madhya Pradesh | 43 | 0.420 | 0.473 | 0.434 | 0.205 | 0.458 | 0.252 |
| Maharashtra | 43 | 0.408 | 0.404 | 0.438 | 0.212 | 0.441 | 0.268 |
| Orissa | 43 | 0.585 | 0.425 | 0.499 | 0.205 | 0.502 | 0.269 |
| Punjab | 43 | 0.087 | 0.138 | 0.067 | 0.065 | 0.074 | 0.097 |
| Rajasthan | 43 | 0.332 | 0.376 | 0.349 | 0.194 | 0.368 | 0.273 |
| Tamil Nadu | 43 | 0.462 | 0.402 | 0.483 | 0.258 | 0.478 | 0.316 |
| Uttar Pradesh | 43 | 0.425 | 0.450 | 0.352 | 0.291 | 0.361 | 0.339 |
| West Bengal | 43 | 0.487 | 0.337 | 0.358 | 0.221 | 0.370 | 0.332 |
| Delhi | 43 | 0.013 | 0.167 | | 0.046 | 0.013 | 0.060 |

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Table 7: State Head Count Ratios by Round Author and Sector

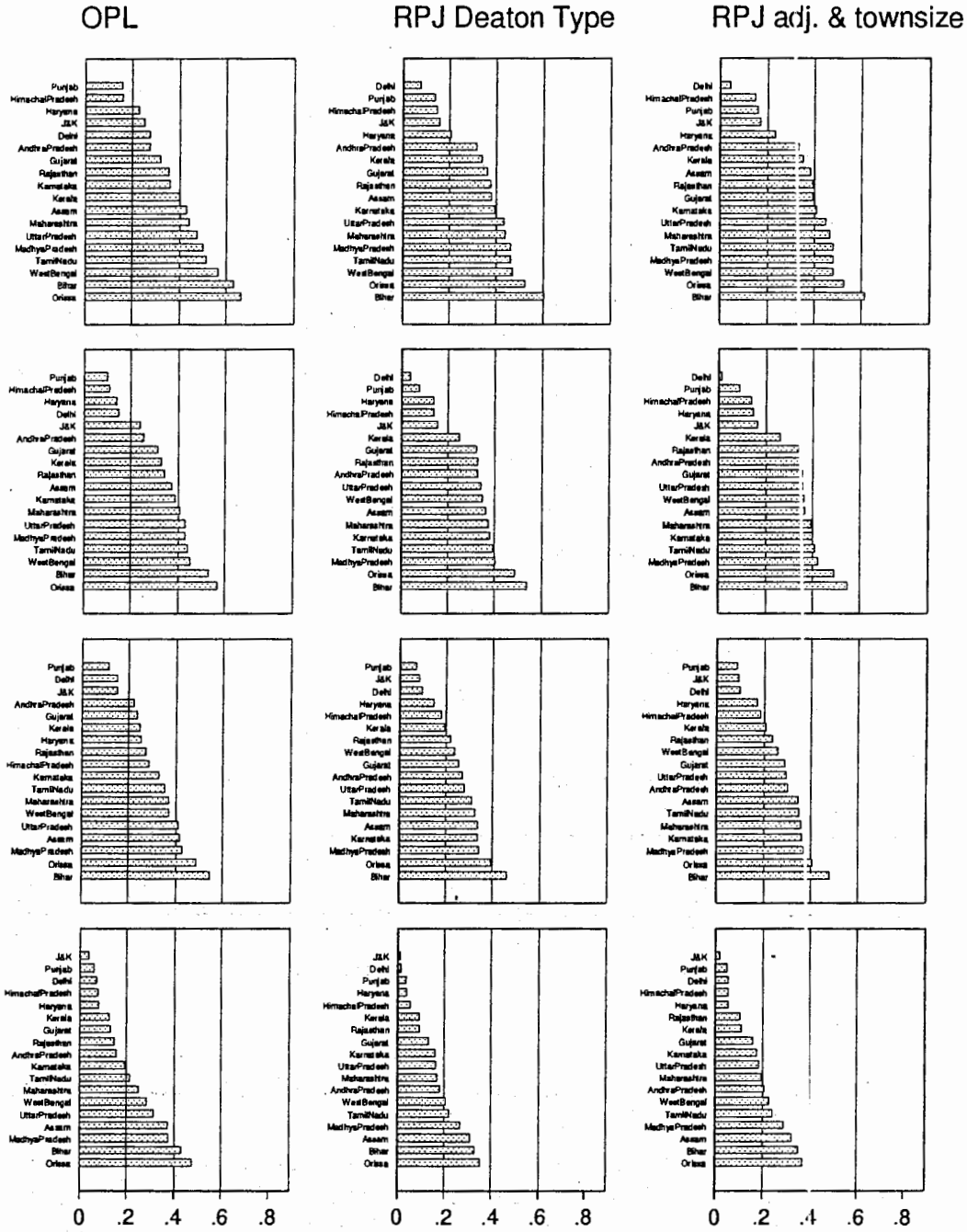
| | | OPL | | Rpj | | | | Deaton | | rpj | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| State | | rural | urban | rural | urban | rpjts1 | rpjts2 | R | u | r_s | u_s |
| Andhra Pradesh | 50 | 0.159 | 0.383 | 0.306 | 0.183 | 0.192 | 0.291 | 0.289 | 0.176 | 0.294 | 0.263 |
| Assam | 50 | 0.452 | 0.079 | 0.359 | 0.127 | 0.125 | 0.241 | 0.349 | 0.123 | 0.371 | 0.321 |
| Bihar | 50 | 0.577 | 0.350 | 0.490 | 0.251 | 0.242 | 0.396 | 0.480 | 0.266 | 0.480 | 0.344 |
| Gujarat | 50 | 0.222 | 0.262 | 0.320 | 0.118 | 0.127 | 0.225 | 0.324 | 0.129 | 0.328 | 0.209 |
| Haryana | 50 | 0.283 | 0.165 | 0.165 | 0.092 | 0.106 | 0.188 | 0.169 | 0.104 | 0.173 | 0.185 |
| Himachal Pradesh | 50 | 0.304 | 0.093 | 0.194 | 0.046 | 0.037 | 0.098 | 0.172 | 0.034 | 0.188 | 0.124 |
| J&K | 50 | 0.181 | 0.050 | 0.104 | 0.031 | 0.031 | 0.056 | 0.100 | 0.028 | 0.106 | 0.049 |
| Karnataka | 50 | 0.302 | 0.398 | 0.386 | 0.216 | 0.213 | 0.297 | 0.375 | 0.212 | 0.372 | 0.282 |
| Kerala | 50 | 0.251 | 0.243 | 0.216 | 0.146 | 0.143 | 0.190 | 0.193 | 0.138 | 0.204 | 0.174 |
| Madhya Pradesh | 50 | 0.408 | 0.482 | 0.393 | 0.186 | 0.180 | 0.302 | 0.364 | 0.181 | 0.374 | 0.294 |
| Maharashtra | 50 | 0.374 | 0.358 | 0.433 | 0.175 | 0.173 | 0.256 | 0.419 | 0.187 | 0.434 | 0.276 |
| Orissa | 50 | 0.499 | 0.408 | 0.430 | 0.155 | 0.149 | 0.259 | 0.433 | 0.152 | 0.420 | 0.279 |
| Punjab | 50 | 0.117 | 0.108 | 0.066 | 0.078 | 0.074 | 0.135 | 0.061 | 0.076 | 0.065 | 0.135 |
| Rajasthan | 50 | 0.263 | 0.312 | 0.231 | 0.181 | 0.170 | 0.253 | 0.227 | 0.183 | 0.233 | 0.253 |
| Tamil Nadu | 50 | 0.328 | 0.401 | 0.381 | 0.193 | 0.192 | 0.287 | 0.379 | 0.204 | 0.372 | 0.274 |
| Uttar Pradesh | 50 | 0.422 | 0.352 | 0.296 | 0.205 | 0.203 | 0.303 | 0.282 | 0.213 | 0.305 | 0.282 |
| West Bengal | 50 | 0.412 | 0.231 | 0.259 | 0.160 | 0.149 | 0.260 | 0.248 | 0.153 | 0.259 | 0.265 |
| Delhi | 50 | 0.020 | 0.165 | 0.097 | 0.098 | 0.098 | 0.128 | 0.000 | 0.079 | 0.097 | 0.178 |
| | | | | | | | | | | | |
| Andhra Pradesh | 55 | 0.109 | 0.277 | 0.216 | 0.095 | 0.091 | 0.182 | 0.221 | 0.094 | 0.221 | 0.202 |
| Assam | 55 | 0.405 | 0.075 | 0.337 | 0.108 | 0.101 | 0.225 | 0.319 | 0.106 | 0.323 | 0.257 |
| Bihar | 55 | 0.442 | 0.338 | 0.348 | 0.232 | 0.218 | 0.379 | 0.304 | 0.180 | 0.337 | 0.302 |
| Gujarat | 55 | 0.125 | 0.150 | 0.175 | 0.041 | 0.038 | 0.120 | 0.157 | 0.039 | 0.168 | 0.149 |
| Haryana | 55 | 0.074 | 0.094 | 0.039 | 0.035 | 0.033 | 0.098 | 0.034 | 0.033 | 0.041 | 0.125 |
| Himachal Pradesh | 55 | 0.079 | 0.046 | 0.056 | 0.022 | 0.022 | 0.034 | 0.070 | 0.022 | 0.053 | 0.062 |
| J&K | 55 | 0.039 | 0.020 | 0.012 | 0.000 | 0.000 | 0.029 | 0.032 | 0.006 | 0.030 | 0.021 |
| Karnataka | 55 | 0.171 | 0.247 | 0.193 | 0.078 | 0.068 | 0.133 | 0.203 | 0.084 | 0.204 | 0.174 |
| Kerala | 55 | 0.096 | 0.201 | 0.092 | 0.090 | 0.090 | 0.168 | 0.093 | 0.087 | 0.100 | 0.112 |
| Madhya Pradesh | 55 | 0.375 | 0.384 | 0.308 | 0.122 | 0.120 | 0.229 | 0.302 | 0.106 | 0.319 | 0.230 |
| Maharashtra | 55 | 0.237 | 0.269 | 0.229 | 0.077 | 0.077 | 0.144 | 0.237 | 0.107 | 0.240 | 0.168 |
| Orissa | 55 | 0.485 | 0.434 | 0.395 | 0.136 | 0.140 | 0.254 | 0.403 | 0.130 | 0.399 | 0.208 |
| Punjab | 55 | 0.062 | 0.055 | 0.035 | 0.032 | 0.026 | 0.075 | 0.027 | 0.029 | 0.029 | 0.055 |
| Rajasthan | 55 | 0.136 | 0.194 | 0.103 | 0.054 | 0.049 | 0.112 | 0.102 | 0.060 | 0.104 | 0.126 |
| Tamil Nadu | 55 | 0.206 | 0.224 | 0.284 | 0.097 | 0.095 | 0.163 | 0.277 | 0.089 | 0.275 | 0.160 |
| Uttar Pradesh | 55 | 0.314 | 0.309 | 0.167 | 0.151 | 0.141 | 0.260 | 0.155 | 0.134 | 0.174 | 0.227 |
| West Bengal | 55 | 0.318 | 0.150 | 0.242 | 0.077 | 0.077 | 0.177 | 0.213 | 0.067 | 0.229 | 0.183 |
| Delhi | 55 | 0.007 | 0.094 | 0.007 | 0.017 | 0.017 | 0.070 | 0.000 | 0.034 | 0.007 | 0.030 |

Table 8: Ranking of States by HCR over Rounds, by Author and Sector

| Rural | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Round | Opl | | | | Rpj | | | |
| State50 | 38 | 43 | 50 | 55 | 38 | 43 | 50 | 55 |
| Andhra Pradesh | 5 | 5 | *3* | **7** | 6 | **7** | **10** | 11 |
| Assam | 11 | 11 | **16** | 16 | 8 | **11** | 12 | **16** |
| Bihar | 17 | 17 | 18 | 17 | 18 | 18 | 18 | 17 |
| Gujarat | 7 | 7 | ***5*** | **8** | 10 | 10 | 11 | ***9*** |
| Haryana | 4 | 4 | **8** | *4* | 5 | ***3*** | 4 | 4 |
| Himachal Pradesh | 3 | 3 | **10** | *5* | 3 | 4 | 5 | 5 |
| J&K | 6 | 6 | ***4*** | *2* | 4 | 5 | *3* | 2 |
| Karnataka | 8 | **10** | 9 | 10 | 11 | **13** | 14 | ***10*** |
| Kerala | 10 | ***8*** | ***6*** | 6 | 7 | 6 | 6 | 6 |
| Madhya Pradesh | 14 | 13 | 13 | 15 | 13 | 14 | 15 | 15 |
| Maharashtra | 12 | 12 | 12 | 12 | 15 | 15 | **17** | *12* |
| Orissa | 18 | 18 | 17 | 18 | 17 | 17 | 16 | 18 |
| Punjab | 2 | 2 | 2 | 3 | 2 | 2 | 1 | **3** |
| Rajasthan | 9 | 9 | **7** | **9** | 9 | 9 | 7 | 7 |
| Tamil Nadu | 15 | 15 | ***11*** | 11 | 14 | **16** | ***13*** | 14 |
| Uttar Pradesh | 13 | 14 | 15 | *13* | 12 | *8* | 9 | 8 |
| West Bengal | 16 | 16 | ***14*** | 14 | 16 | ***12*** | ***8*** | **13** |
| Delhi | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| Urban | | | | | | | | |
| State50 | 38 | 43 | 50 | 55 | 38 | 43 | 50 | 55 |
| Andhra Pradesh | 8 | **13** | 14 | 14 | 5 | **15** | 13 | 12 |
| Assam | 4 | 2 | 2 | 4 | 11 | ***6*** | 7 | **14** |
| Bihar | 14 | **18** | *11* | **16** | 18 | 18 | 18 | 18 |
| Gujarat | 10 | 9 | 9 | 7 | 6 | 7 | 6 | 6 |
| Haryana | 5 | 6 | 5 | 5 | 7 | 5 | 4 | 5 |
| Himachal Pradesh | 1 | 1 | 3 | 2 | 3 | 1 | 2 | 3 |
| J&K | 2 | 4 | ***1*** | 1 | 1 | 3 | 1 | 1 |
| Karnataka | 11 | **17** | 15 | ***12*** | 9 | **13** | **17** | ***10*** |
| Kerala | 13 | ***9*** | 8 | 10 | 12 | ***8*** | 8 | **11** |
| Madhya Pradesh | 18 | 16 | 18 | 17 | 13 | 11 | 14 | 15 |
| Maharashtra | 12 | 12 | 13 | 13 | 9 | 9 | 11 | ***8*** |
| Orissa | 17 | ***14*** | **17** | 18 | 15 | ***12*** | ***9*** | **16** |
| Punjab | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 4 |
| Rajasthan | 9 | 8 | 10 | 9 | 8 | 10 | 12 | ***7*** |
| Tamil Nadu | 15 | ***11*** | **16** | ***11*** | 17 | 16 | 15 | 13 |
| Uttar Pradesh | 16 | 15 | ***12*** | **15** | 15 | 17 | 16 | 17 |
| West Bengal | 7 | 7 | 7 | 7 | 14 | 14 | ***10*** | 8 |
| Delhi | 6 | 5 | 5 | 5 | 2 | 2 | **5** | ***2*** |

Notes: Figures bolded and italic are 2 or more (3 or more) ranks higher (less poverty) than in the preceding year in the rural (urban) sector. Figures bolded (not italic) are 2 or more (3 or more) ranks lower than in the preceding round. Greyed entries show rise and fall in ranking over rounds.

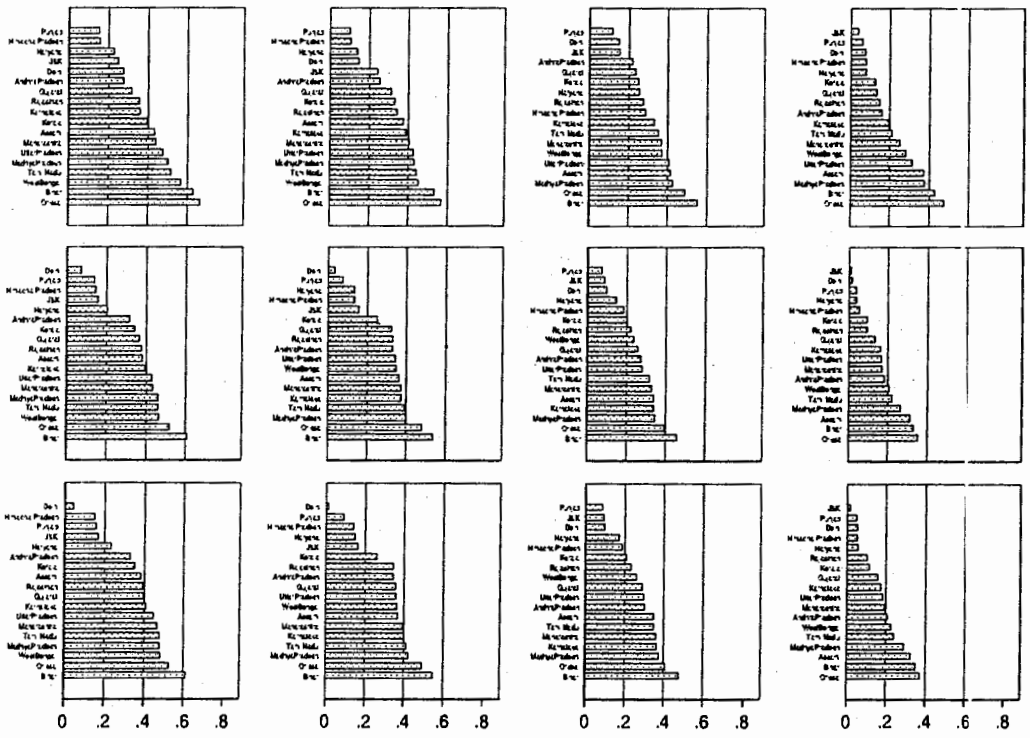
Figure 4: HCRs of States, 38th - 55th Rounds




Rows are Rounds and Columns are Poverty Lines

RPJ PLs calculated at NSSR Level.
The third column includes adjustment for non-uv shares and townsize
Bars ranked by HCR

Figure 5: HCRs of States, 38th - 55th Rounds




Rows are PLs and Columns are Rounds

RPJ PLs calculated at NSSR Level.
The third column includes adjustment for non-uv shares and townsize
Bars ranked by HCR

Table 9: Spearman Rank Correlation Coefficients (rho), between HCRs over States by Different PLs and Rounds

| Round | | Sector | | | |
|---|---|---|---|---|---|
| | | Rural | | Urban | |
| | Author | Deaton | Rpj | Deaton | rpj |
| 38 | opl | . | 0.913 | . | 0.825 |
| | Deaton | | . | | . |
| 43 | opl | 0.886 | 0.878 | 0.845 | 0.705 |
| | Deaton | | 0.996 | | 0.917 |
| 50 | opl | 0.719 | 0.740 | 0.765 | 0.598 |
| | Deaton | | 0.986 | | 0.765 |
| 55 | opl | 0.920 | 0.946 | 0.868 | 0.728 |
| | Deaton | | 0.994 | | 0.872 |

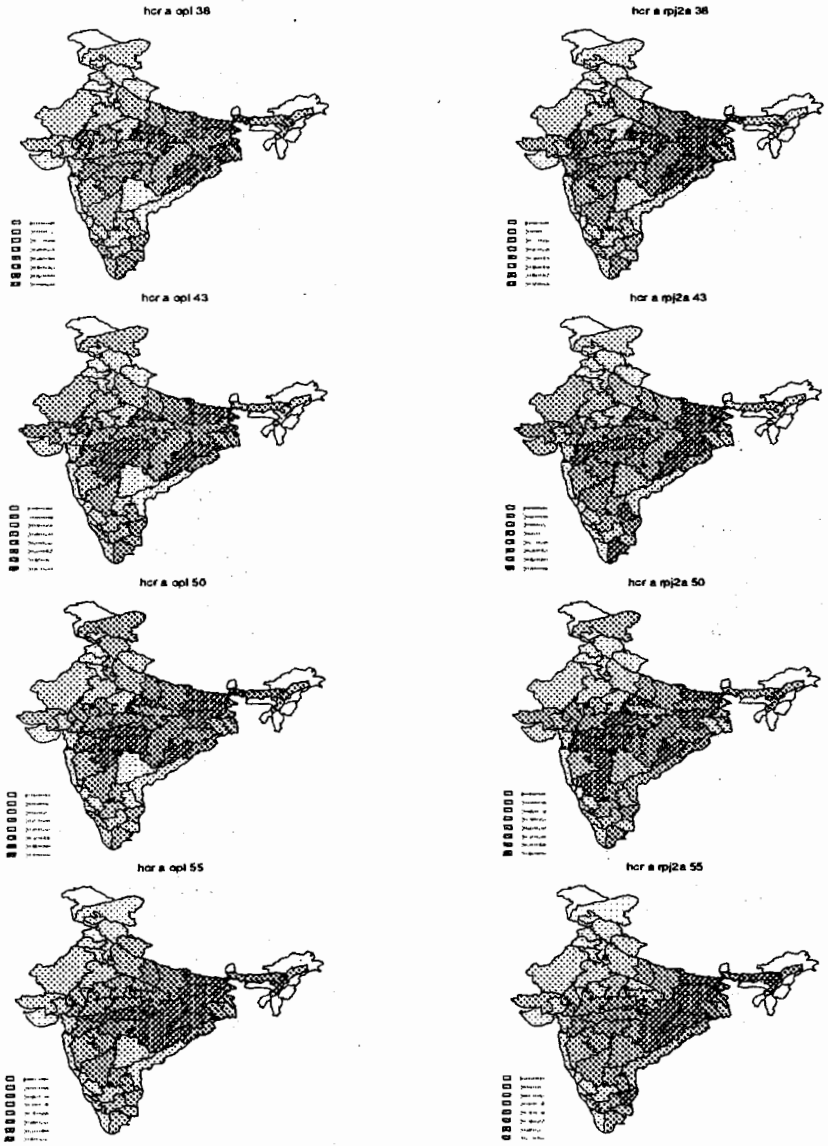
Note: State level poverty lines and poverty calculations.

Nevertheless, the patterns of differences in rankings between the sets of PLs are quite varied, more so in the urban sector. Compared to OPCs, the rural sector of Andhra Pradesh has higher poverty in all rounds. AP, Gujarat, Karnataka and Maharashtra show a lower ranking (more poverty) – a difference of at least two ranks - in three of the four rounds and TN in two, by our method than the OPCs; UP and West Bengal show higher rankings (less poverty). In the urban sector because of the greater volatility of ranks we highlight only differences of three or more ranks; WB, Assam, Bihar, MP show lower ranking, while Gujarat and MP show higher rankings. Orissa show a higher ranking in the 50$^{th}$ round.

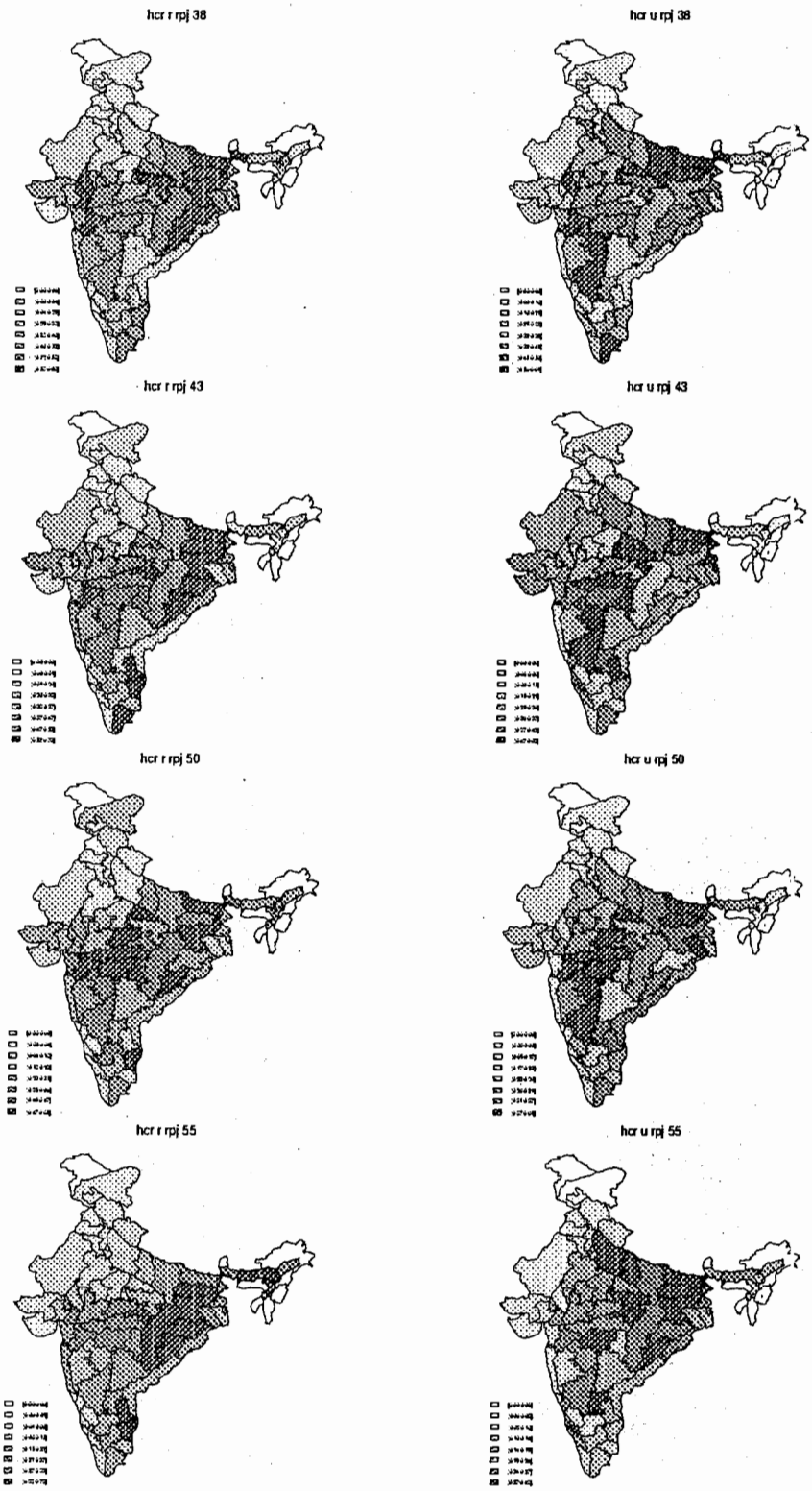
Comparing ranks of states over rounds, the OPCs for the 50th round in the rural sector show a disproportionate number of differences with either the 43rd or 55th Rounds (8 states having a difference of 2 or more ranks). In our PCs in the rural sector AP and Assam fall in the rankings, while Karnataka, Maharashtra, TN and WB show volatility (up and down movements in ranks). In the urban sector both the OPCs and ours show considerable volatility (AP, Karnataka, Kerala, Tamil Nadu, although not always for the same state; e.g. Assam, Bihar, West Bengal, Rajasthan).

The overall spatial pattern of HCRs does not vary greatly (Map 4) because the expenditure distributions have more influence on HCRs than the differences in PLs; there is still more poverty by all authors' PLs in the eastern and central states notwithstanding the higher PLs we calculate in western and north-western states. However, the UV CPI PLs give somewhat more poverty in the south-western and central states, which is clearer when considering HCRs measured at NSSR level (Map 5).

Map 4: HCRs of the Rural Sectors of NSSR, by OPL and RPJ1 PL, by Rounds



Map 5: HCRs of NSSR, by Round and Sector



It is not clear that any overall patterns emerge that cannot be traced to obvious implications of the different methods of computing PLs, mainly the re-ranking of AP due to differences between the UV CPIs and the implicit OPL deflators and to the differences in the urban UV CPIs that we have commented on above.

## IV Robust Poverty Comparisons

One response to the arbitrariness of poverty lines has been to compute stochastic dominance (Atkinson, 1987). One distribution is stochastically dominant over another of order zero if at no point does the cumulative density function of the dominated curve lie below the dominant curve. First order dominance is when the area under the dominant distribution is always less than that of the dominated. Second order dominance is when the square of the area under the CDF of the dominant distribution is always less than that of the dominated. Zero order dominance implies first and second and first order implies second, but not conversely, so that zero order dominance is "greater" than first and second (and similarly for first and second order dominance).

Zero order dominance entails the HCR of the dominant distribution always being less than that of the dominated; first order dominance implies that the Poverty Gap and second order implies that the squared Poverty Gap of the dominant distribution are less than those of the dominated at least up to the expenditure level to which dominance is tested. We have tested dominance up to the Official Poverty Line between states within rounds and for each state between rounds (and for NSSR within Rounds but not reporting here for space constraint). Testing between states across rounds is unlikely to be very meaningful given our reservations about the between rounds CPIs and hence whether PLs of different rounds can be taken to represent the same levels of welfare.

### *Within Rounds Stochastic Dominance*

As the CDFs for selected states given in Figure 3 show, zero order stochastic dominance will not be achieved between many pairs of states since the CDFs intersect and this is confirmed by our results. Tables 10 & 11 show the total numbers of dominance results by order of dominance for within round State and NSSR comparisons. For individual states (NSSR[12]) the results of the stochastic dominance tests between pairs of states can be summarized in a rough way by computing an index of the dominance of a state over other states within the same round that is the sum of the dominance orders in reversed value (i.e., dominance of order 1 is given an index of 3 and dominance of order 3 given an index 1, while order 2 remains the same; no dominance is given a score of zero). This means that the most dominant state will have the highest score over all other states. Table 12 shows the results for states by the OPL and rpj1 spatial deflators. While the overall pattern is not unexpected with north-western states dominant and eastern and southern states at the bottom end of the ranks, there is some inter-round variation and some unexpected results such as, the high ranking of Assam in the 38th and 43rd Rounds; Assam's rank falls precipitously in the 55th Round. There are differences in ranks between our and the OPL deflators, including, as expected, the lower ranking of AP by our deflators, reflecting the low implicit Official PL CPI for this state compared to the UV CPIs. Spearman rank correlations show strong (negative) association with the rank of the states by HCRs (Tables 13 and 14).

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[12] In what follows we drop the oblique NSSR where comparisons for states are also repeated for NSSR.

Table 10: Dominance Order between States by Round, India

| Rural | Dominance Order | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | Total |
| Round | | | Number of Pairs of States | | |
| 38 | 113 | 30 | 8 | 2 | 153 |
| 43 | 103 | 39 | 9 | 2 | 153 |
| 50 | 76 | 65 | 11 | 1 | 153 |
| 55 | 94 | 51 | 7 | 1 | 153 |
| Total | 386 | 185 | 35 | 6 | 612 |
| | | | % of Pairs of States | | |
| 38 | 73.86 | 19.61 | 5.23 | 1.31 | 100 |
| 43 | 67.32 | 25.49 | 5.88 | 1.31 | 100 |
| 50 | 49.67 | 42.48 | 7.19 | 0.65 | 100 |
| 55 | 61.44 | 33.33 | 4.58 | 0.65 | 100 |
| Total | 63.07 | 30.23 | 5.72 | 0.98 | 100 |
| | | | Urban | | |
| | 0 | 1 | 2 | 3 | Total |
| Round | | | Number of Pairs of States | | |
| 38 | 136 | 7 | 8 | 2 | 153 |
| 43 | 76 | 65 | 9 | 3 | 153 |
| 50 | 105 | 37 | 10 | 1 | 153 |
| 55 | 95 | 51 | 7 | 0 | 153 |
| Total | 412 | 160 | 34 | 6 | 612 |
| | | | % of Pairs of States | | |
| 38 | 88.89 | 4.58 | 5.23 | 1.31 | 100 |
| 43 | 49.67 | 42.48 | 5.88 | 1.96 | 100 |
| 50 | 68.63 | 24.18 | 6.54 | 0.65 | 100 |
| 55 | 62.09 | 33.33 | 4.58 | 0.00 | 100 |
| Total | 67.32 | 26.14 | 5.56 | 0.98 | 100 |

Notes: Our Poverty Lines.
Sources: NSS Consumer Expenditure Surveys, our calculations.

Table 11: Dominance Order between NSSR by Round, Rural India

| Round | Dominance Order (number of comparisons) | | | | |
|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | Total |
| 38 | 1834 | 245 | 131 | 20 | 2230 |
| 43 | 1531 | 264 | 58 | 38 | 1891 |
| 50 | 1553 | 233 | 93 | 12 | 1891 |
| 55 | 1555 | 219 | 85 | 32 | 1891 |
| Total | 6473 | 961 | 367 | 102 | 7903 |
| | | | % cases | | |
| 38 | 82.24 | 10.99 | 5.87 | 0.90 | 100 |
| 43 | 80.96 | 13.96 | 3.07 | 2.01 | 100 |
| 50 | 82.13 | 12.32 | 4.92 | 0.63 | 100 |
| 55 | 82.23 | 11.58 | 4.49 | 1.69 | 100 |
| Total | 81.91 | 12.16 | 4.64 | 1.29 | 100 |

Table 12: Rank Ordering of Stochastic Dominance of States' Distributions of Rural Monthly Per Capita Expenditure by OPL and Authors' PLs

| | 38 | | 43 | | 50 | | 55 | |
|---|---|---|---|---|---|---|---|---|
| | opl | rpj | opl | rpj | opl | Rpj | opl | rpj |
| Himachal Pradesh | 1 | 1 | 4 | 4 | 5 | 4 | 3 | 3 |
| New Delhi | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| J&K | 3 | 1 | 2 | 2 | 3 | 3 | 2 | 2 |
| Gujarat | 4 | 5 | 5 | 9 | 10 | 11 | 7 | 8 |
| Haryana | 5 | 4 | 6 | 5 | 12 | 9 | 5 | 4 |
| Punjab | 6 | 6 | 7 | 6 | 2 | 2 | 6 | 5 |
| Assam | 7 | 7 | 3 | 3 | 7 | 7 | 16 | 15 |
| Madhya Pradesh | 8 | 10 | 14 | 12 | 16 | 15 | 14 | 17 |
| Andhra Pradesh | 9 | 11 | 8 | 14 | 11 | 13 | 11 | 16 |
| Kerala | 10 | 8 | 9 | 8 | 8 | 8 | 4 | 6 |
| Uttar Pradesh | 11 | 8 | 9 | 6 | 13 | 9 | 17 | 13 |
| Karnataka | 12 | 11 | 13 | 18 | 8 | 12 | 7 | 8 |
| Maharashtra | 12 | 13 | 9 | 9 | 17 | 18 | 10 | 8 |
| Rajasthan | 12 | 15 | 16 | 14 | 4 | 6 | 7 | 7 |
| Bihar | 15 | 16 | 9 | 12 | 18 | 16 | 14 | 11 |
| West Bengal | 16 | 14 | 15 | 11 | 6 | 5 | 13 | 11 |
| Orissa | 17 | 17 | 16 | 14 | 14 | 14 | 18 | 17 |
| Tamil Nadu | 18 | 18 | 16 | 14 | 14 | 16 | 11 | 14 |

Note: MPCE are deflated by the State PLs to the All-India Rural PL, 89.5, which is used as the maximum to which dominance is tested. States are ordered by rank by Rank by OPL deflators in the 38th Round

Table 13: Spearman Rank Correlations among State HCRs and Stochastic Dominance Orderings

| Round | Sector | pl | HCRs by opl | HCRs by rpj | Dominance opl | Dominance rpj |
|---|---|---|---|---|---|---|
| 38 | R | opl | 0.94 | 0.94 | -0.83 | -0.78 |
| 38 | U | opl | 0.78 | 0.86 | -0.84 | -0.75 |
| 43 | R | opl | 0.90 | 0.90 | -0.72 | -0.54 |
| 43 | U | opl | 0.82 | 0.88 | -0.85 | -0.74 |
| 50 | R | opl | 0.72 | 0.72 | -0.64 | -0.52 |
| 50 | U | opl | 0.79 | 0.78 | -0.88 | -0.86 |
| 55 | R | opl | 0.94 | 0.94 | -0.93 | -0.84 |
| 55 | U | opl | 0.82 | 0.81 | -0.88 | -0.66 |

Dominance order by opl/rpj means dominance when the MPCE is deflated by opl/rpj PLs and tested up to the all-India Rural OPL of the 38th Round.

Table 14: Spearman Rank Correlations among Stochastic Dominance Orderings of State CDFs of MPCE Deflated by OPLs and RPJ PLs

| Round | Correlations between HCRs by Deflators | Sector | |
|---|---|---|---|
| | | Rural | Urban |
| 38 | Opl/Rpj | .962 | .834 |
| 43 | Opl/Rpj | .838 | .861 |
| 50 | Opl/Rpj | .948 | .907 |
| 55 | Opl/rpj | .923 | .767 |

Thus, while dominance is not attained between many pairs of states, the overall rankings are very similar to those when ordered by the simple poverty measures. Similar but not identical spatial patterns of poverty emerge at each round.

We have computed between rounds stochastic dominance for each state considered separately, not comparisons between all combinations of states and rounds, because of our concerns over the comparisons across domains where the "environment" variables

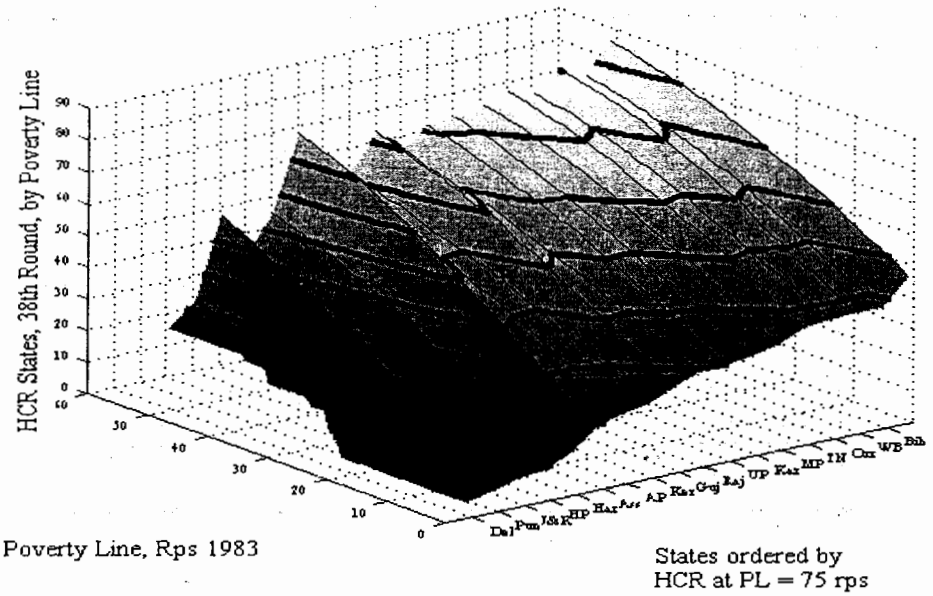
may differ; while this concern applies to within- as well as, between-rounds comparisons, comparing states across rounds conflates the problems of both.

The between rounds comparisons is made by deflating MPCE in each round by the implicit PL deflator to 1983 "real" expenditure levels. Using our (rpj1) PLs, out of 108 possible comparisons (18 states over 4 rounds comparing each state with all previous rounds), 83 show no dominance; the 55th Round shows most cases of dominance (14, with 7 and 8 cases in the 43rd and 50th rounds), most of which are over the 38th Round with only one state dominant in the 55th round over the 43rd and 3 over the 50th[13]). There was no dominance of an earlier round over a following one.

*Comparisons of Poverty at Different Poverty Lines*

Stochastic dominance is a rather exacting requirement even when the range over which is tested is truncated at the lower end since a failure of dominance at the low end prevents dominance over the whole range[14]. Perhaps rather more helpful in understanding the different situations of each state is a comparison of HCRs (or other poverty aggregates) for a range of PLs; if we can find the PLs at which two domains give the same HCR it gives an idea of the differences in CPIs that are required for poverty in one domain to exceed that in another. Figure 6 shows the poverty counts (HCRs) for different states at a range of poverty lines for the 38th Round as a surface with contours of equal HCRs superimposed.

Figure 6: States' HCRs by Poverty Lines, Rural, 38th Round.




[13] Rajasthan shows dominance of each round over the preceding round except for the 43rd over the 38th. Maharashtra and Delhi AP (55) Haryana (43) HP(43,55), J&K (55) Orissa & Punjab (43,50, 55), Rajasthan (50,55), UP (43, 55), WB (55) and Delhi (43) dominate over the 38th Round.

[14] This makes differences in poverty amongst households with the lowest MPCE determinant of poverty rankings. It is likely that many of the lowest MPCE are not realistic assessments of usual household consumption since they are so low that a household could not subsist even for one month with this level of consumption. It is likely that many of these very low expenditure levels reflect errors in the survey response, lumpiness of expenditures, or data processing errors.

States are ordered by their HCR at the lowest PL considered (70 Rps pc pm n 1983 prices). It is clear that, for example, no PL within the range considered (70 – 130 Rps pc pm) would result in Bihar (with most poverty at each PL) and Delhi having the same level of poverty; even if Bihar had a rural PL of 70 Rps pc pm and Delhi a PL of 130 Rps pc pm, there would still be a higher incidence of poverty in Bihar than in Delhi (in their rural sectors). For states which are less far apart in terms of their HCRs there will be PLs where their HCRs reverse and the differences in the slopes of the surface indicates that the difference between their HCRs will vary with the levels of HCR considered. Nevertheless, this gives a rather more informative picture of the relative levels of poverty, or, more to the point, the gap that net differences in the cost of living not properly captured in the currently used expenditure deflators, the availability of public goods and the quality of the environment and culture would have to make up if poverty in the state with the greater HCR were to come down to that with the lower HCR[15].

A similar but spatially more explicit way of demonstrating the same information is to display the HCRs of NSSR as a chloropleth map. Map 5 shows the spatial distributions of HCRs for the rural sector by NSSR at each round, comparing OPLs with our PLs and Map 6 provides as smoothed image of the poverty levels computed from our PLs at each round to illustrate the trans-state nature of these poverty estimates. However, the dominant feature of both maps, which use the same scales all four rounds, is the decline in overall poverty between the 38th and 55th Rounds (subject to the usual caveats about the 55th Round) and the relatively unchanging concentration of poverty in the eastern and central regions.

*Numbers of Poor*

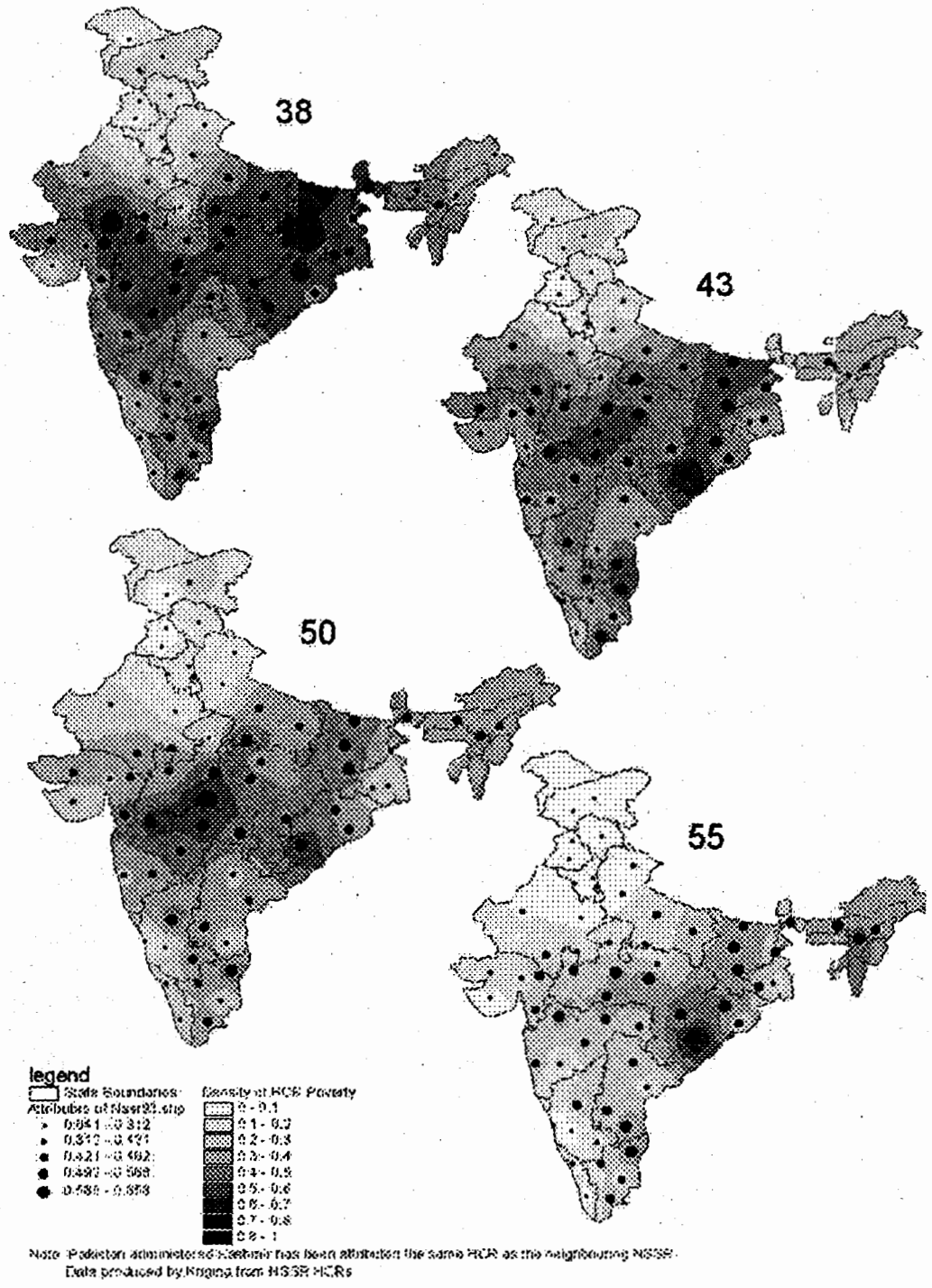
Much debate is concerned with the incidence of poverty assessed as the HCR, PG or PG squared. However, it is arguably more interesting to consider the numbers of poor; here the spatial patterns are somewhat different to the spatial patterns of HCRs (or PG or PGsq). Map 6 show the spatial distributions of the poor and of the incidence of poverty (HCR) for the rural sector in the 38th Round; the spatial distribution of the incidence (HCR) is more evenly spread than that of the poor who are relatively more concentrated in the eastern region. The number of poor is the product of population and the incidence of poverty; the greater density of the poor in the eastern regions arises mainly because the population is greater in the eastern regions rather than because the incidence of poverty is greater. Recently, Subramaniam (2005b), has suggested a mixed poverty estimator that responds to both the numbers of poor and the head count ratio (MPE); Table 15 reports the rankings of states by the HCR, numbers of poor and the MPE. The major re-rankings compared to the HCR are the populous northern states of Uttar Pradesh and West Bengal, whose rankings worsen, while the ranks of the less populous Orissa and Tamil Nadu rise.

Over the four rounds we see significant reduction in the Mixed Poverty Indicator (see Table 16) for nearly all states indicating that falls in the probability of being poor (HCR) outweigh the sometimes increasing numbers of poor. Doubt can be cast on this finding because of the non-comparability of the 55th with earlier rounds; however, when the calculations are repeated using the Mixed Recall Period in all rounds, again nearly all

[15] This is rather more precisely illustrated if we first deflate expenditure by the UV CPI based poverty lines and then compute poverty for a range of PLs. Since within rounds our PLs are not greatly different (compared to OPLs) the figures given do not greatly distort the situation.

states show declines in the mixed poverty estimate since the 38th round (and indeed between earlier rounds) as shown in the final column of this Table (Map 7).

Map 6: Smoothed HCRs by Round (rural Sector)[16]




[16] This map uses the same scale for all rounds

Table 15: Ranks of States by Head Count Ratio, Population of Poor and Mixed Poverty Estimate

| Round | | 38 | | | 43 | | | 50 | | | 55 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State50 | hcr | no poor | mpe | hcr | no poor | mpe | hcr | no poor | mpe | hcr | no poo | mpe |
| Sector | | | | | | | Rural | | | | | |
| Andhra Pradesh | 7 | 12 | 9 | 7 | 14 | 11 | 9 | 11 | 11 | 11 | 12 | 11 |
| Assam | 8 | 6 | 6 | 9 | 7 | 7 | 12 | 7 | 9 | 16 | 9 | 10 |
| Bihar | 18 | 17 | 18 | 18 | 18 | 18 | 18 | 17 | 18 | 17 | 18 | 18 |
| Gujarat | 9 | 8 | 8 | 12 | 8 | 9 | 11 | 9 | 8 | 8 | 8 | 8 |
| Haryana | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 |
| Himachal Pradesh | 3 | 2 | 2 | 3 | 2 | 3 | 5 | 3 | 4 | 5 | 3 | 4 |
| J&K | 4 | 3 | 3 | 5 | 3 | 4 | 3 | 2 | 2 | 3 | 2 | 2 |
| Karnataka | 12 | 11 | 11 | 13 | 10 | 10 | 14 | 10 | 12 | 10 | 10 | 9 |
| Kerala | 6 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Madhya Pradesh | 13 | 14 | 13 | 15 | 16 | 16 | 15 | 16 | 15 | 15 | 16 | 17 |
| Maharashtra | 15 | 15 | 15 | 14 | 15 | 15 | 17 | 15 | 16 | 13 | 15 | 14 |
| Orissa | 16 | 10 | 12 | 17 | 11 | 13 | 16 | 12 | 14 | 18 | 13 | 16 |
| Punjab | 2 | 4 | 4 | 1 | 4 | 2 | 1 | 4 | 3 | 2 | 4 | 3 |
| Rajasthan | 11 | 9 | 10 | 10 | 9 | 8 | 7 | 8 | 7 | 7 | 7 | 7 |
| Tamil Nadu | 17 | 13 | 14 | 16 | 12 | 14 | 13 | 14 | 13 | 14 | 11 | 13 |
| Uttar Pradesh | 10 | 18 | 17 | 8 | 17 | 17 | 10 | 18 | 17 | 9 | 17 | 15 |
| West Bengal | 14 | 16 | 16 | 11 | 13 | 12 | 8 | 13 | 10 | 12 | 14 | 12 |
| Delhi | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Sector | | | | | | | Urban | | | | | |
| Andhra Pradesh | 5 | 12 | 10 | 14 | 13 | 14 | 13 | 14 | 13 | 12 | 14 | 14 |
| Assam | 6 | 3 | 3 | 6 | 3 | 5 | 8 | 3 | 5 | 14 | 3 | 7 |
| Bihar | 18 | 14 | 16 | 18 | 15 | 17 | 18 | 11 | 15 | 18 | 16 | 17 |
| Gujarat | 9 | 10 | 11 | 12 | 10 | 10 | 7 | 10 | 9 | 7 | 10 | 8 |
| Haryana | 7 | 4 | 5 | 5 | 6 | 6 | 5 | 5 | 6 | 6 | 5 | 5 |
| Himachal Pradesh | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 1 |
| J&K | 1 | 2 | 2 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 |
| Karnataka | 10 | 11 | 12 | 16 | 11 | 12 | 15 | 12 | 12 | 8 | 11 | 10 |
| Kerala | 12 | 8 | 7 | 7 | 8 | 7 | 6 | 7 | 7 | 11 | 8 | 9 |
| Madhya Pradesh | 14 | 13 | 13 | 13 | 12 | 11 | 17 | 15 | 14 | 15 | 15 | 16 |
| Maharashtra | 13 | 16 | 15 | 8 | 17 | 15 | 11 | 17 | 17 | 10 | 17 | 15 |
| Orissa | 15 | 7 | 8 | 10 | 7 | 8 | 12 | 8 | 8 | 16 | 9 | 11 |
| Punjab | 4 | 6 | 6 | 4 | 5 | 4 | 4 | 4 | 3 | 4 | 4 | 3 |
| Rajasthan | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 10 | 5 | 7 | 6 |
| Tamil Nadu | 16 | 17 | 17 | 15 | 16 | 16 | 14 | 16 | 16 | 9 | 13 | 13 |
| Uttar Pradesh | 17 | 18 | 18 | 17 | 18 | 18 | 16 | 18 | 18 | 17 | 18 | 18 |
| West Bengal | 11 | 15 | 14 | 11 | 14 | 13 | 10 | 13 | 11 | 13 | 12 | 12 |
| Delhi | 3 | 5 | 4 | 1 | 4 | 3 | 3 | 6 | 4 | 3 | 6 | 4 |

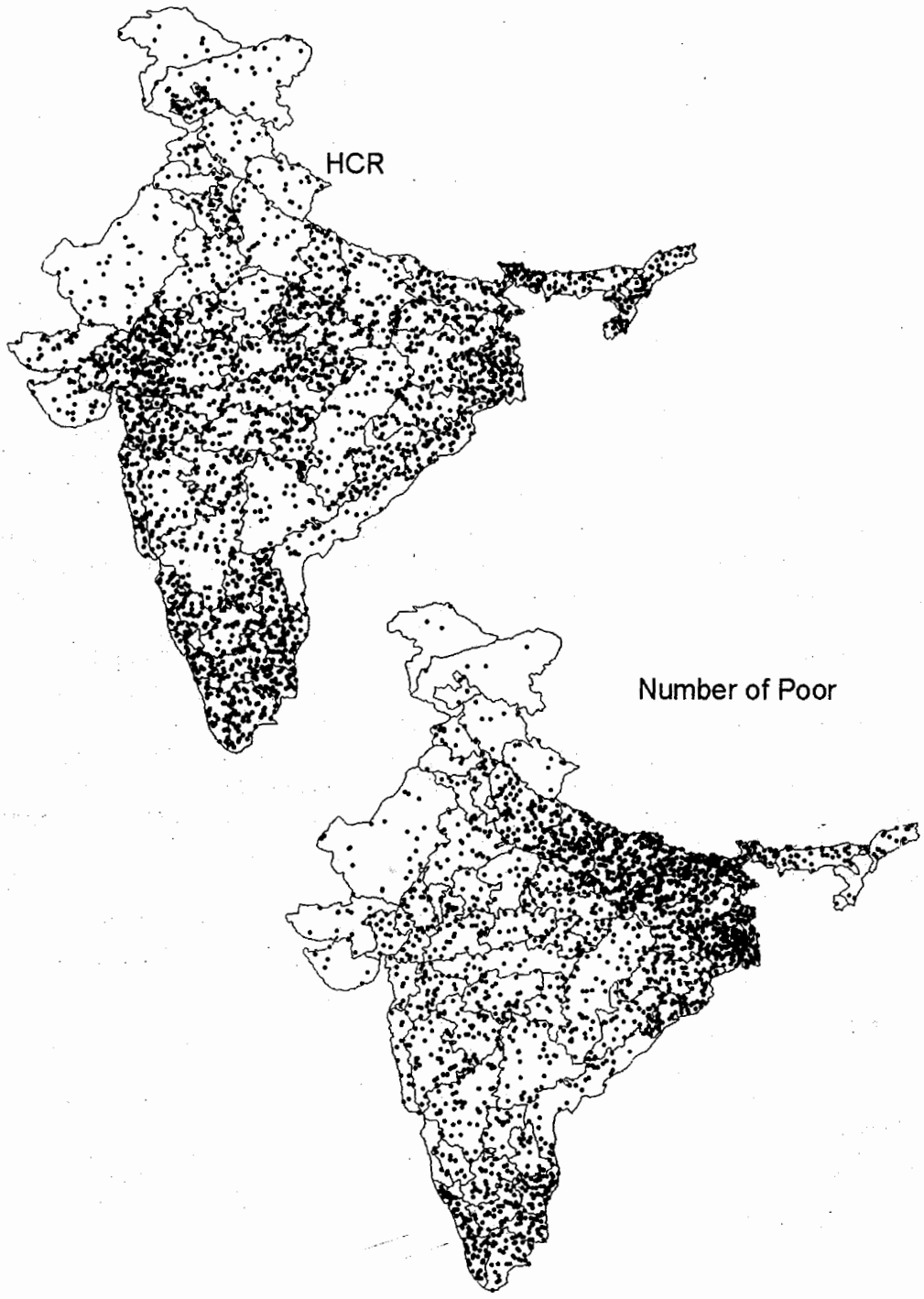
Table16: Mixed Poverty Estimate by State and Round

| State | Rural | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|
| | 38 | 43 | 50 | 55 | 38 | 43 | 50 | 55 |
| Andhra Pradesh | 2238 | 2148 | 1567 | 1284 | 909 | 956 | 938 | 630 |
| Assam | 1239 | 1298 | 1408 | 1250 | 290 | 219 | 273 | 286 |
| Bihar | 5455 | 4735 | 3720 | 2604 | 1454 | 1533 | 1026 | 1213 |
| Gujarat | 1911 | 1784 | 1357 | 709 | 944 | 794 | 597 | 344 |
| Haryana | 639 | 371 | 479 | 109 | 490 | 278 | 301 | 204 |
| Himachal Pradesh | 257 | 218 | 316 | 86 | 58 | 26 | 47 | 17 |
| J&K | 332 | 299 | 109 | 53 | 111 | 80 | 30 | 21 |
| Karnataka | 2383 | 2031 | 1806 | 952 | 973 | 915 | 860 | 411 |
| Kerala | 1443 | 985 | 644 | 336 | 660 | 421 | 369 | 362 |
| Madhya Pradesh | 3165 | 3050 | 2343 | 2115 | 1136 | 900 | 1020 | 806 |
| Maharashtra | 3416 | 2736 | 2480 | 1446 | 1434 | 1023 | 1109 | 746 |
| Orissa | 2675 | 2555 | 2074 | 1974 | 671 | 448 | 477 | 490 |
| Punjab | 341 | 203 | 174 | 81 | 512 | 201 | 251 | 155 |
| Rajasthan | 2251 | 1769 | 1034 | 469 | 775 | 670 | 621 | 284 |
| Tamil Nadu | 3248 | 2669 | 1996 | 1407 | 1737 | 1130 | 1085 | 570 |
| Uttar Pradesh | 4112 | 3158 | 2683 | 1538 | 1914 | 1549 | 1331 | 1287 |
| West Bengal | 3501 | 2171 | 1507 | 1390 | 1146 | 934 | 834 | 553 |
| Delhi | 14 | 67 | 67 | 9 | 367 | 108 | 257 | 155 |

| State | Total | | | | Uniform Recall Period[1] Round on Round Change | | | | Mixed Recall Period[2] |
|---|---|---|---|---|---|---|---|---|---|
| | 38 | 43 | 50 | 55 | 43/38 | 50/43 | 55/50 | 55/38 | 55/38 |
| Andhra Pradesh | 2400 | 2343 | 1826 | 1419 | 0.98 | 0.78 | 0.78 | 0.59 | 0.63 |
| Assam | 1268 | 1301 | 1416 | 1273 | 1.03 | 1.09 | 0.90 | 1.00 | 1.16 |
| Bihar | 5584 | 4965 | 3835 | 2864 | 0.89 | 0.77 | 0.75 | 0.51 | 0.55 |
| Gujarat | 2110 | 1927 | 1443 | 778 | 0.91 | 0.75 | 0.54 | 0.37 | 0.45 |
| Haryana | 790 | 456 | 566 | 197 | 0.58 | 1.24 | 0.35 | 0.25 | 0.32 |
| Himachal Pradesh | 264 | 217 | 316 | 87 | 0.82 | 1.46 | 0.28 | 0.33 | 0.38 |
| J&K | 346 | 304 | 110 | 57 | 0.88 | 0.36 | 0.52 | 0.16 | 0.23 |
| Karnataka | 2523 | 2191 | 1979 | 1023 | 0.87 | 0.90 | 0.52 | 0.41 | 0.43 |
| Kerala | 1587 | 1071 | 742 | 472 | 0.67 | 0.69 | 0.64 | 0.30 | 0.33 |
| Madhya Pradesh | 3333 | 3106 | 2539 | 2239 | 0.93 | 0.82 | 0.88 | 0.67 | 0.76 |
| Maharashtra | 3593 | 2775 | 2557 | 1589 | 0.77 | 0.92 | 0.62 | 0.44 | 0.48 |
| Orissa | 2730 | 2523 | 2094 | 1986 | 0.92 | 0.83 | 0.95 | 0.73 | 0.77 |
| Punjab | 537 | 277 | 279 | 153 | 0.52 | 1.01 | 0.55 | 0.28 | 0.36 |
| Rajasthan | 2354 | 1875 | 1205 | 547 | 0.80 | 0.64 | 0.45 | 0.23 | 0.24 |
| Tamil Nadu | 3623 | 2765 | 2241 | 1459 | 0.76 | 0.81 | 0.65 | 0.40 | 0.44 |
| Uttar Pradesh | 4536 | 3516 | 2995 | 1939 | 0.78 | 0.85 | 0.65 | 0.43 | 0.46 |
| West Bengal | 3573 | 2343 | 1722 | 1486 | 0.66 | 0.73 | 0.86 | 0.42 | 0.44 |
| Delhi | 358 | 124 | 265 | 138 | 0.35 | 2.14 | 0.52 | 0.39 | 0.49 |

Note: 1. Uniform recall Period in rounds 38-50, Mixed Recall Period in 55th Round; (2) MRP in all rounds.

Map 7: Incidence and Numbers of Poor in India, 38th Round, Rural Sector




Note: each dot in the lower right represents 100,000 people
in the upper right map each dot represents 1% HCR

## V Poverty and Other Indicators of Welfare

The poverty line in India is certainly not one that allows a standard of living much beyond bare necessities, even if it cannot be posed as a minimum "absolute" standard related to "requirements" for food and a minimal allowance for other necessities[17]. Since at this level of living people whose consumption is around or below this level will be faced with health and nutritional challenges which will impair many of them to the extent that is reflected in the basic indicators of health and nutrition. We present in this section some simple correlations between poverty measures from the 50th and 55th rounds with women and children's anthropometric status from the 1993-94 and 1998-99 National Family Health Surveys computed at the level of NSSR and infant and child mortality figures from the 1981 and 1991 censuses[18].

Anthropometric poverty can be defined as having an anthropometric or nutritional status below the cut-offs for malnutrition and can be considered a direct indicator of ill-being; there are well-known health hazards associated with low anthropometric status both for the individual (Shetty & James, 1994; Fogel, 1994) and for the children of anthropometrically disadvantaged mothers (Barker, 1998). There are also well-known problems with both these types of indicators and their correlation with monetary poverty can be expected to be conditional (Micklewright and Ismail, 2001; Sahn & Stifel 2002; *see also* Baulch and Masset, 2003; Haddad *et al.*, 2005). Distributions of these indicators can vary so that the ranking of different groups in terms of anthropometric poverty may depend on the cut-off points used; stochastic dominance methods can be used but are not of great help if dominance does not obtain among these distributions[19], or if there is uncertainty about the relative poverty lines to be used.

Nevertheless both measures of central tendency (mean or median) and proportion of the population below specific "anthropometric poverty" cut-offs may be useful indicators of the prevalence of ill-being in different groups and over time. We use the mean z scores of height for age, as well as, the estimated proportions of the population with height for age z-scores below the standard cut offs (-2 sd. and -3 sd. below the median of the standard population[20]). Women's and children's height for age have been calculated at NSSR level for NFHS 2 (1998/99) and children's height and weight for age in NFHS1 (1992/93)[21]. NFHS 1 and NFHS 2 preceded by one year the 50th and 55th Rounds. The Body Mass Index of adult women is also included; the sample for this variable is larger

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[17] As we suggested in the second paper, an equal command over calories will neither assure a constant standard of living (e.g. can be a basis for measuring poverty); nor will it translate into a constant level of nutritional well-being. Both the translation of calories into a standard of living and into nutritional well-being are contingent on the "environmental" variables which we discussed in our second paper.

[18] See Murthi *et al.*, 2001, for mapping of Indian Districts to NSS Regions.

[19] The patterns of (mainly lack of) stochastic dominance is similar to the results of the stochastic dominance tests for poverty reported above. A more useful approach might be to compare levels of anthropometric measures over a rather narrower range although the justification we used in the case of poverty (that we had no idea of the "value" of the environmental variables in different domains) is unlikely to apply in the case of anthropometric indicators where there is rather more agreement as to the relevant ranges, which are not likely to differ greatly between domains.

[20] Z-scores are the distance in terms of standard deviations of the reference population from the median of the reference population. DHS data provide these figures; however, when recalculated using standard programs such as, ANTHRO (from WHO) of NutStat from the EpiInfo suite of programs, we do not always obtain the same figures from these different programs as reported in the NFHS data.

[21] Child height data do not appear for a number of regions in NFHS 1.

than for children as it was recorded for most of the sample; women's anthropometric data do not appear in NFHS 1.

Infant mortality is another indicator of ill-being that is used for example in the Human Development Index produced by the UNDP[22]. Infant mortality can be calculated from the NFHS, but it is debatable whether the population is large enough to make comparisons for NSS Regions or even Indian States. Regional estimates of infant and child mortality can be made from other sources of information such as, the Censuses in India and the Indian Sample Registration System. We have used the published estimates of IMRs from the 1981 and 1991 Indian Censuses, as well as, IMRs calculated from the NFHS.

Table 17 shows our results. While the signs of associations are as one would expect the level of correlation is not particularly high; even among anthropometric indicators associations can be quite low or even insignificant (women's height with child stunting for example). Women's BMI and height are the most (negatively) correlated with poverty, followed by IMRs in the 1981 and 1991 censuses. The very low correlation between child height and weight for age in NFHS 1 and stunting in NFHS 2 is surprising[23].

Table 17: Correlations among Poverty, the Anthropometric Status of Women and Children and Child Mortality Rates Pair wise Pearson Correlation Coefficients for the 62 NSSR in the Major States of India

| | Poverty | | NFHS2 | | | NFHS1 | | |
|---|---|---|---|---|---|---|---|---|
| | rpj (r&u) | | Women's' | | | Children's' | | |
| | hcr_rpj50 | hcr_rpj55 | bmi_ | wt_ht | Ht/age | Wt/ht | <-2 sd. | <-3sd |
| Hcr_rpj 50 | 1 | | | | | | | |
| Hcr_rpj55 | 0.7425* | 1 | | | | | | |
| Women's' bmi | -0.5653* | -0.5423* | 1 | | | | | |
| Wt/ht | -0.5474* | -0.5276* | 0.9908* | 1 | | | | |
| Children's Ht/age | -0.3796 | -0.365 | 0.3746* | 0.3588 | 1 | | | |
| ' wt/ht | -0.3495 | | | | 0.303 | 1 | | |
| Ht<-2sd | 0.3536 | | -0.3364 | -0.3036 | -0.8377* | | 1 | |
| Ht<-3sd | 0.4075 | 0.3577 | -0.4350* | -0.4158* | -0.8616* | | 0.8070* | 1 |
| Ht/age_sdt | | -0.3076 | 0.4404* | 0.3751* | 0.3523 | -0.4171* | | -0.5229* |
| Wt/ht | -0.3497* | | 0.4568* | 0.4940* | | 0.5307* | | |
| Ht <-2 | | | -0.5441* | -0.5043* | | | | |
| Ht <-3 | | | -0.4847* | -0.4331* | | | | 0.4034* |
| Imr 81 | 0.2915 | 0.2716 | -0.3708* | -0.3378* | | | | |
| Cmr 81 | 0.5337* | 0.3818* | -0.5744* | -0.5149* | -0.3954* | -0.3062 | | 0.4021* |
| Imr 91 | 0.5045* | 0.4590* | -0.5175* | -0.4703* | -0.3548 | | | 0.3792* |
| Cmr 91 | 0.4653* | 0.3901* | -0.4957* | -0.4405* | -0.3394 | | | 0.3920* |
| Imr nfhs1 | -0.4325* | -0.4006* | 0.4346* | 0.4283* | | 0.5402* | | |
| Cmr nfhs1 | -0.4317* | -0.4456* | 0.4770* | 0.4364* | 0.6179* | 0.3105 | -0.5721* | -0.6357* |
| Imr nfhs2 | | | 0.3103* | 0.2855 | | | | |
| Imr nfhs2 | -0.3932* | | 0.5519* | 0.5147* | | | | -0.3762* |

Contd...

[22] And was recently used to highlight the effects of the latest Iraq war on the population.

[23] This extends to stunting in NFHS 1 which is not reported here.

Table 17: Correlations among Poverty, the Anthropometric Status of Women and Children and Child Mortality Rates Pair wise Pearson Correlation Coefficients for the 62 NSSR in the Major States of India

| | NFHS2 | | | | Census | |
|---|---|---|---|---|---|---|
| | Children's' | | | | 1981 | |
| | Ht/age | Wt/ht | <-2sd. | <-3sd | .imr | Cmr |
| Hcr_rpj 50 | | | | | | |
| Hcr_rpj55 | | | | | | |
| Women's' bmi | | | | | | |
| Wt/ht | | | | | | |
| Children's Ht/age | | | | | | |
| ' wt/ht | | | | | | |
| Ht<-2sd | | | | | | |
| Ht<-3sd | | | | | | |
| Ht/age_sdt | 1 | | | | | |
| Wt/ht | -0.2673 | 1 | | | | |
| Ht <-2 | -0.6709* | | 1 | | | |
| Ht <-3 | -0.8494* | | 0.8155* | 1 | | |
| Imr 81 | -0.4731* | -0.2847 | 0.4223* | 0.4342* | 1 | |
| Cmr 81 | -0.5602* | -0.3303* | 0.4521* | 0.4923* | 0.8160* | 1 |
| Imr 91 | -0.5310* | | 0.4177* | 0.5190* | 0.8244* | 0.8424* |
| Cmr 91 | -0.5241* | | 0.3829* | 0.5156* | 0.8032* | 0.8773* |
| Imr nfhs1 | 0.3365* | 0.25 | | | -0.5078* | -0.5059* |
| Cmr nfhs1 | 0.5875* | | -0.274 | -0.4504* | -0.5207* | -0.6726* |
| Imr nfhs2 | 0.3381* | | -0.3038 | -0.3882* | -0.3155* | -0.4726* |
| Imr nfhs2 | 0.4559* | 0.3015 | -0.5498* | -0.5397* | -0.4888* | -0.7567* |

| | Census | | | | | |
|---|---|---|---|---|---|---|
| | 1991 | | NFHS1 | | NFHS2 | |
| | Imr | cmr | Imr | cmr | imr | |
| Hcr_rpj 50 | | | | | | |
| Hcr_rpj55 | | | | | | |
| Women's' bmi | | | | | | |
| Wt/ht | | | | | | |
| Children's Ht/age | | | | | | |
| ' wt/ht | | | | | | |
| Ht<-2sd | | | | | | |
| Ht<-3sd | | | | | | |
| Ht/age_sdt | | | | | | |
| Wt/ht | | | | | | |
| Ht <-2 | | | | | | |
| Ht <-3 | | | | | | |
| Imr 81 | | | | | | |
| Cmr 81 | | | | | | |
| Imr 91 | 1 | | | | | |
| Cmr 91 | 0.9718* | 1 | | | | |
| Imr nfhs1 | -0.5482* | -0.5094* | 1 | | | |
| Cmr nfhs1 | -0.6663* | -0.6658* | 0.6350* | 1 | | |
| Imr nfhs2 | -0.4752* | -0.4960* | | 0.5199* | 1 | |
| Imr nfhs2 | -0.6112* | -0.6454* | | 0.5176* | 0.6515* | |

Notes: BMI: Body Mass Index; IMR: Infant Mortality Rate; CMR: Child Mortality Rate; values are printed is $p < 0.05$ and starred if $p<0.00$

Sources: HCRs - author's calculations from NSS Consumer Expenditure Surveys; BMI & Ht/age from the National Family Health Surveys 1&2 (1998/99); IMRs & CMRs - Indian Censuses and NFHS 1 & 2.

Typically, southern states perform rather better in terms of anthropometric and mortality indicators than in terms poverty; there are high levels of relative disadvantage by these indicators in the eastern and central regions of India for most indicators, as with poverty, but child stunting is somewhat more prevalent in the north-west than is women's height disadvantage, which seems particularly severe in Bihar and eastern Uttar Pradesh. However, it is notable that child stunting is the least well correlated of the anthropometric indicators with rural poverty. Both women's anthropometries and infant and child mortality, are more closely associated with rural poverty than child anthropometry. As noted above, child heights and weights from NFHS 1 do not correlate particularly well with those from NFHS 2. These results raise questions about the quality of anthropometric data and also on reliance on a single "intrinsic" indicator of well-being such as, child anthropometry, as used for example by Sahn and Stifel, 2002.

## VI Concluding Remarks

In this paper we revisited poverty calculations of the Planning Commission and those of other researchers. Much attention has focused on the issue of the comparability of the 55th with earlier rounds, a debate charged by the putative political significance of trends in poverty after the changes in economic policy in India in the early 1990s (see Deaton and Kozel, 2004, for a useful summary). After examining the poverty calculations that have been put forward, we arrive at a rather disconcerting conclusion that the emphasis on comparability of the data and poverty ratios in 1990s seems to be over-blown compared to other deficiencies in data and methods, particularly those of calculating poverty lines.

The Official Price Indexes and the UV CPIs and the methods used to compute PLs from them (including the anchoring of PLs) have severe flaws; the NSS data on consumption expenditure used to calculate budget shares and the welfare aggregates (MPCE) show many problems which do not seem to have been corrected in the data provided by NSS[24]. Nor do the geographical domains for which poverty calculations are made make much sense. In the rural sector states show considerable variation in poverty between regions. In the urban sector this seems also to be the case and lumping all urban areas together makes little sense when prices, expenditures and environmental variables vary greatly between towns of different size. The quality of the raw data and the methods of calculating the welfare aggregates are also of considerable concern and, while perhaps appropriate to calculation of expenditures at the level of large spatial aggregates[25] may

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[24] For example, we often find stray codes (values of categorical variables that have no corresponding definitions in the survey schedules) and extreme values; number of cases in different files do not always agree; weights do not necessary add to any recognizable (household) population total. Treatment of these problems is not always easy; for example, it seems inconsistent to discard extreme values from the calculation of Unit Values but not to recalculate MPCE substituting more reasonable unit values. However, a priori extreme UVs may arise either because the expenditure is excessive in relation to the quantities purchased, or *vice versa*. While it might be considered better for the analyst to be presented with the uncorrected data to make their own corrections, it would be helpful to know how these extremes are treated in official publications. One can screen for extreme expenditures and quantities and use this information to decide which to adjust, or to discard the observation, but some experiments we have conducted suggest that it is not easy to decide rules for automatic correction in this way. Further, since the recalculation of MPCE needs some adjustment for extreme expenditure values or quantities it would seem better for NSS to undertake this rather than the analyst who is further removed than NSS officials from the sources of the problem in either field entry or data processing.

[25] Presumably under the assumption that errors in assignment of household to poverty categories, introduced for example by the lumpiness of expenditures on more expensive items, cancel out.

not be appropriate when analysis of household poverty becomes important, as it rightly has. In this case a welfare aggregate that more closely reflects the welfare of each household is required and this requires data on different variables to be collected to those in the current CES. Hence, in contrast to others who have addressed these issues, we do not believe that we can be confident that any sets of figures of poverty that have been produced so far, by us or others, provide very reliable estimates of the proportions or numbers of people who live below a given constant standard of living.

One cannot help asking what the purpose of putting forward alternative poverty calculations is when the methodological and empirical bases are so flawed? Would it not be likely to generate rather more light relative to heat if more attention were paid to dealing with these problems rather than trying to recalculate poverty and to repair the survey schedules and data to establish comparability with earlier rounds? We suggest there are serious problems of comparability within[26] and between the earlier rounds as well due to both reliance on the same survey schedules for all domains within India, which have quite different consumption and environmental characteristics and because these characteristics have been changing over time in ways that can be expected to change the relationships between consumption and well-being. While the sets of numbers produced by Deaton, 2003a, 2003b and S&H and those that would arise from the suggestions of Bhalla and Das, 2004, might serve a narrow purpose of pro and anti-reform rhetoric, the fact remains that there is much more to poverty calculation than just the problems with CPIs, the recall period and resulting 'contamination' of the NSS consumption data, or gaps between the NSS measures of consumption and those from the National Accounts.

We are confident that the unit value based indexes produced first by Deaton and Tarozzi (1999) and later by Deaton (2003a, 2003b) do highlight problems that have crept in the Indian official price index calculations. Our explorations of the UV CPIs suggests that neither the Deaton and Tarrozi methodology nor our modifications of it are really satisfactory without further corroboration which must come from a more rigorous approach to price index construction. Our discussion of the anchoring of PLs suggests that a more secure conceptual basis and operationalisation of poverty measures is required. The solution to unsatisfactory price indexes does not lie in adopting the unit value based price indexes as true reflections of price change and variation. There are problems of endogeneity that unit value based price indexes bring with them and the spatial and temporal variation in household budgets which reflect not only changing relative prices but also changes in the quality of goods, arrival of new goods and changes in the environment in which consumption expenditure decisions are made. There are some obvious lines of approach here including more detailed examination of both official prices and UVs and comparisons between and an attempt to reconcile them; a thorough

[26] For example, the list of items to specifically question for in consumer expenditure surveys should be adjusted to local consumption patterns; in a country as diverse as India and also between rural and urban areas, consumption patterns differ greatly even among the poor, yet the same schedule is applied to all consumers. Yet the schedule is truncated and does not include all items of significance in all areas in India due to time constraints. Tapioca in Kerala is a good example; tapioca is a staple for many consumers in Kerala yet is hardly consumed elsewhere. Tapioca may be fresh or dried with very different prices (and calorie contents), yet the CES schedule does not make this distinction. This is likely to be a part of the "data problem" causing the exceptionally low calorie consumption in Kerala noted by Sen, 2005.

re-examination of the official price collection, computation and dissemination procedures also seem warranted[27].

Clearly, there are a lot of grey areas in poverty calculations. If the objective of policy is to reduce poverty then reliance on indicators derived from money expenditures and constant budget shares alone is deeply flawed (see also Subramaniam, 2005). That the state of poverty measurement is in disarray should not be such a surprise; for example Szekele; Lustig; Cumpa and Meija, 2004, show that a huge range of poverty estimates may be produced by "acceptable" methods of calculation. They suggest that what is required is to make the methods clear so that debates about patterns and trends are not confounded by confusion over the methods of calculations. Others seem to be pursuing ever more complex adjustments and calculations with existing data (as for example, by those who are comparing or combining data from non-comparable sources (Deaton, 2003b, Elbers *et al.*, 2003).

These are not the priorities we identify in our explorations of Indian poverty statistics. While making methods clear is a sensible component of any such enterprise[28], the flaws are deeper. A number of authors seem to recognise that a given command over goods may translate into a better standard of living in an area that has effective law and order, or an unpolluted environment (as also argued by Ravallion, 1992) but have not drawn the conclusion that current practices are largely meaningless given their neglect of these factors and the flaws in the expenditure data, the CPIs and methods of calculation typically employed, at least in developing countries[29]. Some who recognise the problems, in national as well international contexts, have suggested experimentation with survey methods (Srinivasan, 2004) or their replacement by capabilities based methods (recently by Reddy, 2004). But neither, on their own or together, is likely to be enough.[30]

We suggest that more is needed than just experimentation with, for example, recall periods, or the replacement of money metric with health, nutrition and education statistics. In addition to overhauling the consumer expenditure surveys, CPI calculations need reform, as do the statistical bases of capabilities indicators (as we have suggested here, nutrition, health and mortality indicators seem to have their own problems[31]). The

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[27] However, given the deeply political nature of price indexes this is unlikely to be an easy task, as the obscure nature of the linking of the pre-mid 1980s indexes to their successors shows. However, since one of the political issues is the linking with earlier poverty calculations, taken together with our suggestion that the poverty series may be deeply flawed, combining a reform of price indexes with an acceptance that linking new poverty calculations to earlier ones is not possible, revising the CPIs may be a bit less contentious. A first step would be making more and more disaggregated official price data available to independent researchers for them to work on to explore the patterns of prices and to assess the differences between official prices and UVs that we showed existed in the second paper.

[28] Admirably practiced, for example, by Deaton in his contributions to the Indian debates.

[29] Practice in developed, while superficially similar, is actually vastly different. Poverty calculations are generally much more carefully worked over and contested among civil servants, academics and interest groups; poverty lines are adjusted for family types and circumstances; and poverty calculations are generally not central to debates about general economic policy as opposed to sectoral welfare issues. For recent approaches see Lister, 2004, for the UK and Citro and Michael, 1995 and Iceland, 2004 for USA.

[30] While different indicators may respond in different ways to the standard of living (e.g. height for age and height for weight; and anthropometry with mortality), the relatively low correlations among the infant and child mortality figures from the census and the NFHS are somewhat worrying.

[31] While different indicators will vary in their relationship with the standard of living and so will not be perfectly correlated with each other, it is worrying that, for example, the infant and child mortality figures from the census and the NFHS at NSSR level do not agree better and that the child anthropometric indicators, especially those using cut-offs (stunting), show considerable variation between the NFHS 1 and 2.

conceptual basis of poverty as the outcome of consumption and environment needs to be operationalised incorporating the factors left out of money metric calculations into the assessment.

But more basic is that economists who make use of data should become more concerned about its quality and consequently its production. There seems to be a general reluctance to engage deeply with the mechanics (and conceptual bases of) of data production, from the concepts underlying surveys and the practices of survey organisations, to the release of data files, in favour of working with existing data and using methodology to assess and correct for data problems[32]. This is useful of course, in part to reveal the limitations of data and data will always have problems. However, in our view the best way of rectifying the problems associated with calculation of poverty and getting "plausible" poverty statistics for India and for the Indian states in the future, is not to return to methods that allow a previously comparable series to be continued, since this series may not be as comparable as it may be thought to be. Rather, it would seem more sensible to start somewhat afresh, perhaps attempting to splice the new series with the old by a bridging activity for one or two rounds, with a more rigorous conceptualization, operationalisation and implementation of raw data production processes and procedures, as methodology is no substitute for data.

## References

Atkinson, A. B. (1987), On the Measurement of Poverty, *Econometrica*, 55:749-764.

Barker, D.J.P. (1998), *Mothers, Babies and Diseases in Later Life*, London: Churchill Livingston.

Baulch, B. and Masset, E. (2003), Do Monetary and Non-monetary Indicators Tell the Same Story About Chronic Poverty?: A Study of Vietnam in the 1990s, *World Development*, 31(3):441-453.

Bhalla, S. S. and Das, T. (2004), *Why be Afraid of the Truth? Poverty, Inequality and Growth in India, 1983-2000,* New Delhi: Oxus Research and Investments.

Citro, C. G. and Michael, R. T. (Eds.) (1995), *Measuring Poverty: A New Approach,* Washington D.C., National Academy Press.

Davidson, R. and Duclos, J. Y. (2000), Statistical Inference for Stochastic Dominance and for the Measurement of Poverty and Inequality, *Econometrica*, 68:1435-1465.

Deaton, A. (2003a), Adjusted Indian Poverty Estimates for 1999-2000, *Economic and Political Weekly*, January 25th:322-326.

---------- (2003b), Prices and Poverty in India, 1987-2000, *Economic and Political Weekly*, January 25th:362-368.

Deaton A. and Dreze, J. (2002), Poverty and Inequality in India: A Re-Examination. *Economic and Political Weekly,* 38(36):3729-3748.

Deaton, A. and Kozel, V. (2004), *Data and Dogma: The Great Indian Poverty Debate,* pdf. http://www.wws.princeton.edu/~deaton/papers.html.

Deaton, A. and Tarrozi, A. (1999), *Prices and Poverty in India,* Princeton, Mimeo.

[32] Participants in the World Bank sponsored LSMS are a partial exception to this stricture.

Deaton, A. and Zaidi, S. (2002), *Guidelines for the Construction of Consumption Aggregates for Welfare Analysis [pdf]: Living Standards Measurement Study,* Working Paper: 135. V. 104, pp. xi, Washington, D.C.: The World Bank, http://www.wws.princeton.edu/~rpds/working.htm.

Dubey, A. and Gangopadhyay, S. (1998), *Counting the Poor: Where are the Poor in India?,* Delhi, Department of Statistics, Government of India (Sarvekshana Analytical Report No 1).

Dubey, A. and Palmer-Jones, R. W. (2005a), *Prices, Price Indexes and Poverty Counts in India during 1980s and 1990s: Calculation of UV CPIs.*

---------- (2005b), *Prices, Price Indexes and Poverty Counts in India during 1980s and 1990s: From CPIs to Poverty Lines?*

Economic and Political Weekly (2005), Poverty Measurement, Monitoring and Evaluation in India: An Overview, *Economic and Political Weekly*, January 25th:296.

Elbers, C.; Lanjouw, J. and Lanjouw, P. (2003), Micro-Level Estimation of Poverty and Inequality, *Econometrica*, 71(1):355-364.

Fogel, R. (1994), Economic Growth, Population Theory and Physiology: The Bearing of Long-Term Processes on the Making of Economic Theory, *American Economic Review,* 84(3):369-395.

GOI (1997), *Estimates of Poverty*, Press Information Bureau, Press Release, March 11.

---------- (2001), *Estimates of Poverty*, Press Information Bureau, Press Release, July.

Haddad, L.; Alderman, H.; Appleton, S.; Song, L. and Yohannes, Y. (2005), Reducing Child Malnutrition: How Far Does Income Growth Take Us?, *World Bank Economic Review*, 17(1):107-131.

Iceland, J. (2004), *Rapporteur. Experimental Poverty Measures: Summary of a Workshop,* Washington D.C.: National Academy Press.

Lister, R. (2004), *Poverty*, Cambridge, Polity Press.

Micklewright, J. and Ismail, S. (2001), What can Child Anthropometry Reveal about Living Standards and Public Policy?: An Illustration from Central Asia, *Review of Income and Wealth*, 47(1):65-79.

Murthi, M.; Srinivasan, P. V. and Subramanian, S. V. (2001), Linking Indian Census with National Sample Survey, *Economic and Political Weekly*, 3rd March: 783-792.

Near, R. (1991), *Rural Poverty in India: An Analysis of Inter-State Differences*, New Delhi, Oxford University Press.

NSSO (2003), Suitability of Different Reference Periods for Measuring Household Consumption Results of a Pilot Survey, *Economic and Political Weekly*, January, 25th:307-321.

Palmer-Jones, R. W. and Sen, K. K. (2003), What Has Luck Got to Do With It?: A Regional Analysis of Poverty and Agricultural Growth in Rural India, *Journal of Development Studies*, 40(1):1-31.

Popli, G.; Parikh, A. and Palmer-Jones, R. W. (2005), Are the 2000 Poverty Estimates for India a Myth, Artefact or Real?, *Economic and Political Weekly*, 4619-4624.

Ravallion, M. (1992), *Poverty Comparisons: A Guide to Concepts and Methods*, Washington, World Bank, LSMS Working Paper No. 88.

---------- (1998), *Poverty Lines in Theory and Practice*, Washington, D.C., World Bank, LSMS Working Papers No 133.

Reddy, S. (2004), A Capability-Based Approach to Estimating Global Poverty, in Sahn, D. and Stifel, D. (2002), Robust Comparisons of Malnutrition in Developing Countries, *American Journal of Agricultural Economics*, 84(3):716-735.

Saith, A. (2005), Poverty Lines *versus* the Poor: Method *versus* Meaning, *Economic and Political Weekly*, 40(43):4601-4610.

Sen, Abhijit and Himanshu (2004a), Poverty and Inequality in India - 1, *Economic and Political Weekly*, September 18th:4247-4263.

---------- (2004b), Poverty and Inequality in India - 2, *Economic and Political Weekly*, September 25th:4361-4375.

Sen, P. (2005), Of Calories and Things: Reflections on Nutritional Norms, Poverty Lines and Consumption Behaviour in India, *Economic and Political Weekly*, 40(43): 4611-4618.

Shetty, P. S. and James, W. P. T. (1994), *Body Mass Index: A Measure of Chronic Energy Deficiency in Adults*, Rome, FAO, Food and Nutrition Paper 56.

Srinivasan, T. N. (2004), The Unsatisfactory State of Global Poverty Estimation, *In Focus*, September:3-5.

Subramaniam, S. (2005a), Unravelling a Conceptual Muddle: India's Poverty Statistics in the Light of Basic Demand Theory, *Economic and Political Weekly*, 40(1):57-66.

---------- (2005b), Fractions *versus* Whole Numbers: On Headcount Comparisons of Poverty across Variable Populations, *Economic and Political Weekly*, 40(43): 4625-4628.

Sundaram, K. and Tendulkar, Suresh D. (2003), Poverty in India in the 1990s Revised Results for All-India and 15 Major States for 1993-94, *Economic and Political Weekly*, November 15th:4865-4872.

Szekele, M.; Lustig, N.; Cumpa, M. and Meija, A J. (2004), Do We Know How Much Poverty There Is?, *Oxford Development Studies*, 32(4):523-558.

Tendulkar, S. D.; Sundaram, D. K. and Jain, L. R. (2003a), Poverty Has Declined in the 1990s: A Resolution of Comparability Problems in NSS Consumer Expenditure Data, *Economic and Political Weekly*, January 25-31:327-337.

---------- (2003b), Poverty in India in the 1990s: An Analysis of Changes in 15 Major States, *Economic and Political Weekly*, April 5th:1385-1393.