The Situation Assessment Surveys: An Evaluation

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Introduction

This note is a review of the Situation Assessment Surveys of Farmers conducted by the National Sample Survey Organisation. It attempts to locate an evaluation of the surveys in the context of the parameters set in the *Global Strategy to Improve Agriculture and Rural Statistics,* particularly with respect to completeness, consistency, and comparability. The Situation Assessment Surveys conducted by the National Sample Survey Office (NSSO) in 2003 and 2013 (59th and 70th rounds) are detailed socio-economic sample surveys of farmer households. They are the only large-scale surveys that focus specifically on estimating household crop income in India. Unlike the Comprehensive Scheme for Study of Cost of Cultivation of Production of Principal Crops (CCPC), Situation Assessment Surveys provide robust estimates of the incomes of cultivating households instead of crop-wise or plot-wise returns, as well as data on the social and economic profiles of farming households, and use cost concepts that are different from those in the CCPC scheme.

The first Situation Assessment Survey was conducted by the NSSO in 2003. A repeat survey was conducted in the 70th round of surveys in 2012–13. The two surveys, however, are not strictly comparable (NSSO 2014). Here, we review both these surveys and investigate the differences between the two, particularly as they relate to sampling, definitions, and cost estimation methodology.

Situation Assessment Survey of Farmer Households (SAS), 2003

The Situation Assessment Survey of Farmer Households (SAS) conducted in 2003 was a part of the 59th round of surveys of the National Sample Survey Office (NSSO), under the Ministry of Statistics and Programme Implementation, Government of India. In order to assess the standard of living of the farming community in the country, the survey collected data on consumer expenditure,

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income and productive assets, indebtedness, farming practices, resource availability, awareness of technological development, and access to modern technology in agriculture. Detailed data were collected on receipts and expenses of farm and non-farm activities of households, to calculate the income from these sources.

The survey covered only rural areas of the country. A total of 51,770 farmer households in 6,638 villages across the country were sampled and surveyed. The total sample size was fixed based on the available resources. This was allocated across different States based on the share of a State's population in total population. Samples were drawn using a stratified multi-stage design. The first stage unit (FSU) was the census village, and the ultimate stage unit (USU) the household.

Cost Concepts in SAS 2003

An integrated schedule (Schedule 33) was designed for the 59th round of the NSS for collecting data on aspects related to farming and other socio-economic characteristics of farmer households. This schedule consisted of 24 blocks, of which block 14 collected data on expenses incurred on and value of output obtained from cultivation. Data were collected for all crops cultivated in the reference period listed in the survey schedule. The cost items collected as part of the survey are listed below, in Table 1. Data on input use quantity and price were not collected separately. Respondents were asked to list their expenses on each item. For instance, no data were collected for seed use quantity and seed price separately, but the total seed cost incurred by a household was recorded.

Comparison of CCPC Scheme and SAS 2003

The items of cost included in SAS 2003 are conceptually closer to the Cost A2 concepts specified under the Comprehensive Scheme for Study of Cost of

Table 1 *Cost items collected for SAS 2003 in the 59th round of the NSS*

Serial no.	Cost items	Details
1.	Material inputs	(i) Seed (both home-produced and purchased) (ii) Fertilizers and manure (both home-produced and purchased) (iii) Pesticides/insecticides (iv) Irrigation
2.	Hired labour	(i) Human labour, including animal and machinery (if any)
3.	Maintenance expenses	(i) Owned machinery and equipment
4.	Interest paid on crop loan	
5.	Rent paid for leased-in land	
6.	Other expenses	

Source: Report No. 497 (59/33/5), NSSO (2005).

Cultivation of Production of Principal Crops (CCPC), but exclude maintenance of owned bullock labour and depreciation of owned farm machinery. It is thus expected that the estimated costs in SAS 2003 will be different from the cost estimates of the CCPC scheme. As the understanding of the cost structure of individual crops in India is mainly based on CCPC data, it might be of interest to compare the CCPC cost estimates with the SAS 2003 estimates. Here, we consider the cultivation of paddy and wheat, two important crops in India. The differences in the per hectare cost of cultivation across major paddy-growing States are shown in Table 2 and across wheat-growing States in Table 3.

Data for the agricultural year 2002–3 show that costs of cultivation for paddy (Table 2) estimated by SAS 2003 are in all cases lower than the CCPC scheme estimates at the State level. This difference in absolute terms ranged from Rs 650 for Bihar to Rs 9,441 for Karnataka. In percentage terms, it ranged from around 9 per cent for Bihar to 60 per cent for Assam and Odisha.

In the case of wheat (Table 3), cost estimates in the CCPC scheme were lower than those in SAS 2003 for only two States: Jharkhand and Uttar Pradesh. In all the other

Table 2 *Costs of cultivation per hectare under the CCPC scheme and SAS 2003, paddy (kharif), major States, 2002–3* in Rs per hectare

State	Cost of cultivation per hectare (Cost A2), CCPC scheme	Cost of cultivation per hectare, SAS 2003	Difference in costs of cultivation (3—2)	Deviation of cost in SAS 2003, in per cent {(4/ 2)*100}
1	2	3	4	5
Andhra Pradesh	15,790	12,380	— 3,410	—22
Assam	5,350	2,163	—3,187	—60
Bihar	7,272	6,622	—650	—9
Chhattisgarh	5,770	3,430	—2,340	—41
Haryana	16,222	13,277	—2,945	—18
Jharkhand	5,962	3,165	—2,797	—47
Karnataka	19,141	9,700	—9,441	—49
Kerala	18,495	12,636	—5,859	—32
Madhya Pradesh	5,880	2,639	—3,241	—55
Odisha	8,814	3,487	—5,327	—60
Punjab	17,452	15,541	—1,911	—11
Tamil Nadu	19,235	13,035	—6,200	—32
Uttar Pradesh	9,368	6,979	—2,389	—26
Uttarakhand	7,730	4,217	—3,513	—45
West Bengal	13,027	9,122	—3,905	—30

Source: CCPC scheme estimates are taken from Reports of the Commission for Agricultural Costs and Prices (CACP), 2006, pp. 230–31, and SAS 2003 values are calculated from the 59th round unit-level data of the Situation Assessment Survey (SAS).

Table 3 *Costs of cultivation per hectare under the CCPC scheme and SAS 2003, wheat (rabi), major States, 2002–3* in Rs per hectare

State	Cost of cultivation per hectare (Cost A2), CCPC scheme	Cost of cultivation per hectare, SAS 2003	Difference in costs of cultivation (3—2)	Deviation of cost in SAS 2003, in per cent {(4/ 2)*100}
1	2	3	4	5
Bihar	8,805	7,053	−1,752	−20
Chhattisgarh	5,790	2,894	−2,896	−50
Gujarat	11,407	10,287	−1,120	−10
Haryana	11,753	10,926	−827	−7
Himachal Pradesh	4,629	4,404	−225	−5
Jharkhand	4,823	5,691	+868	+18
Madhya Pradesh	7,431	4,666	−2,765	−37
Punjab	12,484	11,938	−546	−4
Rajasthan	10,609	9,822	−787	−7
Uttar Pradesh	10,033	12,127	+2,094	+21
Uttarakhand	10,450	3,954	−6,496	−62

Source: CCPC scheme estimates are taken from Reports of the Commission for Agricultural Costs and Prices (CACP), 2006, pp. 380–81, and SAS 2003 values are calculated from the 59th round unit-level data of the Situation Assessment Survey (SAS). Sarkar (2017).

States, the SAS 2003 costs of cultivation of wheat per hectare were much lower than the CCPC estimates. The difference in 2003 was as much as Rs 6,496 for Uttarakhand, Rs 2,896 for Chhattisgarh, and Rs 2,765 for Madhya Pradesh.

Thus, a comparison of cost estimates of the CCPC scheme and SAS 2003 establishes that the SAS estimates were usually lower than the CCPC estimates. This is on account of the difference in cost concepts.

Situation Assessment Survey of Agricultural Households (SAS), 2013

A repeat of the Situation Assessment Survey was conducted by the NSSO in 2012–13, titled "Situation Assessment Survey of Agricultural Households." It differed from the survey conducted in 2003 in terms of its reach, sampling design, definition, and cost accounting.

Sample Size of SAS 2013

The number of central sample households was reduced from 51,770 in the 59th round of SAS to 35,200 in the 70th round. This scaling down of the sample size may have had implications in terms of the variability generated in the data. As Rao (1999, p. 29) stated:

> As the sample size increases, the variability in the estimates decreases but the cost of the survey tends to increase. Thus a balance has to be struck which leads to an "optimum" sample size.

Rao's paper does not determine the "optimum" sample size for this survey. However, taking a cue from it, it can be said that the reduction in sample numbers may have increased variability.

Sampling Design

The sampling design for the selection of both FSU (village) and SSU (household) changed over the course of the two surveys. Villages were stratified into three strata for the 59th round. Stratum 1 consisted of villages with a population of less than 50, stratum 2 consisted of villages with a population of over 15,000, and stratum 3 consisted of all villages other than those covered by stratum 1 and stratum 2. For the 70th round, only two strata were used: stratum 1 consisting of all villages with a population of less than 50, and stratum 2 comprising all villages not included in stratum 1. In the 59th round, the stratification accounted for the need to capture large villages. Changes in the stratification for the 70th round did away with this provision, making uncertain the representation of villages with a population of over 15,000.

The sampling frame for the second stage strata (SSS) is based on the extent of land possessed at the time of survey. This stratification changed over the two survey rounds (Table 4).

Overall, the changes in the sampling design make the survey less sensitive to local agroclimatic and social conditions. The stratification adopted for villages may not be adequate to ensure the representation of villages with large populations, and stratification for household sampling may not be adequate to capture representative holdings in the larger size-classes in a large number of samples (Kumar 2016).

Table 4 *Stratification of households within villages or hamlet groups, 59th and 70th rounds of the Situation Assessment Survey (SAS) of the NSS*

Second Stage Strata (SSS)	59th round (SAS 2003)	70th round (SAS 2013)
SSS 1	< 0.005 hectare	< 0.005 hectare
SSS 2	0.005 to X	0.005 to 1.000 hectare
SSS 3	X to Y	1.001 to 2.000 hectare
SSS 4	> Y	> 2.000 hectare

Note: Two cut-off points, X and Y, have been determined at the State and Union Territory levels such that 40 per cent of these households possess land area less than X, 40 per cent possess land area between X and Y, and 20 per cent possess land area greater than Y.
Source: Report No. 497 (59/33/5), NSSO (2005); and NSSO (2014).

Definitional Issues in Sampling Units

From 2003 to 2013, the focus of the Situation Assessment Survey shifted from farmer household to agricultural household – a matter not merely of nomenclature but of definition. In 2003, a farmer was defined as "a person who possessed some land and engaged in agricultural activities on any part of that land during the last 365 days" (NSSO 2005, p. 4).[1] A household with at least one farmer member was considered a farmer household.

In 2013, the agricultural household was defined as a household that received some value of produce from agricultural activities (e.g., cultivation of field crops, horticultural crops, fodder crops, plantation crops, animal husbandry, poultry, fishery, piggery, bee-keeping, vermiculture, and sericulture) over the preceding 365 days. However, households that were entirely dependent on agricultural labour were excluded from the survey.[2] Only households with at least one member self-employed in agriculture, in either a principal status or a subsidiary status, and a total value of produce more than or equal to Rs 3,000 over the preceding 365 days, were included in the survey.[3] This was done to eliminate households for which agricultural activities were not of significance.

The changes in the definition of a household across the two surveys have two immediate consequences. First, it restricts direct comparison of the results obtained in SAS 2013 with that of the 2003 survey. Secondly, the new definition, which excludes households with a value of agricultural produce less than Rs 3,000 from the sample frame, is likely to shift estimates of average income upwards. It is not necessary that the value of agricultural produce will be low only for households that carry out significant agricultural activities. The output value may be below this threshold in cases of crop failure due to pest attack, drought, or a price shock, despite members of the household spending a large part of their time and a majority of their resources on agricultural activity.

Cost Concepts

The cost items in the 2013 survey are listed in Table 5, and they are the same as those in the 2003 survey. The cost accounting method in SAS 2013, however, is different

[1] Agricultural activities refer to the cultivation of field crops and horticultural crops, the growing of trees or plantation crops (such as rubber, cashew, coconut, pepper, coffee, tea, etc.), animal husbandry, poultry, fishery, vermiculture, sericulture, etc. NSSO (2005), p. 4.

[2] It is important to note that apart from agricultural labourers, households that received income entirely from coastal fishing and agricultural services, and rural artisan households were not considered as agricultural households and were kept out of the scope of the survey.

[3] According to the Employment and Unemployment Survey (EUS) of the NSS, if a person is engaged in more than one economic activity, the activity on which the person spends a relatively longer period of time over the 365 days preceding the date of survey is considered as the principal activity status of that person. Any other activity on which a person spends a relatively shorter period of time than the usual principal activity, but at least 30 days or more during the reference period of 365 days preceding the date of survey, is considered the subsidiary activity status of the person (Dhar 2011). The same methodology was followed in SAS 2013 for the 70th round of the NSS.

Table 5 *Cost items collected for SAS 2013 in the 70th round of the NSS*

Serial no.	Cost items	Details
1.	Material inputs	(i) Seed (only purchased) (ii) Manure (only purchased) (iii) Fertilizers (iv) Pesticides/insecticides (v) Irrigation
2.	Hired labour	(i) Human (ii) Animal (iii) Machine
3.	Maintenance expenses	(i) Owned machinery and equipment
4.	Interest paid on crop loan	
5.	Rent paid for leased-in land	
6.	Other expenses	

Source: NSSO (2014).

from that in SAS 2003. While the costs of home-grown inputs were imputed for SAS 2003, only purchased inputs were accounted for in SAS 2013. This means that the estimated cost for the same production process would be lower in the 2013 survey as compared to 2003.

Comparison of SAS 2003 and SAS 2013

The change in methodology between the two survey rounds makes comparisons of crop income estimates difficult. Notwithstanding this, Chandrasekhar and Mehrotra (2016) have studied changes in income over the decade (2003–13) using data from SAS 2003 and SAS 2013. In doing so, they have compared data from the two surveys by including households from SAS 2003 with an annual income from agriculture of at least Rs 1,345, or Rs 3,000 at 2013 prices, and comparing these households with the sample of SAS 2013 (*ibid.*, p. 10).

This method has the following errors. First, the cut-off value for the SAS 2013 is supposed to be an annual income greater than Rs 3,000 (Rs 1,345 at 2003 prices), whereas for SAS 2003, the selection of the sample is based on the land owned or operated by a household. An NSSO report of 2013 titled *Income, Expenditure Productive Assets, and Indebtedness of Agricultural Households in India* states:

> In order to estimate households pursuing agricultural activities of insignificant nature in the 70th round, households with at least one member self-employed in agriculture either in principal status or subsidiary status and having total value of produce during last 365 days of more than Rs 3,000 were only considered for inclusion in the survey coverage. (Report No. 576, NSSO 2013, p. 3)

Hence, a sample household in SAS 2013 may or may not possess land. Given the nature and characteristics of the agrarian structure in India, there is a significant difference

between households that possess land and those that do not, in terms of access to input and output markets, utilisation of resources, and costs and returns.[4] Secondly, the study does not account for the difference in cost concepts between SAS 2003 and SAS 2013 to arrive at crop income estimates.

An Ideal Dataset on Farm Incomes: Where Do Official Statistics on Farm Incomes in India Stand?

A conceptual framework for an ideal dataset for statistical systems of agricultural economies was developed in the *Global Strategy to Improve Agriculture and Rural Statistics*. This framework specified the kind of data needed to guide decision-making in agriculture in the twenty-first century (World Bank, FAO, and UN 2010). Data was to be collected on three dimensions: economic, social, and environmental. This section discusses how official crop income statistics in India deviate from the guidelines provided by the *Global Strategy*.[5]

Basic Unit for Agricultural Statistics

The *Global Strategy to Improve Agriculture and Rural Statistics* looks at the basic unit for agricultural data collection from three perspectives. For economic statistics, the basic unit is the farm or agricultural holding; for social statistics, it is the household; and for environmental statistics, it is the land parcel. For purposes of data collection, the *Global Strategy* recommends a conceptual framework that can build a statistical link between economic, social, and environmental dimensions. This framework would provide the basis for selection of a farm household as the basic unit for data collection. This approach can link the characteristics of the farm or agricultural holding to the household and land parcel. To do this, an integrated statistical survey system with a master sample frame was recommended.

Apart from the CCPC scheme, SAS 2003 is the only large-scale sample survey in India that is conceptually close to the basic unit recommended in the *Global Strategy*. SAS 2003 provides economic statistics of crop production at the farm level, social statistics at the household level, and production and input cost statistics at the crop level. In comparison, SAS 2013 does not provide data on input costs of individual crops, which were collected under SAS 2003. SAS 2013 data are therefore subject to two limitations: first, relative economic importance in terms of income and profitability of individual crops cannot be determined; secondly, crop-specific input use and cost of cultivation cannot be derived.

The *Global Strategy* recommends that the reach of the basic unit "should be as exhaustive and as comprehensive as possible, and any omission of units based on

[4] Section 1.3.6 of the report titled *Key Indicators of Situation of Agricultural Households in India* by the NSSO points out the major differences between the survey conducted in the 59th round and the one conducted in the 70th round (NSSO 2014, p. 3).

[5] See Sarkar (2017) for more details.

their size, importance, location, or other criteria should be avoided" (World Bank, FAO, and UN 2010, p. 10). The definition of an "agricultural household" in SAS 2013 falls short of this recommendation. Households were excluded from the survey if the value of their agricultural produce was less than Rs 3,000. This exclusionary criterion constrains comparison of crop income estimation and other characteristics of smaller holdings (or larger holdings with crop losses).

Stratification in Multi-Stage Sampling Surveys

The Food and Agricultural Organisation (FAO) of the United Nations reviewed approaches in use by different countries, and recommended that stratification of larger administrative areas in sample surveys for agricultural statistics must take into consideration agroclimatic conditions and the structure of agriculture in that region (FAO 2015). In India, the CCPC scheme demarcates States into homogeneous areas based on soil type, rainfall pattern, and crop area. However, for the Situation Assessment Surveys, States were divided into administrative areas rather than agroclimatic zones for the selection of sample villages.

Concepts of Cost

A conceptual understanding of cost of cultivation has major implications for the estimation of crop incomes. Two approaches are common in the literature with respect to cost of cultivation and its practical applications. These are economic costs and accounting costs. The key difference between the two concepts is the inclusion of cost items in the overall estimation methodology. Accounting costs include explicit costs of farms that are out-of-pocket expenses in cash or kind for crop production. The economic costs of production usually exceed accounting costs because they include explicit accounting costs and implicit costs. Economic costs include inputs provided by farm households such as farm-saved seed, home-produced manure, or family labour, which are excluded in the accounting costs concept.

To analyse crop income data and ensure comparability of cost of production across farms, commodities, and regions, it is important to collect and calculate economic costs (FAO 2013). The accounting cost approach fails to provide an adequate overview of the cost of cultivation as implicit costs are not covered. This approach may lead to significant gaps in data that will vary by farm and region, depending on whether farms use their own factors in production or purchase them from the market.

In India, the CCPC scheme collects data to calculate the economic costs of cultivation. The scheme uses nine different cost concepts to arrive at economic cost. These are: Cost A1, Cost A2, Cost (A2+FL), Cost B1, Cost B2, Cost C1, Cost C2, Cost C2*, and Cost C3. Broadly speaking, Cost A2 is the base level economic cost for both owner and tenant cultivators, and is the most commonly used concept to estimate crop incomes.

Nevertheless, any of the nine cost concepts listed above may be used, based on their suitability for the required analysis.

SAS 2013 uses only out-of-pocket expenses or the accounting cost concept. The omission of several inputs provided by farm households leads to estimates of accounting costs that are lower than the cost of cultivation mentioned in the literature, which is based on the Cost A2 concept. However, a comparison of the cost of cultivation for individual crops between the CCPC scheme and SAS 2013 data is not possible as disaggregated crop-specific costs were not collected under SAS 2013. An alternative method to examine the gap between accounting cost and Cost A2 would be to use these two methodologies on village-level databases.

Village-level data collected and maintained by the Foundation for Agrarian Studies (FAS) allow for flexibility in methodology (here, accounting cost and Cost A2) within the same database to analyse the effect that differences in methodology have on estimations. I estimated the accounting cost as adopted in SAS 2013 and Cost A2 from 14 villages in nine States surveyed by FAS under its Project on Agrarian Relations in India (PARI) between 2006 and 2010. All figures, as presented in Table 6, are in current prices, and the level of deviation in accounting cost over Cost A2 is given in percentage terms.

Table 6 *Differences between cost estimates based on the accounting method and Cost A2 (basic economic cost), PARI survey villages, 2006–10* in Rs per hectare

Village	State	Survey year	Annual cost of cultivation per hectare		Difference in cost as used in SAS 2013, in per cent {(5 −4)/4*100}
			Cost A2	Accounting cost	
1	2	3	4	5	6
Ananthavaram	Andhra Pradesh	2006	49,528	42,594	−14
Bukkacherla	Andhra Pradesh	2006	11,459	8,480	−26
Alabujanahalli	Karnataka	2009	56,329	27,038	−52
Gharsondi	Madhya Pradesh	2008	19,103	9,934	−48
Nimshirgaon	Maharashtra	2007	41,439	26,935	−35
Warwat Khanderao	Maharashtra	2007	14,376	9,344	−35
25F Gulabewala	Rajasthan	2007	18,209	16,024	−12
Rewasi	Rajasthan	2010	11,831	8,755	−26
Kothapalle	Telangana	2006	16,443	12,826	−22
Harevli	Uttar Pradesh	2006	26,763	18,467	−31
Mahatwar	Uttar Pradesh	2006	15,169	11,377	−25
Amarsinghi	West Bengal	2010	54,070	46,500	−14
Kalmandasguri	West Bengal	2010	42,794	27,388	−36
Panahar	West Bengal	2010	67,088	59,037	−12

Source: PARI survey data, 2006–10.

An examination of the figures in Table 6 shows that accounting cost (SAS 2013) was lower than Cost A2 in all the study villages, ranging from a deficit of 12 per cent to 52 per cent. The gap between accounting cost and Cost A2 was lowest in 25F Gulabewala, a canal-irrigated village in Rajasthan, where purchased inputs were intensively used in place of home-produced inputs. On the other hand, the gap was highest in Alabujanahalli, an irrigated rice- and sugarcane-cultivating village of Karnataka, where most inputs were home-produced and were not considered in accounting for costs. This difference in costs results in different levels of crop income estimation in different regions, based on local factors such as cropping pattern, labour intensity, forms of labour (family or hired), input use, etc. It reinforces the FAO 2013 guideline that adopting accounting cost is not a suitable choice for collection of data on cost of cultivation due to incomparability across regions.

Conclusions

The National Sample Survey Organisation conducted two large-scale sample surveys in 2003 and 2013. These nationwide surveys, known as Situation Assessment Survey of Farmers (59th round) and Situation Assessment Survey of Agricultural Households (70th round), contributed to our understanding of the level of farm incomes. However, on account of differences in the definition of a farmer, the sampling size and strategy, and the concept used to estimate cost of cultivation, these surveys were non-comparable and unable to analyse long-term trends. Further, an analysis based on data from 14 villages in nine States shows that accounting costs, as per the SAS 2013 definition, were invariably lower than Cost A2, the difference being of the order of 12 to 52 per cent.

Finally, I evaluated official sources of data on crop incomes in respect of four of the recommendations of the *Global Strategy to Improve Agriculture and Rural Statistics*.

First, the *Global Strategy* recommends the basic unit for economic statistics to be the farm or agricultural holding, with the means to link the characteristics of the farm or agricultural holding with the household. In India, no official source of crop income data satisfies this criterion. Situation Assessment Surveys do not collect crop-specific input use, cost of cultivation, and returns. The CCPC scheme provides data for costs of and returns on some selected crops, and cannot be used to study the economics of the household farm.

Secondly, the *Global Strategy* recommends comprehensive criteria for identifying farmer households or agricultural households, without omissions based on size, importance, and location. However, the SAS 2013 definition of "agricultural household" excludes households with agricultural produce of value less than Rs 3,000.

Thirdly, the *Global Strategy* recommends taking into account agroclimatic and regional specificities in designing the stratification for sample surveys. In India, the CCPC scheme demarcates States into homogeneous areas based on agroclimatic conditions for sampling, while the Situation Assessment Surveys do not.

Fourthly, the *Global Strategy* suggests the use of economic costs for crop income calculation. The CCPC scheme offers significant flexibility. However, data from SAS 2003 and 2013 do not correspond to this method of cost accounting, and do not allow for data to be reconstituted according to different cost concepts.

Acknowledgements: I am grateful to the referees of this article for their comments, and the editorial team of the journal for extensive help with the text. I also thank Deepak Kumar for comments on the subject matter of this article.

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