Indian Poverty during the 1990s:
Resolving Methodological Issues from the 55th NSS Round

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Abstract

The fieldwork for the 61st National Sample Survey (NSS) has recently been completed and Indian poverty estimates for 2004/05 are currently being calculated. We revisit the debate over the 55th NSS round, which produced incomparable poverty estimates due to a change in the recall period used in the survey. The adjustment methods of Sundaram and Tendulkar (2003a; 2003b); Deaton (2003a and Drèze 2002); and Kijima and Lanjouw (2003) are analysed, and the underlying assumptions of each method are probed. We conclude that the use of the Employment/Unemployment surveys is not valid, reject the assumption of a stable Engel curve but cannot reject the assumption that returns to factors are constant. With the caveat that there has been no structural shift in the relationship between income and expenditure, we accept Kijima and Lanjouw's adjustment method. This implies that poverty reduction during the 1990s was considerably slower than prior to the 1991 economic reforms.

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1. Introduction

Poverty in India is measured by the head-count ratio (HCR), the proportion of the population that has expenditure below the official poverty line. The source of this data is the Consumer Expenditure Survey (CES), part of the National Sample Survey (NSS). Since 1972 the CES has been a quinquennial survey with the specific aim of ascertaining per capita expenditure on consumption. In 1986, annual surveys of consumption were re-introduced. These surveys did not canvass such a large population, and hence are known as the 'thin rounds' viz. the 'thick' quinquennial rounds. The thin rounds differ from the thick rounds in sampling size and survey design, and are not officially endorsed by the Planning Commission. The consequence of this is a reliance on the thick rounds for analysis and potentially a ten year gap in comparable statistics if a thick round is compromised.

Changes to the recall period used in the 55th round (1999/2000) caused such a compromise. Two changes were introduced to the survey – firstly, food items were canvassed on a dual recall period of 7 days as well as the standard 30 days. Secondly, low frequency items, such as medical goods, were only canvassed on a 365 day recall instead of the dual 30 day and 365 day recall in the previous thick round. Earlier experiments with reference periods indicated this change could potentially halve the measured rate of poverty. Further, this change came exactly as reliable statistics were required to gauge the impact of India's 1991 economic reforms on the poor. A wide literature has evolved analysing and correcting the data from this round (See, for example, January 25 2003 issue of *Economic and Political Weekly*). This paper reviews this literature.

The plan of the paper is as follows: Section 2 discusses NSS methodology prior to the 55th round, summarises the changes made in the 55th round and overviews the resulting concerns. Section 3 overviews the methods of Sundaram and Tendulkar (2003a; 2003b), Deaton (2003a and Drèze 2002), and Kijima and Lanjouw (2003) of adjusting the 55th round data, highlighting the assumptions apparent in each method. These assumptions are then analysed in Section 4, where we reject the use of the

Employment/Unemployment surveys, show that the Engel curve is not stable and accept, with a caveat, the Kijima and Lanjouw method. Section 5 briefly concludes.

2. NSS methodology

2.1 Background

The NSS is an all-India survey, conducted by the National Sample Survey Organisation (NSSO), within the Ministry of Statistics and Programme Implementation. India's states and union territories form 78 NSS agro-economic regions, grouped on the basis of similar population density and crop pattern. The NSS uses a stratified two-stage sampling procedure, using villages for first stage units (FSU's) in the rural areas and NSS Urban Frame Survey (UFS) blocks as FSU's for the urban areas. The sample size of the 1999-2000 CES (55th NSS round) was 71,386 (374,857) rural households (persons) and 48,924 (225,160) urban households (persons) (Government of India, 2000 :15).

Respondents commit two main errors when answering survey questions – recall error, where the individual does not remember accurately what they have consumed; and telescoping error, where an event is remembered as occurring more recently than it did. The reference period – the time respondents are asked to recall their consumption over - will therefore have a large influence on the level of non-intentional error committed by survey respondents. To ensure comparability between surveys it is ideal to maintain consistent recall periods.

The initial CES surveys used a uniform reference period of 30 days – that is, households were asked to recall the quantity and value of items they had consumed in the last 30 days. An additional reference period of 365 days was added for clothing, footwear and durable goods in the 32nd NSS round, and for Education and Institutional medical expenses in the 50th round. Although there were two recall periods, official calculations utilised only the 30 day figure in calculating per capita expenditure and poverty rates. This is referred to as a 'uniform' reference period (URP). The 55th round introduced an additional reference period for high frequency goods (Food/Pan/Tobacco and Intoxicants) of 7 days and removed the 30 day recall period for 'low frequency goods' (Clothing / Bedding / Footwear / Education / Institutional medical services and durable goods). The recall period for 'Intermediate

goods' (Fuel & Light / Miscellaneous goods and services / Non institutional medical services / Rents and Consumer cesses & taxes) remained unchanged. Consumption was calculated using a 'mixed' recall period (MRP) – 30 days for high and intermediate goods and 365 days for low frequency goods. The 61st NSS survey was in the field from July 2004 to June 2005. This survey reverted back to the original methodology for high frequency goods, retaining the longer recall period for low frequency goods. This is summarised in Table 1 below:

Table 1: Overview of Recall periods: NSS Quinquennial Rounds

NSS Round	Date	Year	Recall period		
			High frequency (days)	Intermediate (days)	Low frequency (days)
27	July to June	1972-73	30	30	30
32	July to June	1977-78	30	30	30 and 365*
38	January to December	1983	30	30	30 and 365
43	July to June	1987-88	30	30	30 and 365
50	July to June	1993-94	30	30	30 and 365*
55	July to June	1999-2000	7 and 30	30	365
61	July to June	2004-2005	30	30	365

* Note: 32nd round introduced a dual recall period of 30 days and 365 days for clothing, footwear and durable goods. This was extended to include Educational expenses and Medical (Institutional) expenses in the 50th round.

A common criticism of the NSS was that the 30 day recall period, especially for food, was too long and hence causing underestimates of consumption due to recall error. The NSSO experimented with recall periods during thin rounds 51-54. Two schedules were canvassed from independent samples of the population. Schedule 1 used the standard 30 day recall period while Schedule 2 used alternate recall periods – for high frequency items[2], this was 7 days; low frequency items[3] a 365 day recall period; and intermediate items goods[4] retained the standard period. Households using Schedule 2 reported average consumption 15-18% higher than those using Schedule 1. However, this was enough to halve the poverty rate (Deaton & Kozel, 2004 : 4). This result illustrates how sensitive poverty measures are to both survey design and the choice of poverty line – because large numbers of households are clustered around the poverty line, small increases in (reported) consumption are enough for them to cross over the poverty line and no longer be included in the HCR. The results from the thin round

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[2] Food/Pan/Tobacco/Intoxicants

[3] Clothing/Bedding/Footwear/Educational & Institutional medical expenses

[4] Fuel & Light/Miscellaneous goods and services/Non-institutional medical services/Rents/Consumer cesses & taxes

experiments provoked political debate over the choice of reference period. A compromise was reached for the 55th round – the 'high frequency goods' would be canvassed for both the 7 day and the 30 day recall period.

2.2 The 55th NSS round

The official results from the 55th NSS round showed a dramatic decrease in poverty in India – for rural India, poverty decreased from 37.27% to 27.09%, while in urban India it went from 32.36% to 23.62%. Nationwide, poverty decreased from 35.97% to 23.33% (Planning Commission, 2001a, b). However, there were serious data comparability problems with earlier rounds. These were first discussed by Sen (2000) prior to the full results being released, where he labelled the 55th round a 'failed experiment' and proposed a contamination hypothesis - the dual recall period would cause respondents to roughly extrapolate between their two answers to give consistent replies. The data supported this hypothesis - the disparity between the two recall periods when canvassed during thin rounds 51-54 was 30% for all-India rural and 33% all-India urban (Sundaram & Tendulkar, 2003a : 328). That is, the shorter recall period produced estimates on average 30% greater than the alternative recall period for rural India overall. The figures from the 55th round show a difference of only 6.5% (5.7%) between the 7 day and 30 day responses for all-India rural (urban) (Sundaram & Tendulkar, 2003a : 328).

The second comparability issue is how the poverty measure is calculated from the data. The 55th round poverty counts were calculated using a mixed recall period (MRP) of 30 days for the high and intermediate goods, and 365 days for the low frequency goods. The 50th round used a uniform recall period (URP) of 30 days for all goods. It is possible to recalculate a MRP poverty measure from the 50th round because low frequency goods were canvassed for both a 30 and a 365 day recall period. However, it is not possible to calculate an URP poverty measure from 55th round data as low frequency goods were only canvassed for a 365 day recall period.

2.3 Impact of economic reforms on poverty

The Indian economy has experienced high growth rates since the introduction of economic reforms in 1991. Has this growth benefited the poor? The relationship between economic growth and poverty reduction is a major area of research, with

some arguing that growth is the most effective way to reduce poverty (Dollar & Kraay, 2000). However, the applicability of this argument to India has been questioned after increased economic growth seems to have had little additional impact on poverty decrease (Datt & Ravallion, 2002). The level of poverty from the 55th round is key to understanding the impact of the reforms on the poor in the 1990s. The table below summarises the official results for all the quinquennial NSS rounds to date, showing the average annual growth rate of per capita GDP alongside the rate of poverty decrease between each survey.

Table 2: Relationship between Growth and Poverty Reduction, using official NSS figures

Year	NSS round	Annual growth rate of per capita GDP %	Rural		Urban	
			HCR %	Annual rate of poverty decline %	HCR %	Annual rate of poverty decline %
1973-74*	28		56.44		49.01	
1977-78	32	2.55	53.07	0.84	45.24	0.94
1983	38	2.20	45.65	1.35	40.79	0.81
1987-88	43	3.81	39.09	1.46	38.20	0.58
1993-94	50	3.44	37.27	0.30	32.36	0.97
1999-2000	55	4.90	27.09	1.70	23.62	1.46

Source: Author's calculations, data from Penn World Tables (version 6.1) (variable grgdpch) and Planning Commission (2001a; 2001b).

* The first quinquennial round was actually the 27th NSS round, 1972-73. However, the official poverty statistics from the Planning Commission give the poverty figures for 1973/74, the last year of the annual surveys before the change.

The official results from the 55th round heralded that the 1990s had been a period of increased poverty reduction, with an average annual poverty decline of 1.70% (1.46%) for the rural (urban) sector, well above poverty reduction for any proceeding survey period. There was also considerably higher per capita GDP growth, at an average of 4.90% per annum, compared with average annual rates of growth between 2.20% and 3.81% for the proceeding survey periods.

3. Overview of methods

Three methods to adjust the 55th round data to make it comparable to earlier rounds have been proposed: Sundaram and Tendulkar (ST) (2003a, 2003b); Deaton (2003a, and Drèze 2002); and Kijima and Lanjouw (KJ) (2003). These methods all use NSS data to construct revised estimates of poverty incidence for 1999/00. Recent papers by Sen and Himanshu (SH) (2004a; 2004b) have reviewed the methodologies of ST and Deaton; these papers are incorporated in the discussion below.

3.1 Sundaram and Tendulkar

ST's method uses data that was collected during the 55th round NSS from a parallel survey, the Employment-Unemployment survey (EUS)[5]. The EUS included a one page worksheet on consumer expenditure which was extremely abridged compared to the CES. Abridgment is generally considered to underestimate consumption (Sundaram & Tendulkar, 2003a). ST have updated their initial paper to correct a computational error (2003b) .

Their method utilised the fact that the 55th round CES allegedly overestimated consumption (and hence overestimated poverty decrease). They compared the difference between the EUS and CES for each aggregated food group to the average difference found between the two recall periods from the experimental thin rounds. They hypothesised that either the 7 day recall had been asked first and the 30 day extrapolated from this, or that the 30 day question had been asked first and that the 7 day result derived from this. Given the expected bias of the abridgment effect was in the opposite direction from the expected bias of the recall effect, they expect the CES/EUS difference to be clearly greater than the average difference found in the thin rounds to accept the first hypothesis (i.e. conclude contamination). If the difference was not as great as that found in the thin rounds, they would accept their second hypothesis, and attribute the difference between the CES and EUS entirely to the abridgment effect. They did not find a clear difference between the EUS/CES and average thin round values, hence concluded that their second hypothesis held (2003a :331).

The second comparability issue, of the 365 day recall for low frequency goods, is addressed by recalculating the 50th round poverty counts using the 365 day recall data for low frequency goods instead of the 30 day figures. ST argued that this group of goods did not suffer the same contamination problem as the high frequency goods because firstly, consumption is less frequent for these products, therefore expenditure is more salient for respondents; and secondly, there was previous experience using this survey method. The data shows that the shift in recall period leads to a higher

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[5] The quinquennial NSS rounds pre-55th had canvassed both the CES and EUS from the same households. However, the duplicate recall period of the 55th round made the survey considerably longer and the two schedules were administered to independently selected households from the sample population survey.

mean per capital total expenditure (PCTE) for fractile groups in the bottom 65% (rural) and 70% (urban) while lowering the PCTE for the upper quantile groups (Sundaram & Tendulkar, 2003a :333-4). ST argue that since the inclusion of the 30 day recall period only increases the recorded consumption of the richer households, but not the poorer households, re-calculating the 50th round poverty counts with an MRP allows comparability with 55th round MRP figures. SH agree (2004a :4251), however, Deaton and Kozel question why this can be ignored when it is essentially the same dual recall issue as with the high frequency goods (2004 :24). It is important to note that because the higher quintile groups report decreased expenditure with the longer recall period for low frequency goods, inequality measures are not directly comparable with earlier rounds. All NSS rounds after the 55th have kept this longer recall period so this issue will be an ongoing concern when comparing future NSS data to earlier surveys.

The assumptions that need to be verified for Sundaram and Tendulkar's adjustment to be accepted are:

1. The EUS data is valid to use as a direct comparison with the CES

2. That the two situations ST propose - either all of the respondents were asked the 7 day questions first or all of the respondents were asked the 30 day questions first are the only two possible scenarios (Sen & Himanshu, 2004a).

3. The poor (i.e. those under the poverty line) did not contaminate their replies due to the presence of the dual recall period for low frequency items in the 50th round.

3.2 Deaton

Deaton has done substantial work on constructing alternative poverty lines for India (refer e.g. Deaton, 2003b; Deaton & Tarozzi, 2000). Deaton has two papers that use the same methodology for adjusting the 55th round data, one using the official poverty lines (Deaton, 2003a) and the other his preferred poverty lines (Deaton & Drèze, 2002).

Deaton uses the fact that there were a small number of items that remained directly comparable between the 50th and 55th round – the 'intermediate goods'[6]. Deaton

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[6] Intermediate goods: Fuel & Light/Miscellaneous goods and services/Non-institutional medical services/Rents/ Consumer cesses & taxes

hypothesises that the conditional probability of being poor, given the amount spent on these goods, remains constant over time. Using the data from the 50th round he constructs a dummy variable to measure whether the household is in poverty (based on the appropriate poverty line) and regresses this dummy on the logarithm of the 30 day expenditures. The intermediate goods expenditure data from the 55th round is deflated, and an adjusted 55th round HCR is found by a weighted average of the 50th round predictions using the 55th round density estimates as weights. This method does not rely on using any data that was potentially contaminated.

SH, in their analysis of this method, find a flaw in this assumption using the 55th round data itself. For the 50th round they calculate the conditional probabilities of being poor (based on consumption of intermediate goods) using the mixed reference period (30 day data for high frequency and intermediate goods but 365 day data for low frequency goods) instead of the official uniform reference period of 30 days for all goods. They then calculate the same for the unadjusted data from the 55th round. Comparing the two poverty counts, they find that the 55th round HCR is higher than the 'adjusted' 50th round count, akin to stating that the presence of the 7 day recall period increased poverty (2004a Table 7 :4257). Deaton is arguing that the presence of 7 day recall period decreased poverty, hence ST conclude that Deaton's assumption that the probability of being poor based on consumption of intermediate goods fails to hold. We can note that this assumption is the same as stating that the Engel[7] curve is stable between the 50th and 55th rounds.

Deaton's method rests on two assumptions:
1. Changes to the survey design did not impact how respondents answered the intermediate goods questions in the 55th round.
2. The Engel curve is stable between the 50th and 55th round.

As Deaton and Kozel note, if the first assumption does not hold, it is difficult to justify using any of the 55th round data (2004 :22). It is therefore the second assumption that needs to be examined.

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[7] An Engel curve shows the relationship between consumption of a good and income. Changes in taste and preference will shift the Engel curve. Changes in income, ceteris paribus, will only cause shifts along the curve.

3.3 Kijima and Lanjouw

KJ's method (Kijima & Lanjouw, 2003) involves econometric models calibrated against NSS data from the 50th round, restricted to variables that are strictly comparable in recall period between the two rounds. Their paper produces poverty estimates at NSS regional (sub-state) levels, drawing on the methodology of Chris Elbers et al. (2003). To allow direct comparison with Deaton's methodology they use Deaton/Tarozzi poverty lines.

KJ calculate two models to estimate 55th round poverty and an additional model to check the robustness of their stability assumption, that the underlying relationship between the variables remains constant. The first model uses a single regressor, the 30 day intermediate goods, as per Deaton (above). The second model excludes 30 day expenditure, instead using a set of demographic, occupational and educational variables as regressors. These were elicited in the introductory pages of the 50th and 55th surveys and remain comparable across both rounds. A point to note is that this model is based on returns to factors and is therefore predicting income, rather than expenditures. Poverty in India is measured in terms of expenditure. This model therefore implicitly assumes that there has been no structural shift in the relationship between income and expenditure between the 50th and 55th rounds. It is not possible to test this assumption without accurate data from the 55th NSS round, so we only note this assumption.

KJ's third model uses durable ownership as the explanatory variable. However, there is a substantial amount of data missing from the 50th round, so results are only calculated for two states, Gujarat and Andhra Pradesh. Results from this model are closer to KJ's multivariable model than to Deaton/Dreze estimates, supporting their stability assumption slightly.

The assumptions that KJ employ are as follows:
1. For the 30 day model – the Engel curve remains stable
2. For the multivariable model – the underlying relationship between the variables remains constant, that is, returns to these factors (labour, education and land) remain the same between rounds.

3. For the multivariable model – the relationship between incomes and expenditures (that is, the savings rate), remains constant.

4. Analysis of underlying assumptions

There are three major assumptions present in the adjustment methods that can be analysed empirically – the validity of the EUS data, the stability of the Engel curve and constant returns to factors. These are summarised in Table 3 below.

Table 3: Underlying assumptions of each adjustment

		EUS valid	Stable Engel curve	Constant return to factors	Additional assumptions
Sundaram/Tendulkar		X			- Two discrete choices for order of questioning - Dual recall in 50th round did not cause contamination
Deaton			X		
Kijima and Lanjouw	Model 1 (Intermediate goods)		X		
	Model 2 (Multivariate)			X	- Relationship between income and expenditure constant

4.1 Validity of consumption data from EUS

ST compare the difference between EUS and CES figures to conclude that the CES figures are reliable and have not been contaminated by the dual recall period.

The average difference between the CES and EUS estimates for 'high frequency goods' is 10% (CES over EUS), but the data is very heterogenous, ranging from -33% for educational spending to 110% difference for miscellaneous goods and services (Sundaram & Tendulkar, 2003a Table 3R & 3U :330-331). Because the EUS is expected to be biased downwards and the CES biased upwards, ST only conclude contamination of CES if the difference between CES/EUS is absolutely larger than the difference between recall periods found in the experimental rounds. The EUS has to be reliably less than CES for this assumption to work. However, surveys discussed by Sen and Himanshu (2004a) cast doubt on this. The surveys, from the 38th and 52nd NSS rounds, showed that the abridged food estimates were the same as the non-abridged estimates (:4253). They also note that the aggregation used in the 52nd round was the same as in the 55th round. If this were the case, then any differences in the

55th round for food items would be entirely due to contamination. The only reliable check on the validity of the EUS data compared to the CES data is to test it against CES data from the same survey. However, this requires the 55th round CES data to be correct, which it is not.

Another assumption is troubling with ST's method – they avoid considering a logical situation of partial contamination - that is, some respondents were queried on the 7 day recall period first, while some were queried on the 30 day recall period first (Sen & Himanshu, 2004a). Indeed, orders to reverse the order of questioning (i.e. to ask the 30 day recall first) were not issued until 6 weeks into the survey (Sen & Himanshu, 2004a :4255), which suggests that it is highly likely that some respondents did answer the 7 day recall first, contradicting ST's conclusion.

4.2 Stability of the Engel curve between 50th and 55th rounds

The assumption of a stable Engel curve requires that the share of intermediate goods in overall expenditure remained constant between the two rounds. This means that households did not change their pattern of expenditure – by, for example, spending more on rent and less on rice, without their total expenditure changing. Deaton's method would treat this household as now being richer, because the increased expenditure on rent would be reflected in the intermediate goods expenditure, but the decrease in expenditure on rice (a 'high frequency' item) is not picked up in the calculation. However, as the household's total expenditure has not changed they are in fact no better off.

Tarozzi (2004) analyses this assumption using data from the thin NSS rounds, 50 – 53. His results (Figure 2 and Table 4, Appendix) support Deaton's hypothesis of a stable Engel curve. However, the thin NSS rounds are not considered reliable (Deaton & Kozel, 2004 :16). SH (2004a) find a clear shift in the Engel curve away from food consumption, using data from NSS surveys 1986/7 to 1997. They find that food shares in the NSS fell between 10-13% in rural and urban India between 1990-81 and 2000-01, and the National Accounts System (NAS) trend is similar (:4258). This empirical evidence suggests that there has been a shift in the Engel curve away from food products.

4.3 Constant returns to factors

KJ's multivariate model assumes that returns to factors, such as education, land and labour are constant between the two rounds. There is scant data available for India to test this assumption.

Jha's discussion on the impact of the reforms on poverty and inequality (2004) includes data on the trends of employee compensation as a share of Net Domestic Product (NDP) (Table 12.7 :316). For the organised sector, employee compensation has remained close to 7% of NDP between 1980 until 1995. However, for the unorganised sector, employee compensation has decreased from 14.5% to 12.6% over the same period. Jha comments that the reforms have been associated with a decrease in labour absorption – the fastest growing areas, such as the FIRE[8] sector, have encouraged profit opportunities over increased labour earnings (:316). Nominal figures from Labour Bureau (Government of India, 2002 Table 24.14 :292; 2004 Table 2.1) adjusted by the Consumer Price Index for Industrial workers (Government of India, 2001) show a 7.8% decrease in real average per capita income for factory workers earning less than 1600 Rs. per month over the period 1995 to 1999. This data does not support a hypothesis of increasing returns to labour. In crude terms, relating educational level to the organised/unorganised sectoral divide, we do not find evidence for increasing returns to education. Hence, we are not able to discard the assumption of constant returns to factors.

4.4 Discussion of results

The various adjustment methods produce a wide range of poverty estimates. These are summarised in the table below. Absolute comparisons are not valid due to the use of different poverty lines (either official lines or Deaton/Tarozzi lines) and certain aspects of some adjustment methods, such as ST readjusting the 50th round figures. Table 4 below summarises the change in poverty over the 10 ½ year period between the 38th and 50th NSS rounds (using official statistics) as well as the change in poverty arrived at by each method of adjustment between the 50th and 55th round (6 years[9]). Datt, Kozel and Ravallion (DKR) (2003) estimate expected poverty incidence in

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[8] FIRE sector: Finance, Insurance and Real Estate.

[9] The NSS rounds did not occur every year during the 50th and 55th round. The 51st round was held between 1993/4, the 52nd between 1995/96, the 53rd from January-December 1997, the 54th for only 6 months, from January – June 1998 and the 55th from July 1999 to June 2000.

1999/00 based on an econometric model calibrated from external data sources over the period 1960 to 1994. While this method is not a direct adjustment of the 55th round, because it uses external data sources rather than NSS data, their results, included in Table 4, provide a plausible benchmark for the other poverty estimates.

Table 4: Summary of poverty reduction between 50th and 55th NSS rounds

Method		Average growth rate of per capita GDP over the time period considered	Rural		Urban	
			Decrease in HCR %	Average annual rate of poverty decline %	Decrease in HCR %	Average annual rate of poverty decline %
38th – 50th NSS rounds (1983 -1994)		3.37	8.38	0.80	8.43	0.80
Official: 55th round		4.90	10.18	1.70	8.74	1.46
Sundaram and Tendulkar		4.90	5.26	0.88	3.32	0.55
Deaton	Official lines	4.90	7.00	1.17	7.90	1.32
	Deaton/Tarozzi line	4.90	6.70	1.12	5.80	0.97
Kijima and Lanjouw		4.90	4.20	0.70	2.00	0.33
Datt, Kozel and Ravallion		4.90	4.40	0.73	4.80*	0.80

Data sources: Author's calculations, using growth data from Penn World Tables (Version 6.1) and poverty figures from the applicable papers:
Official: Planning Commission (2001a; 2001b)
Sundaram/Tendulkar: Sundaram and Tendulkar (2003b): Table 2
Deaton: Official lines: Deaton (2003a): Table 1, 2 (columns 2 &5)
Deaton/Tarozzi lines: Deaton and Drèze (2002): Table 1a
Kijima/Lanjouw: Kijima and Lanjouw (2003) Table 2, 3 (columns 1 & 5)
Datt/Kozel/Ravallion: Datt et al. (2003) Table 3, 4 (columns 1 & 2)
* DKR do not compute an urban value. This figure is their all-India value.

The official results heralded that the 1990s had been a period of increased poverty reduction, with an average annual reduction in poverty of 1.70% for the rural sector between the 50th and 55th rounds, compared to an average annual poverty decrease of 0.80% between the 38th and 50th rounds. For the urban sector the figure is 1.46% between the 50th and 55th rounds, compared to 0.80% for the earlier period. How much of this poverty reduction disappears when the various adjustments to the 55th round data are considered?

Deaton's method is the only adjustment method that finds that poverty reduction has increased for both rural and urban sectors post-50th NSS round compared with the 38th-50th rounds, regardless of the poverty line used. ST find a higher rural rate of poverty decline (0.88% compared with 0.80%), but a lower urban rate (0.55% compared with 0.80%), compared to the official results between 38th and 50th rounds.

KJ find that poverty declines on average by 0.70% (0.33%) per year for the rural (urban) sector, significantly lower than the previous period. DKR's predictive model finds a slightly lower rate of annual poverty decline (0.73%) for the rural sector than between the 38th and 50th rounds. They do not calculate separate urban figures, but their all-India projection is in line with the earlier figure of 0.80% annual decrease in the urban sector.

Only one of the four alternative estimation methods supports the official result that the 1990s were a period of increased poverty reduction for both the rural and urban sector.

This is despite a considerably higher average growth rate of per capita GDP of 4.90% between the 50th and 55th rounds, compared with 3.37% in the pre-reform period. If growth is sufficient for poverty reduction, the higher growth rate should mean that poverty reduction is at least the same, if not greater, in the post reform period than the proceeding period. Further analysis of the relationship between economic growth and poverty reduction, looking specifically at sectoral growth, would bear more information on the impact of the post reform growth on poverty reduction.

4.5 Summary

Starting with the model of Sundaram/Tendulkar, the use of the EUS data to confirm the contaminated CES data cannot accepted. Although there are other methodological issues that are still not resolved in this method, particularly the assumption that the 50th round MRP poverty statistics are directly comparable to 55th round MRP poverty statistics, these are of little consequence if the underlying assumption is not satisfied.

Deaton's method relies on the presence of a stable Engel curve between the 50th and 55th rounds. The stability of the Engel curve has been analysed by SH and a shift in consumption patterns, away from food, is found. It is therefore likely that Deaton's method overestimates poverty reduction. The assumption of a stable Engel curve is not accepted.

Kijima and Lanjouw's first model is not satisfactory as it also relies on the stability of the Engel curve. Their second method relies on an assumption of constant returns to factors. With the evidence available we are not able to reject this hypothesis. An

additional caveat, that there has been no structural change in the relationship between income and expenditure, is also required. With this caveat, the only remaining option is to accept Kijima and Lanjouw's multivariate model as the preferred adjustment method for the 55th NSS round.

5. Conclusion

The debate over the 55th NSS round has raised many issues related to poverty measurement, especially the importance of maintaining comparable data across surveys. No method of adjustment of the 55th round data will be perfect and it is highly unlikely that there will be agreement from all concerned over the precise level of poverty in India in 1999/00. This paper has analysed three methods of adjusting the data and rejected those with underlying assumptions that cannot be accepted on the basis of empirical evidence. The EUS data is not reliable to use to judge the validity of the CES and so Sundaram and Tendulkar's method is rejected. Considerable empirical evidence suggests that there has been a shift in the Engel curve, away from food items, so Deaton's adjustment, as well as Kijima and Lanjouw's single variable model, are both rejected. There is no evidence to reject the assumption of constant returns to factors so the multivariable model of Kijima and Lanjouw is accepted, with the caveat that there has been no structural shift in the relationship between income and expenditure. This is significant, because Kijima and Lanjouw's results show that the rate of poverty decrease has been slower in the 1990s than in the proceeding decade, despite India's increased economic growth. Growth may be only one aspect of a successful poverty reduction policy – other determinants need to be identified and implemented in conjunction with growth policies.

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