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Measuring India's GDP Growth: Unpacking the Analytics and Data Issues behind a Controversy That Has Refused to Go Away[‡]

ABSTRACT The Indian Central Statistics Office's (CSO's) new series of National Accounts Statistics (NAS) with 2011–12 as the base year—and incorporating methodological changes drawn—from the UN System of National Accounts (SNA)—has been criticized for reporting annual gross domestic product (GDP) growth rates widely different from the older series, and being at variance with other available macroeconomic indicators. Critics have raised many analytical and empirical issues that in their view were not adequately addressed by CSO and which could have caused the discrepancy in growth rates. However, CSO has claimed the new series to be a distinct improvement since it uses new, large, data sources and incorporates advances in methodology. Taking stock of this debate, the paper makes an overall assessment of the new NAS and offers recommendations for going forward.

Keywords: *National Income, National Accounts Statistics, India, GDP Growth, Base Year, Consumption, Saving, Investment, SNA 2008, MCA 21, CSO*

JEL Classification: *E01, E02*

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1. Introduction

In January 2015, the Government of India's Central Statistics Office (CSO) introduced a new series of National Accounts Statistics (NAS) with base year 2011–12, replacing the earlier series with base year 2004–05 (CSO 2015a).[1] This is a routine matter for the CSO—as with the statistical offices of most countries—to change the base year of the NAS periodically to account for structural changes in the economy and in relative prices and to replace older survey data with newer surveys that better capture current economic activity.[2] This time around, the revision also had another objective: to update to the extent possible the underlying methodology of NAS to the most recent international guidelines, namely the UN System of National Accounts 2008 (SNA 2008).[3]

In changing the methodology and data sources for the new series, the CSO said:

> Besides shifting the base year from 2004–05 to 2011–12, this series incorporates latest available data from surveys, censuses, new economic activities, expansion of coverage of activities and improvement in procedures, and to the extent possible, the latest recommendations of System of National Accounts (SNA) 2008 in the compilation of national accounts. (CSO 2015b, Foreword)

CSO held a "Data User Conference" in 2015 on the new series, and slides of the presentation at this conference (CSO 2015c) have been in circulation, though not officially as a CSO paper. In addition, there has been extensive discussion in the media, as well as in professional journals by

1. See the website of the Ministry of Statistics and Programme Implementation (MOSPI) http://mospi.gov.in/publication/documents-report-sub-committee-national-income-0 for a number of reports of the government's Sub-committee on National Income and background studies relating to the new series. A good reference for the previous revision of the NAS to base year 2004–05 done in 2010 is available in CSO (2010).

2. Professor P. C. Mahalanobis, chairman of the First National Income Committee, was instrumental in the founding of CSO. He also founded the National Sample Survey (NSS) in the Indian Statistical Institute at Kolkata, later transferred to the central government and called the National Sample Survey Organization. The preliminary and final reports of this Committee set the standards, not necessarily thereafter followed by the CSO, for compilation and publication of the National Income Accounts in India.

3. For a brief exposition of SNA 2008, and a factual account of the main changes in the new NAS, see EPW Research Foundation (2015). SNA 2008 was prepared under the auspices of the Inter-Secretariat Working Group on National Accounts, comprising the European Community, the International Monetary Fund, the Organization for Economic Development and Cooperation, United Nations, and the World Bank.

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experts on national accounts, including, importantly, in the *Economic and Political Weekly*. Critically reviewing and summarizing this large and diverse literature is beyond the scope of this paper. What we do instead is to draw on this literature selectively while including all the important CSO publications in our assessment of the new NAS series and the major controversies surrounding it.

Section 2 of CSO (2015b), entitled "Guiding Principles for the New Series," lists the three major components influencing the present revision exercise as:

> (i) revision of base year to a most recent year (for meaningful analysis of structural changes in the economy in real terms); (ii) complete review of the existing database and methodology employed in the estimation of various macroeconomic aggregates, including the choice of alternative databases on individual subjects; and (iii) to the extent feasible, implementing the international guidelines on the compilation of national accounts, the System of National Accounts, 2008…. (CSO 2015b, p. 3).

The first two components are almost routinely undertaken during any revision of the base year. Whether or not the second component was in fact a "complete" review will depend on the extent of structural changes in the Indian economy that must be incorporated, the new data that had become available since the previous base year, and the time and resources CSO devoted to the task.

The structure of the paper is as follows. Section 2 describes the main changes made in the new series, and compares them to the old series, particularly those that are at the heart of the ongoing debate. Before coming to the current debate, it is important to point out that there have been many, long-standing methodological issues that have beset the Indian NAS, which, strictly speaking, does not follow the global SNA templates. Only some of these long-standing issues were addressed in the recent revision. We believe that many of these issues warrant flagging in any methodological review of the NAS. Section 3, therefore, describes the legacy issues relating to the methodologies followed in the revised series.

Section 4 describes the principal methodological changes made in the revision that seem to have affected the rates of output growth and how they might relate to the structure of the economy. While the methodological changes in the new series are substantive and extensive, this review will focus on the main issues that have come up for scrutiny in the public debate and not address all the changes made. To keep the main strands of ideas and evidence easily understandable, a lot of detail is relegated to footnotes

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and appendices. Section 5 explores our individual concerns on the problems confronting the old and new NAS series. Section 6 concludes by making several recommendations.

2. Changes in the New National Account Statistics

For India, with its overwhelming majority of the labor force unorganized and informal (as measured by the NSS in its quinquennial employment and unemployment surveys [EUS]), and with the uneven quality of economic data used in the estimation of the NAS, a base year revision is usually an occasion to improve methodologies, bring in newer and better databases, and address long recognized infirmities in the national accounts.[4] Until the latest revision, the rebasing has usually led to a marginal rise in the absolute size of the aggregate measures as economic activities get better represented. However, their annual growth rates invariably did not change—implying that though the absolute size of the economy may have altered slightly in the new base year, its rate of growth had remained the same.

The recent revision has been different. The absolute size of India's gross value added (GVA) at current basic prices in the 2011–12 base year was marginally "smaller" by 2.1 percent compared to the earlier gross domestic product (GDP) estimates at current factor costs, and there was a significant change in the growth rates for the subsequent years. For instance, India's annual economic growth rate for 2013–14 at constant base prices according to the new series was 6.2 percent, compared to 4.8 percent at constant factor cost according to the old series (Figure 1). Further, the manufacturing sector GVA's growth rate in real terms for the same year changed from –0.7 percent to +5.3 percent. Furthermore, the revised estimates did not seem consistent with other macroeconomic indicators such as corporate earnings or credit growth (Figures 2a and 2b).

Similarly, rates of domestic saving and investment as a percentage of gross domestic disposable income were also much higher in the new series

4. The definitions of the terms "organized" and "unorganized," "establishment," and "enterprise" depend on data sources, such as the population and economic censuses, follow-up enterprise surveys and, of course, the NSS Employment and Unemployment Surveys. The comparability of data across sources and over time cannot be taken for granted since the definitions of the concepts used in the surveys also seem to vary across surveys.

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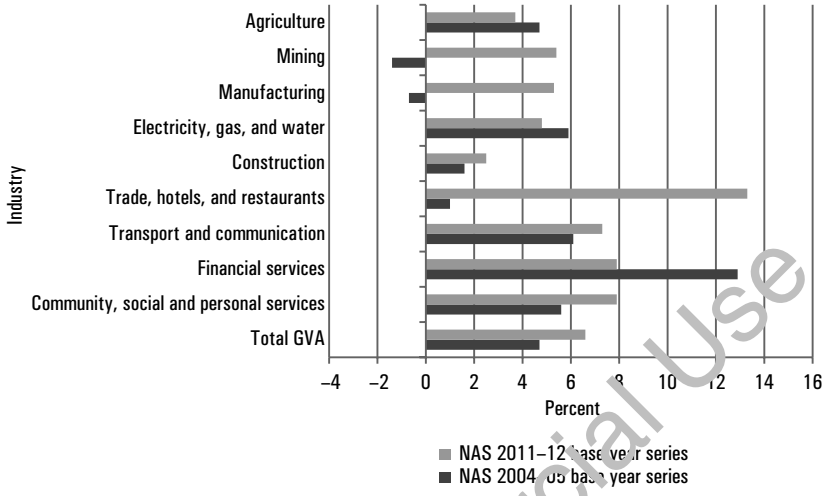
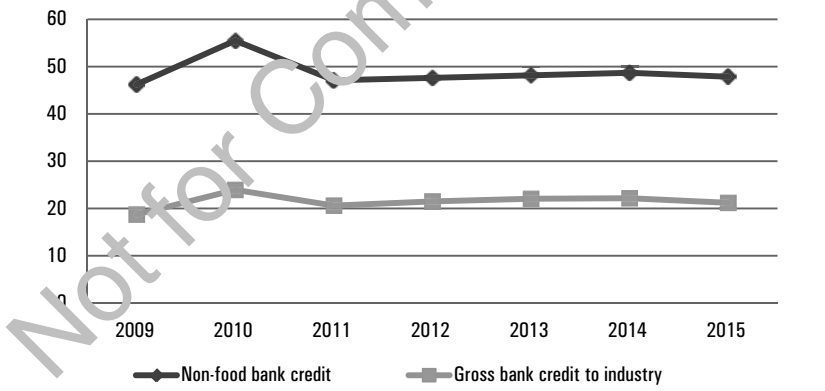
FIGURE 1. Disaggregated GDP Growth Rates for 2013–14



Source: CSO (2014, 2015b).

FIGURE 2a. Bank Credit to GDP Ratio, 2009–15



Source: www.rbi.org.in.

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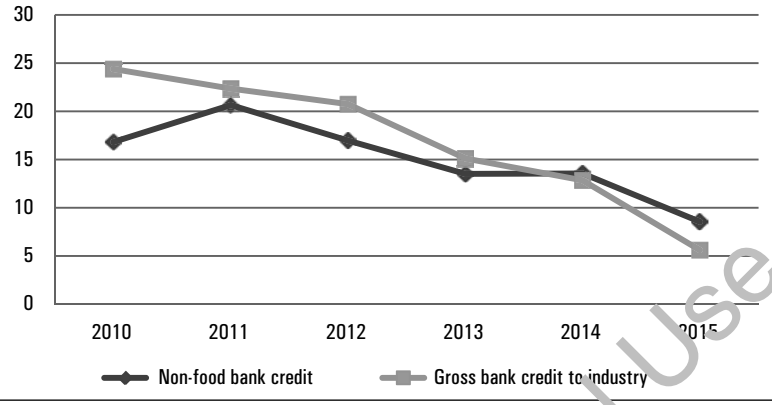
as compared to the same rates relative to GDP at current market prices from the old series (Table 1).

In January 2016, following its regular calendar of NAS press notes, CSO released the "First Revised Estimates" (FRE) of the new series, in which even the base year estimates had changed, thus causing more uncertainty

FIGURE 2b. Growth in Bank Credit, 2010–15



Source: www.rbi.org.in.

TABLE 1. Saving and Investment Ratios and Growth Rates, 2010–11 to 2013–14

	Growth Rate of GDS (%)		*Growth Rate of GCF (%)*		*Saving/GNDI (%)*		*GCF/GNDI (%)*	
Year	*2004–05 Series*	*2011–12 Series*	*2004–05 Series*	*2011–12 Series*	*2004–05 Series*	*2011–12 Series*	*2004–05 Series*	*2011–12 Series*
2010–11					6.7		12.8	
2011–12	6.2		–0.5		6.4	9.4	10.1	13.3
2012–13	8.3	16.6	1.3	14.7	6.1	9.7	9.2	13.5
2013–14		23.7		6.2		10.6		12.6

Source: CSO (2014, 2015b).

according to some (CSO 2016b; Rajakumar and Shetty 2016). For instance, the FRE showed domestic output size (GVA at current basic prices) in the base year 2011–12 lower than in the old series (GDP at factor cost at current prices) by 3.4 percent (compared to 2.3 percent as estimated in 2015). Thus, for example, for 2013–14, we have three sets of GDP growth rate estimates with considerable differences between them (Figure 3).

Over the past 20 months, critics of the methodologies and databases used in the revised estimates have questioned the credibility of the new NAS.[5] Their critiques have led to skepticism about the new GDP estimates among the media, policymakers, international investors, and economic analysts.

5. Srinivasan (2003) notes that many of these criticisms had been discussed, though by no means resolved, by the 2001 Rangarajan National Statistical Commission (MOSPI 2001).

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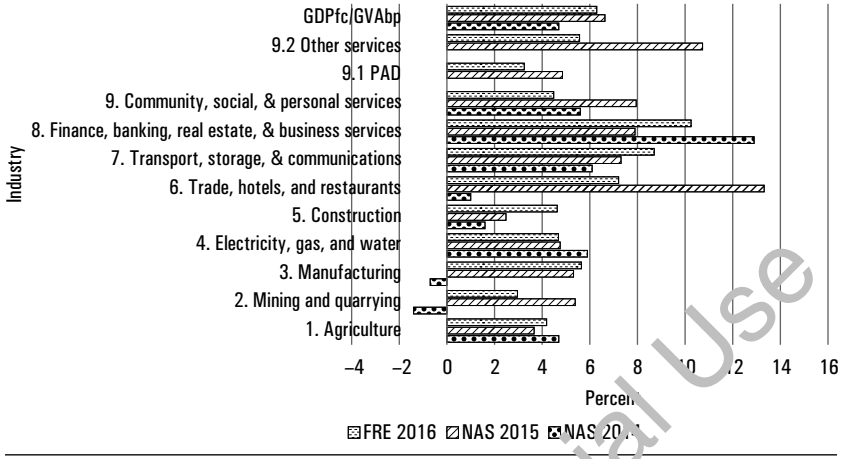
FIGURE 3. Growth Rates in 2013–14



Source: CSO (2014, 2015b, 2016b).
The growth rate estimates for 2013–14 are FRE 2016 = first revised estimate of GVA at basic prices (*GVAbp*) released in 2016; NAS 2015 = new series GVAbp with base 2011–12 released in 2015; NAS 2014 = original GDP series at factor cost (*GDPfc*) with base 2004–05 released in 2014.

However, CSO and other statistics officials have repeatedly responded to these criticisms by asserting that the NAS revision is benchmarked against the best international practices and has used larger and improved datasets, hence the estimates are technically better and therefore more credible. But the debate has refused to go away, and the doubts seem to get reinforced with every release of the new estimates.[6]

2.1. Changes in the Sectoral Composition of Domestic Output

To begin with, it is useful to list the principal changes in the domestic output estimates at current prices in the new series. The main changes are the following:

1. The industrial (also referred to in this paper as sectoral) composition of domestic output has changed somewhat: the industrial sector's size at market prices has swelled by about 5 percent of GDP in the new series, with a corresponding decline in the tertiary sector's size and the share of agriculture remaining broadly the same (Table 2).

6. For instance, in first week of June 2016, just ahead of the IPF Conference, there were two op-ed columns critical of the new estimates, which showed that the high and rising growth rate is made up of unexplainable "discrepancies" and accounted for nearly half of the incremental output growth in the January–March 2016 quarter.

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TABLE 2. Sectoral/Industrial Composition of GDP at Factor Cost (Old Series) and GVA at Basic Prices (New Series), Base Year 2011–12

Sector/Industry Percentages	*GDPfc (%), Old Series*	*GVA bp (%) New Series (2016 Rev.)*
1. Agriculture, forestry, and fishing	17.9	18.5
2. Mining and quarrying	2.7	3.2
3. Manufacturing	14.7	17.4
4. Electricity, gas, water supply, and other utility services	1.6	2.3
5. Construction	8.2	9.6
6. Trade, repair, hotels, and restaurants	**17.4**	**10.9**
7. Transport, storage, communication, and services related to broadcasting	7.3	6.3
8. Financial, real estate, and professional services	16.5	18.9
9. Public administration, defense, and other services	**13.8**	**12.7**
10. Total %age	100.0	100.0
GDP at fc and GVA at bp (₹ crore)	8,391,691	8,106,656

Source: CSO (2014, 2015b).

2. Table 2 shows the industrial distribution of GDP at current market prices for the base year 2011–12 as per the new (revised estimates of January 2016) and the old (2004–05) series. It shows that the shares of manufacturing and the financial sector have expanded, while those of trade, hotels, and restaurants, and of community, social, and public services have declined.

2.2. Changes in the Institutional Composition of GDP

There have been important shifts in the institutional composition of GDP (Figure 4). The new series uses the corporate form of organization in four out of six institutional sectors. The two excluded are general government and the household sector. This change could have implications for the measurement of output in many activities, as discussed below.

2.3. Changes in the Organizational Units of Measurement

In the old series, a factory or a plant was the unit of record. In any plant, activities could include the production of goods and services, the latter including the management of the plant (and possibly also of other plants of the same owner) and auditing, and accounting services for that plant (and possibly for other plants owned by the same owner). Therefore, unless the owner owned only one plant, the traditional statements of assets and liabilities, and of income and expenditure for the plant would have been meaningless in the old series.

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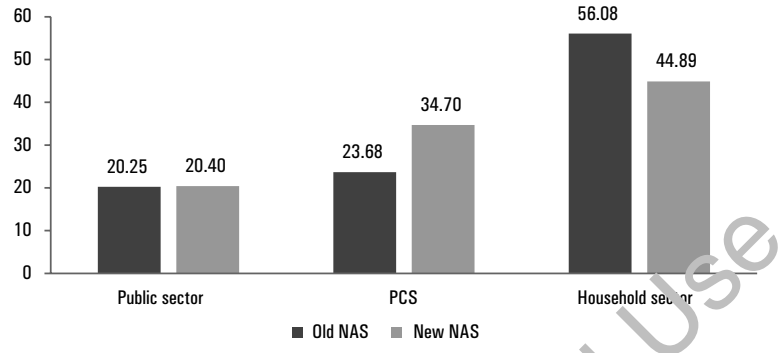
FIGURE 4. Institutional Composition of GDP in Old and New NAS Series, for 2011–12 (Percent)



Source: CSO (2014, 2015b).

In the new series, outside of agriculture and the public sector, an enterprise rather than a factory is now the organizational unit of measurement used for recording output and other data. Value addition in all its activities is, in principle, captured in the enterprise's or company's balance sheet. Table 3a lists the institutional framework of the old NAS and the framework adopted in the new 2011–12 base year NAS. Table 3b presents comparative data for the new and old NAS using the new NAS classification in Table 3a. In the old series, the organized sector consisted of the overlapping categories of (a) the public sector, (b) the private corporate sector (PCS), and (c) factory manufacturing and recognized educational and medical institutions, accounting for 40–45 percent of GDP.

Table 3b shows that public sector's share in GDP in the new series has remained the same as in the old series, though there has been some reshuffling within the public sector in the new series: "Administrative

TABLE 3a. Institutional Framework of NAS 2004–05 and NAS 2011–12

Old Series (Base Year 2004–05)	*New Series (Base Year 2011–12)*
1. Public Sector	1. Public Non-financial Corporations
1.1 Administrative Departments	2. Private Non-financial Corporations
1.2 Departmental Enterprises	3. Public Financial Corporations
1.3 Non-departmental Enterprises	4. Private Financial Corporations
2. Private Sector	5. General Government
2.1 PCS	6. Household Sector, including NPISHs
2.2 Household Sector, including NPISHs	

Source: CSO (2015c).

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TABLE 3b GDP Shares, 2011–12

Old Series (Base Year 2004–05)	*GDP Share (%)*	*New Series (Base year 2011–12)*	*GDP Share (%)*
I. Organized Sector	43.9	**I. Organized Sector**	55.1
1. Public Sector	20.3	*1. Public Sector*	20.4
(i) Administrative Departments		(i) General Government	9.7
(ii) Departmental Enterprises		(ii) Public Non-financial Corporations	2.1
(iii) Non-departmental Financial Enterprises		(iii) Public Financial Corporations	8.6
2. PCS	23.7	*2. PCS*	34.7
3. Factory Manufacturing		(a) Private Financial Corporations	
		(b) Private Non-financial Corporations	
4. Recognized Educational and Medical Institutions			
II. Unorganized Sector	56.1	**II. Household Sector**	44.9

Source: CSO (2015c).

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departments" in the old series have now become "General government," which, in principle, includes local administration as well. "Departmental enterprises" and "Non-departmental and non-financial non-enterprises" are now put under the subheading "Public non-financial corporations." "Non-departmental financial enterprises" are now placed under a separate subheading called "Public financial corporations."

Within PCS, the scope of the non-financial private corporate sector (NF-PCS) has expanded significantly with the inclusion of quasi corporations (QCs), defined as noncorporate entities that appear to maintain accounts like the corporate sector, now shifted from the household sector (more about this below). As a result, the size of PCS has gone up by 11 percentage points of GDP, with a corresponding reduction in the size of the household sector. As is widely known, PCS consists of NF-PCS and financial PCS (F-PCS). In the new NAS, the larger size of PCS seems to be on account of NF-PCS, while the F-PCS' size has remained the same.

Correspondingly, the GVA of the household sector has contracted. There could, however, be another possible reason for the shrinkage of the household sector: the methodology for estimating GDP in the nonagricultural household sector has changed (CSO 2015e; more about this in Section 4).

2.4. Changes in the Estimation of Manufacturing Output

A lot of the debate on the new NAS has centered around the manufacturing sector.[7] The manufacturing sector has traditionally been measured in two parts. First, the registered sector, consisting of all factories registered under the Factories Act—that is, factories employing 10 or more workers using power (or 20 or more workers without power)—accounting for about two-thirds of manufacturing sector output and employing about 20 percent of manufacturing employment. The Annual Survey of Industries (ASI) is the principal database to capture the output of registered manufacturing. ASI, in turn, consists of two parts: an annual census of all registered factories employing 50 or more workers using power (or 100 or more workers without power) and a sample survey of smaller registered factories, with roughly one-third of such factories surveyed each year.

Second, the rest of the manufacturing sector—small workshops and household enterprises employing less than 10 workers with power (or 20 workers without power) and called unregistered or unorganized

7. For details of the debate on the manufacturing sector output estimation, see Goldar (2015) and Nagaraj (2015c).

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manufacturing—has had its value added estimated "indirectly" via periodic NSS sample surveys.

The list of factories used for canvassing the ASI is incomplete and often out of date due to the widespread and growing evasion of registration under the Factories Act, especially by smaller factories (Nagaraj 2002). Further, there is a problem of nonresponse by factories that do not comply with the law to submit their production information under the ASI.

The foregoing method of measuring manufacturing output has many shortcomings: first, there is about a two-year lag in getting ASI results, during which the Index of Industrial Production (IIP) was used for estimating manufacturing sector GVA. Second, the IIP's quality has been deteriorating over time, adversely affecting the quality of value added estimates in manufacturing. Third, the estimation of the unorganized manufacturing sector's output was widely considered unsatisfactory, as the value added per worker (VAPW) parameter that was being used tended to get outdated, leading to the underestimation of its output.

The new NAS series has largely done away with the ASI, replacing it with corporate sector data called the Ministry of Corporate Affairs (MCA) 21 database and accounting for nearly two-thirds of manufacturing value added (Tables 4a and 4b). As mentioned earlier, partnership and proprietary firms in unregistered manufacturing that use books of accounts (as per the NSS survey data) are now defined as QCs and shifted to PCS. Their growth rate is taken to be the same as that of the manufacturing sector in PCS in the new series.

2.5. Shrinkage of the Household Sector[8]

As shown earlier, for 2011–12, the household sector's share of GDP has fallen from 54 percent in the old series to 43 percent in the new series mainly for two reasons: first, QCs have been moved to PCS, and second,

TABLE 4a. Data Sources Used for Estimating GVA in Manufacturing

Series	*Year 1 (Advance & Provisional)*	*Year 2 (1st Revised Estimate)*	*Year 3 (2nd Revised Estimate)*
Old 2004–05 Base Year Series	IIP	IIP	ASI
New 2011–12 Base Year Series	IIP + Advance Filing of Corporate Accounts	IIP + MCA 21	MCA 21 + Non-corporate ASI

Source: http://mospi.nic.in/Mospi_New/upload/Understanding_New_GDP.pdf, p. 3.

8. See Section 3.2 also.

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TABLE 4b. Institutional Composition of the Manufacturing Sector

	2013–14		*2014–15*	
Sectors	*Percent Share*	*Growth*	*Percent Share*	*Growth*
Public Sector, including Public Sector Enterprises	7.9	(NDCU = 6.3, DCU = 1.7)‡	8.4	12**
PCS	65.2	7.9§	66.0	8.0@
ASI (Non-corporate) and Household	26.9	0.7*	25.6	1.9*
	100.0	(IIP Growth = (–0.8)	100.0	

Source: http://mospi.nic.in/Mospi_New/upload/Understanding_New_GDP.pdf, page 3; CSO (2014, 2015b).
* Growth is derived from relevant two-digit CCs. Hence growth is not the same as total IIP growth.
§ derived from the MCA 21 database.
@ derived from the RBI sample study and BSE database.
** derived from past trends.
‡ derived from the analysis of accounts of PSUs and government budget.

output per worker in many activities has contracted on account of the change in methodology. In the old series, the unregistered sector's output was estimated "indirectly" as a product of (a) output per worker (as estimated using NSS sample surveys of employment and unemployment) and (b) the number of workers employed in the activity.[9] The new NAS estimates of output per worker are obtained using a Cobb–Douglas (CD) production function. This latter method categorizes workers with varying productivities into (a) wage workers, (b) self-employed workers, and (c) helpers.

9. The CSO explains this process as follows:

> 2.2 At present the estimates of value added and related macroeconomic aggregates for a number of economic activities carried out in the unorganized segment of the economy are compiled using an indirect method called the Labor Input Method (LIM). In this method, first the labor input (LI) is compiled as the sum of workers, either on the principal status or on the subsidiary status (including the work on subsidiary status of principal status workers), at detailed activity level known as "compilation categories" (CCs).
>
> 2.3 The CCs are determined by regrouping the economic activities at 3, 4, and 5 digit level described in the National Industrial Classification (NIC), which, in turn, follows the International Standards Industrial Classification (ISIC) of All Economic Activities of the United Nations. As per the recommendations of the Advisory Committee, the same CCs of 1999–2000 series based on NIC 1998 were used for the current series (2004–05 =100) because of marginal changes in NIC 2004.
>
> 2.4 The benchmark GVA estimates of the unorganized manufacturing and services sectors are then prepared for the CCs for the base year of national accounts series using the estimated labor input (LI) engaged and the VAPW in the activity.
>
> 2.5 The base year estimates are projected to subsequent years ... (CSO 2015d, p. 3).

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2.6. Gross Saving and Capital Formation Estimates

The new series has published a gross national saving and capital formation series, in place of a gross domestic saving (GDS) and capital formation series, signifying the growing role of the external sector in the economy. Thus, in place of the concepts of GDP, GDS, and gross domestic investment, the corresponding gross national product concepts are used. The relevant income concept includes net factor income and transfers from abroad. Further, for the first time, saving is reported more meaningfully in an economic sense as a proportion of gross national disposable income (GNDI), rather than the earlier measure of a gross saving to GDP ratio. Similarly, expenditure on valuables, which was once treated as consumption expenditure, was separately recorded in the old series as one of the assets in the standard table on "Gross Capital Formation by Institutions and Asset Class," but without indicating which institution owned it and their ownership shares (Rajakumar, Sawant, and Shetty 2015; Srinivasan 2014).[10] In the new series, the entire ownership of valuables has been assigned to the household sector. But CSO has not indicated how the household sector finances this investment, thereby making a consistent, consolidated account of the national capital and finance accounts difficult to estimate (more about this in Section 3).

2.7. The Treatment of Quasi Corporations

QCs are defined in the SNA 2008 as "an unincorporated enterprise that has sufficient information to compile a complete set of accounts as if it were a separate corporation, and whose de facto relationship to its owner is that of a corporation to its shareholders" (as quoted in Subba Rao 2015). As per CSO, QCs include (CSO 2015c, p. 6):

1. Unincorporated enterprises covered in ASI
2. Unincorporated enterprises of manufacturing that are not covered in ASI but maintain accounts
3. Cooperatives providing non-financial services
4. Unincorporated enterprises providing non-financial services and maintaining accounts
5. Unorganized financial enterprises.

10. T. N. Srinivasan (2014) has discussed the issue of "valuables" in his unpublished note shared with RBI and CSO officials, and it is available from the author.

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The above list implies that QCs include financial enterprises as well.[11] QCs account for 8 percent of GVA in the new series.[12] There is no comparable estimate available for the old series, so there is little basis to make a comparison. However, the absolute size of this QC component seems very large.[13] Moreover, QCs are assumed to grow at the same rate as PCS, though CSO does not provide any supporting evidence for it.

3. Legacy Issues[14]

3.1. Approaches to the Measurement of Gross Domestic Product

The task of putting together the NAS in an emerging market country such as India is a continuing activity. As the economy develops, it has to respond, as it must, to the dynamics of development at home and abroad, opportunities from a shifting global technology frontier, and from demographic changes, and more methodologically, to advances in economic and statistical theories, economic measurement and econometrics, and computational capabilities and techniques. This being the case, at any point in time, there will invariably be a legacy of unfinished tasks and known but yet to be availed, opportunities, and importantly, anticipated opportunities likely to be available in the near future. This makes any description of legacy issues difficult, imprecise, uncertain, and subjective, if not entirely arbitrary. Also some of the tasks described in this section as unfinished legacy are as relevant for the new series of NAS as they would have been for the old series. For this reason,

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11. Two tables in CSO (2015b) provide data on institutional-cum-industrial classification of output. Table 2 on page 19 gives data on "GVA for non-financial PCS excluding quasi corporate sector in 2011–12;" Annexure I on page A-1 gives data on "GVA at basic prices for the year 2011-12 by industry and institutional sector." The difference in the estimates for PCS between the two tables is on account of QCs. This is the evidence to show that in the official statistics, QCs are defined as part of NF-PCS. But the information given in the text above shows that unorganized financial enterprises are also included in QCs. Therefore, the arguments we raised in Nagaraj (2015d) and in our rejoinder to CSO (Nagaraj 2015e) merit attention. We gratefully owe this clarification to Rymond Zhong.

12. This is estimated using the industry by institutions GVA table in Annexure–I, page A-1, and GVA for NF-PCS excluding QCs from Table 2, page 19 (CSO 2015b).

13. This hunch is based on the following reason. As a large part of QCs is unregistered manufacturing, which accounts for about 4–5 percent of GDP, QCs in services are likely to have much smaller VA per worker. Further, following the methodological reasoning in "Mystery of Private Corporate Saving," Subba Rao (2015) suggests that QC size is perhaps overstated in the new NAS.

14. This section largely reflects T. N. Srinivasan's views.

the boundary between this section on legacy problems and Section 5 on the agenda for the future is unavoidably blurred.

The three independent approaches for estimating GDP and related aggregates are: (a) the production or product approach in which GVA by units of production of goods and services in the economy is aggregated; (b) the income approach in which the income accruing to domestic primary factor owners for their supply of factors of production such as land, labor, and capital is aggregated; and (c) the expenditure approach in which government and resident private sector expenditures on consumption, gross capital formation (GCF), and foreigners' expenditures on exports net of imports are aggregated. If we ignore for simplicity the complications arising from direct and indirect taxes, except for measurement errors, the three approaches should lead to the same estimate of GDP. CSO (2016) gives a good account of these measurement approaches. Syrquin's (2016) review of Coyle (2014) is a good source for the intellectual history of the GDP concept.

Strictly speaking, even in advanced countries, the product-, income-, and expenditure-based estimates are not independently derived, and some mixture of the three is used. In the Indian NAS the mixture is so extensive that it is better called a mishmash, or a confused mixture of the three, that is, in large part, attributable to the persistence of a large unorganized sector in GDP as well as in employment. Yet from Table 6.1 of CSO (2015b), which lists items/sectors for which either a production or income approach is being used, even with the changes in methodology and data sources in the new series, no significant dent seems to have been made in this mishmash legacy.

3.2. Absence of Mutually Consistent Data on Income, Consumption, Saving, and Investment in the NAS

The household sector in the NAS (in the old as well as the new series) includes households as defined in the household consumption expenditure surveys (CES) of the NSS, that is, by the conventional "kitchen" definition: a household consists of all those who usually eat out of the same kitchen. It also includes unincorporated enterprises and partnerships. Not only in the CES but in almost all household surveys of the NSS, such as the EUS, the conventional "kitchen" definition for households is used.

In the CES, data only on consumption (quantities and values) are collected from the sampled households. Data on household income and their sources are not collected, both for valid analytical reasons as well as keeping in mind the results of sampling experiments in early rounds of the NSS on the reliability of income data. So the NSS does not collect data from

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households on their income from their factor supplies. Moreover, the NSS EUS show that a significant number of labor force participants from conventional households are self-employed, so that their income is a mixture of operating surpluses from their production activity in agricultural, cottage, or village industry in which they are self-employed, and wage income from their supply of labor.

Without data on household income, clearly household saving cannot be derived from the CES. In fact, only limited use is made in the NAS (old and new) of the commodity pattern of consumption expenditure from the CES, and instead Table 3 commodity-flow approach is used.[15] Importantly, the asset composition of GCF is derived by using the commodity-flow method. Also, some of the durables purchased by households could be dual use, in that their services could be consumed as well as used as intermediate inputs in home production and/or other income-earning activities. Data on household purchases of financial instruments are not available in the CES. This means that consistent data on income, saving, and investment, and its financing by households, as conventionally defined, are not available from the CES. The NSS had experimented with collecting income, consumption, saving, and investment data in a mutually consistent manner through an integrated schedule in a few earlier rounds. In fact, the 2001 Rangarajan National Statistical Commission had recommended that NSS should resume canvassing this data again.[16] Whether in response or otherwise, the NSS in its Survey on the Status of Agricultural Households in Rural India in the 70th NSS Round in 2014 collected data on incomes, their principal sources, expenditures on consumption, and productive investment. Whether such a survey will be extended to urban areas and continued is not known.

It is worth recognizing that the legacy of not having data collected from direct responses of households on a mutually consistent basis on consumption, saving, and investment necessarily means the NAS estimates of PFCE,

15. Private final consumption expenditure (PFCE) in the NAS is based on a commodity-flow approach, with ratios where relevant for quantities retained for own consumption and retail prices worked out from the NSS Consumer Expenditure Surveys. This approach covers the consumption of primary goods, manufactured products, other products, and services. For extensive details on the methodology and indicators used, see CSO (2015b, 176–81).

16. For a critique of the Report of the Rangarajan Commission, see Srinivasan (2003). In his comments as a formal discussant for this paper at the 2016 IPF, Pronab Sen said that CSO, following the Rangarajan Commission's suggestion, had tried the integrated schedule of income, consumption, savings, and investment, but the results were again not satisfactory. It would be very useful for CSO to prepare a briefing note on the pilot and the unsatisfactory results that were obtained.

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capital formation, and its financing are all based on indirect sources. The issue is discussed in more detail in Section 5.

3.3. Outsourcing, Fragmentation of Production, Regional, and Global Value Chains

Although strictly speaking this is not a legacy issue, newer forms of production could have significant implication for the new NAS series. With the WTO's GATS agreement on services trade in 2001, service activities that used to be done within a manufacturing company are being outsourced to specialized service companies within a country or in a foreign country, so that the value that used to be added by service employees of the manufacturing company is now being outsourced to service companies. This process, originally described by Jagdish Bhagwati, is now very extensive, leading to growing international trade in components and parts and in what is called process trade, in which goods are shipped back and forth among countries for completion of all processes before the goods are ready. Although the quantitative significance for India of the growth of global value chains over the last two decades is not known, what is known is that India is a latecomer in its participation in such chains. Such an analysis should begin as soon as possible. Unfortunately, the MCA 21 database is fairly recent and makes a reliable retrospective analysis difficult. However, as a start, CSO should begin publishing India's international trade data in gross and net value added terms.

3.4. Error Estimates for Sectoral and Aggregate Value Added

The first and final reports of the First National Income Committee, chaired by the late Professor P. C. Mahalanobis, provided approximate error estimates for aggregate and sectoral value added. Although these were not sampling errors in a statistical sense, they were very informative. The CSO does not provide similar error estimates, so that it is impossible to tell whether NAS estimates are now less error prone after more than six decades. On the principle of better late than never, CSO should start publishing error estimates as soon as possible.

3.5. Panel Data

Although CSO collects and publishes several time series, almost all of them are cross sections, with some repeated over time. There are many issues for which panel data are essential for drawing valid inferences. The econometric

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theory and tools for panel data analysis, including panel cointegration techniques, are well developed. It is time that CSO introduces panel features in its time series, which would also help considerably in the correct estimation of the NAS.

4. The Ongoing Debate[17]

This section deals with the methodological changes made in the new NAS series and the main debates surrounding the new estimates that ensued. It focuses on the private corporate and household sectors, whose estimates have undergone the most significant changes. For the sake of convenience, the term "GDP" denotes GVA at basic prices in the new series and GDP at factor cost in the old series.

4.1. The Private Corporate Sector

Historically, due to poor enforcement of the law, only a small fraction of registered companies filed their audited balance sheets with the Registrar of Companies (Nagaraj 2015d).[18] However, as all large companies (that is, with high paid-up capital [PUC]) mostly filed their balance sheets, and PCS was then a small part of the economy, RBI's small sample of companies with high PUC was deemed adequate to capture the PCS' saving and capital formation.[19] RBI sample estimates were then "blown up" to the universe of registered companies—using PUC as the parameter—to get estimates for PCS.

However, with the phenomenal growth in company registrations during the last three decades, and with the majority of them not complying with the statutory requirement to file a return, the foregoing method has become unreliable as there is no record of the universe of "working" companies. The 2001 National Statistical Commission Report had clearly stated this fact and recommended conducting a census of working companies at least once in a decade to ascertain the universe of working companies. To quote the report:

There are more than five lakh (500,000) companies registered in the Registrar of Companies, but the actual number of companies that are operating is not known. This situation seriously affects the reliability of various estimates. An exercise conducted in

17. This section largely reflects R. Nagaraj's views.

18. See the quotation from the National Statistical Commission report below in the text.

19. This is a case of using information from a regulatory filing by companies to estimate saving and capital formation in PCS.

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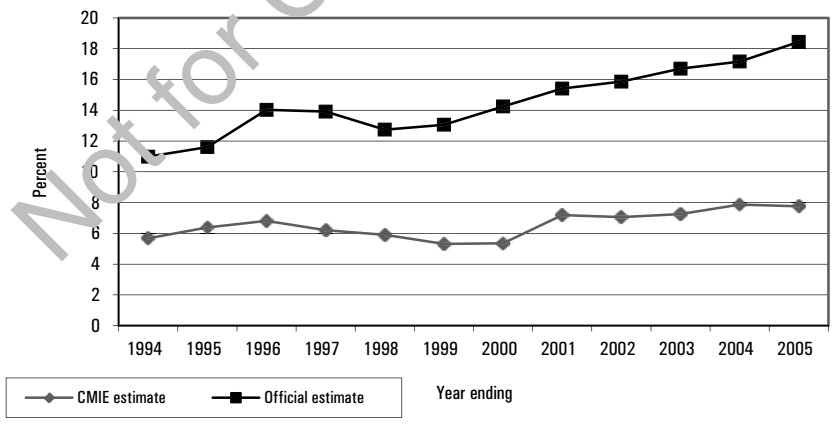
March 1999 indicated that about 47 per cent of the registered companies filed their balance sheets for the year 1997–98 with the Registrar of Companies. (MOSPI 2001, 22)

During the last decade, GDP growth accelerated to 7–8 percent per year mainly on account of the services sector. Disaggregating the growth shows that GDP in the PCS was the source of rapid growth. Inquiring into the possible overestimation of services output growth, Nagaraj (2009) had found a substantial rise in the share of PCS in GDP using estimates derived indirectly from the NAS. Comparing these estimates with those obtained using Centre for Monitoring Indian Economy Pvt. Ltd (CMIE)'s Prowess database, we had shown that there seems to be a systematic overestimation of PCS output in GDP (Figure 5). For instance, for 2005–06 the share of PCS in GDP as per NAS was about 18 percent, whereas it was just about 8 percent based on the CMIE data. Even assuming that the CMIE data underestimates the size of the PCS since it ignores small private limited companies, the gap between the two estimates is so wide that it clearly points to overestimation in the NAS.[20]

In about 2006, MCA initiated an effort to encourage companies to file their financial returns electronically and created a web portal where companies could e-file their returns. After considerable efforts, including incentives and threats of de-registration, the e-filing of returns peaked at over 500,000

FIGURE 5. Size of Corporate Sector as Percent of GDP



Source: CSO (2014, 2015b).

20. Estimates based on CMIE data use audited balance sheet data; therefore they should not be underestimates for companies in the database.

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companies during 2011–12 and 2012–13, out of a total of over 900,000 registered companies. In other words, in spite of its best efforts, the regulatory authority could at best get little over one-half of registered companies to comply with the mandatory requirement. With the phenomenal growth in company registration in the last two decades, a growing proportion of the newer companies seem to be bogus/fictitious, thus seriously eroding credibility and validity problems with the MCA 21 database (Nagaraj 2015d).

CSO's decision to use the MCA 21 database to directly estimate national income aggregates for NF-PCS for the new NAS series was widely welcomed at that time. The new NAS showed that the PCS accounted for about 35 percent of GDP in 2011–12, significantly larger than its previous, indirectly estimated size. The growth rate of the PCS also turned out to be higher. And since a large part of manufacturing firms belonged to the PCS, manufacturing's share in GDP also increased. Both changes led to skepticism about the veracity of the new estimates and have been at the center of the debate between the CSO and the NAS-user community.

There are two methodological changes introduced by CSO that are key to the debate, as revealed when the reliability of the PCS estimates has been questioned (Nagaraj 2015a, 2015b). These are, first, the "blow-up" factor, and second, the inconsistency between the aggregated and the disaggregated cost data that seem to have yielded widely differing GVA estimates.

Put simply, since the number of companies for which accounts are available varies from year to year, the "blowing-up" or "scaling-up" factor changes correspondingly, thus greatly affecting the final estimates. To illustrate, for the years 2011–12 and 2012–13, the MCA 21 database consisted of about 500,000 companies. Estimates based on the PUC of these companies were "blown up" to about 900,000 "active companies." However, for 2013–14, the number of companies in the MCA database submitting their financials plummeted to about 300,000. When the estimates based on the PUC of 300,000 companies were blown up to 900,000 companies, the overall population estimates seem to have been overestimated (compared to the previous year), thereby also raising the estimated growth rates.

Another factor that seems to affect the sample estimates for the companies for which data are available is that the cost data obtained from the MCA database seems incomplete and inconsistent, which seems to lead to differing estimates when disaggregated data is used, compared to when aggregated data are used. To quote CSO:

> [T]he output as per database was restricted to the total revenue reported [which led to smaller estimates]. However at the time of preparing the final report, it was felt that the

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individual components under total revenue would reveal the real picture of the economy in a better way. Hence the restriction was removed and output as per database was estimated using the individual components under total revenue in the database. (CSO 2015d, 87)

The debate on the reliability of the PCS estimates draws attention again to the lack of accurate estimates of the number of working companies, a factor that was highlighted in the 2001 Rangarajan Commission Report. We really do not know how many of the nearly one million companies registered with the MCA actually produce goods and services on a reasonably regular basis. Describing the size and structure of PCS, Nagaraj (2015d) argued that a majority of the companies could be bogus, fictitious, or shell companies that exist only on paper. They may not be able to produce socially useful output and may simply serve the interests of their owners in camouflaging their true operations.

If the foregoing arguments and evidence have some value, then there is a serious need to re-examine the blowing-up or scaling-up procedure. Further, given the inconsistencies in the MCA database, there is a need for a thorough review of the database and a cleanup before it is used to estimate the NAS. Moreover, the MCA 21 database needs to be made public for anyone to verify the official estimates.

4.2. The Household Sector

As mentioned earlier, until the recent revision, the unorganized sector's output was estimated indirectly as a product of the VAPW, obtained from nationwide sample surveys and the number of workers employed in each industry. There is a long and widely held perception that the unorganized sector's output is invariably under-reported or escapes large-scale official surveys, given the predominance of traditional or non-formal modes of production. The 2001 National Statistical Commission endorsed such a view. It said:

Estimate of gross value added (GVA) per worker as per the FuS [follow-up enterprise surveys] is used for the purpose of GDP calculation. Sometimes there are perceptions from the data users that the FuS estimate of GVA per worker does not reflect the reality (see Annex 5.17) for the estimates of GVA per worker as per the NSS 51st Round for 1994–95 and the Special Enterprise Survey for 1998–99. *In fact, the perception is that the same is quite often under-estimated*. Reluctance on the part of the enterprises to supply correct and complete information in the surveys is one of the reasons for likely under-reporting of receipts and GVA. This reluctance might be due to various reasons, such as apprehension that the information supplied may be utilised for taxation purposes (emphasis added). (MOSPI 2001, para. 5.2.23)

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The unorganized sector, by definition, consists of innumerable small, traditional, at times irregular, labor-intensive, and household enterprises, often representing nonmarket or premodern forms of production bordering on survival strategies of the disguised unemployed. The majority of such enterprises often do not (or cannot) maintain modern double entry book keeping, or they cannot do so given the informal, irregular nature of their production, and the low levels of literacy of self-employed workers. Even granting that some small enterprises do maintain financial accounts, these tend not to be kept separate from their personal or family accounts and therefore cannot be used for estimating value added and the profit and loss of such enterprises. The Indian unorganized sector largely consists of subsistence activities, as opposed to modern or capitalist enterprises with a clear separation of individual and family ownership from the legal entity of the company.

Ignoring these well-received views and the above-mentioned conceptual problems, the new NAS has assumed that the older methodology overestimated output per worker since it did not distinguish between different kinds of labor. The subcommittee that looked into the matter made the following critical comments on the older methodology. To quote the report:

> The Labour Input Method, however, suffers from inherent problems. Firstly, while compiling GVAPW [gross value added per worker] ..., it is assumed that there is equal contribution from all categories of workers engaged in an economic activity i.e., the contribution of an employer, a wage-employee (regular or casual), or a family worker, is taken to be equal. Second issue is in projecting the LI [labour input] for subsequent years ... The CAGR [compound average growth rate] concept based on past two rounds of EUS [employment unemployment surveys] being used to project the LI ends up overestimating the LI for most of the compilation categories, especially in the scenario where there is a drop in the LI over the next two consecutive surveys (EUS). (CSO 2015a, 6)

To overcome the problem, the new NAS estimated labor productivity of different categories of workers using a nested CD production function, as discussed in Section 3 of the paper (for details see Nagaraj 2016). This has resulted in a contraction of LIs in the unorganized sector in the new NAS compared to the old series (Figure 6).

As shown in Annex 1 of this paper, this production function methodology used for estimation is arguable. There is a need to justify the specific functional form chosen to estimate effective LI and how its results are superior to alternative estimates.

As Nagaraj (2016) has shown, there is an inconsistency between the LIM, which has contracted the contribution of self-employed labor and the large

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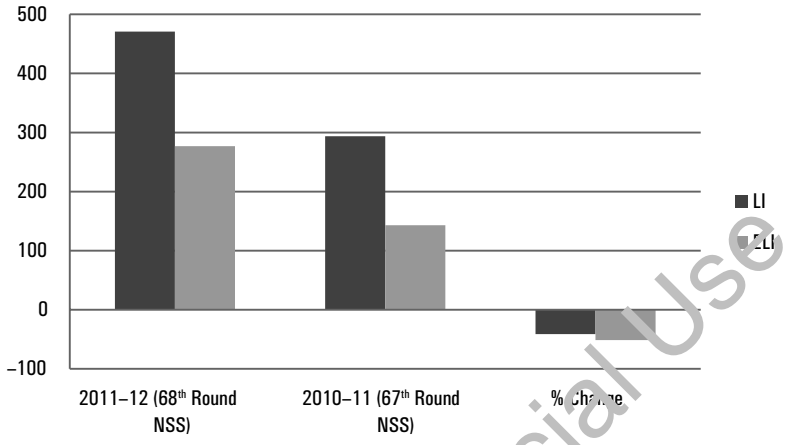
FIGURE 6. Comparison of Labor Input and Effective Labor Input in Unorganized Manufacturing



Source: CSO (2014, 2015b).

size of mixed income in the data on income distribution by factors in the unorganized sector. If the contribution of self-employed or owner–workers is really a fraction of that of a wage worker, how is it that the share of mixed income accounts for over 70 percent of all factor incomes in the unorganized sector (Figure 7)?[21] We therefore have reason to suspect that the new methodology for estimating LI has "underestimated" the contribution of this sector to domestic output.

5. Exploring the Issues

5.1. Comments by T. N. Srinivasan

We noted in our Introduction that the new NAS series introduced and used a major new data source—the MCA 21 database—and also updated the NAS methodology in several ways, including, importantly, conforming to the most recent international template, the UN SNA 2008. Moreover, the base year of the new series was shifted from 2004–05 to 2011–12, the concept of factor cost of the old series was replaced by a base price concept, and

21. Since inputs other than labor are miniscule in this sector, it is very unlikely that wage workers' share in mixed income is over 70 percent of the total factor income.

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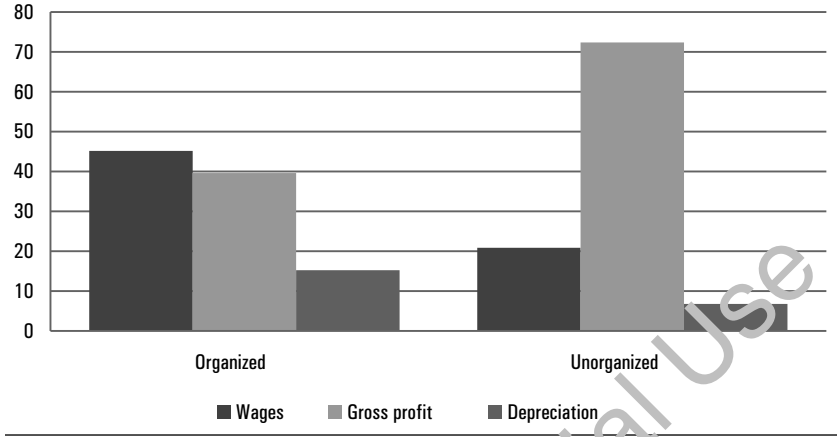
FIGURE 7. Factor Income in Organized and Unorganized Sectors in 2011–12



Source: CSO (2014, 2015b).

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the word "GDP" was restricted to GVA at market prices. Also, there were changes in deflation procedures and in the price indices used in arriving at constant price values of GDP and its components. Furthermore, in conformity with SNA 2008, the organizational unit for data collection was shifted to an enterprise, and away from the concept of an establishment, and there were some shifts of activities across industries and also across institutional sectors in GVA.

With the methodological changes and the new data sources being introduced simultaneously, some of them for the first time, it is understandable that the new NAS data—particularly of the new series at its introduction in January 2015 and after its scheduled first revision in January 2016—surprised most analysts, presumably relative to their expectations of relatively modest changes in GDP, its components, and in growth projections, following previous base revisions. This has led to considerable skepticism around the new GDP estimates among the media, policy makers, international investors, and economic analysts.

This section offers some additional comments on the handling of the new source data from the MCA 21 data.

5.1.1. Use of MCA 21 Data and the "Blow-Up" Factor: The problem of Self-selection

A country's GDP and its components cover the whole economy. Estimating them often involves the analogue of the standard inductive statistical inference of estimating population values from sample values. Consider the

simple problem of estimating the population of a district of *N* villages. If we take a simple random sample of *n* villages out of *N* with replacement and the total population of the sample villages is *p*, then the unbiased estimate of the population of the district is $(N/n) \times p$. The value *p* of the population of *n* sample villages is "blown up" by (N/n) to arrive at the total population of the villages.

Chapter VIII of the MCA's annual report 2013, entitled "Financial Aggregates of Corporate Sector," in paragraph 8.1 says, "As of 31-03-2013, the MCA repository had information for almost 13.02 lakh companies that have been registered in India." As is to be expected, CSO (2015c) devotes many slides to MCA 21. The one entitled "MCA data" mentions in brief its two e-platforms, namely 23 AC/ACA and XBRL, and lists the legal provisions by which companies are required to file their returns. An important slide with the title "Use of MCA 21 data" mentions:

> CSO estimates in 2011–12 series [New Series] for 2011–12 and 2012–13 prepared based on the analysis 5.24 lakh non-financial private companies who [*sic*] constituted approximately 85 percent of total PUC of active non-financial corporate sector as provided by MCA.
>
> For default companies, the estimates are blown up by a scaler [*sic*] factor determined based on PUC [paid up capital] of reporting companies/PUC of all active companies.
>
> For 2013–14, industry-wise estimated parameters are moved using the growth rate as observed for the 3.08 lakh common companies between 2012–13 and 2013–14. (CSO 2015c)

From the above, though it is not explicit, it is evident that 5.24 lakh companies were presumably active and submitted returns in 2012–13, from which estimates for both the years 2011–12 and 2012–13 were prepared. In analogy with the above population example, "*n*" is the equivalent of the PUC of the 5.24 lakh active companies that reported in 2012–13, and "*N*" is the PUC of all active companies, whether they reported or not, and the blow-up factor *N*/*n* is 1/0.85 or 1.15. Applying this factor to the 5.24 lakh active companies that filed, the total number of companies including those that did not file would be around 5.8 lakhs.

On the other hand, if indeed there are 13.04 lakh companies in the MCA repository, and not just 5.24 lakhs that filed, using the 85 percent share of the 5.24 lakh companies in the total PUC of all registered companies for deriving the blow-up factor, it must be the case that the companies out of the 13.04 lakh that did not file, namely, 7.8 lakhs, with only 15 percent share

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in the total PUC of all registered companies, must be, on an average, small with low values of PUC.[22]

However, as T.C.A. Anant, the chief statistician of India and secretary, MOSPI, said in an interview with Ishan Bakshi of *Business Standard* on April 4, 2016:

> Even with the MCA data you do not get reports of all active companies that are participating. So … you make an estimate for the ones whose accounts are as yet awaited. The practice in national accounts has been [to] make an estimate for the whole [of all participating companies]. So you blow up or make some adjustment for the whole. (Bakshi 2016)

While Dr Anant's arguments seem logical, there is a serious statistical problem in applying the procedure, and the blow-up factor such as the one used in estimating the population of a district, to the MCA data. In the case of choosing a village in the sample for estimating the district population, the choice is random and is made by the statistician, with the village authorities playing no role. On the other hand, whether a company files in time, or files at all, is the company's decision. The MCA data are reported by companies that are self-selected. Furthermore, the 3.08 lakh companies that were common to both 2012–13 and 2013–14 are also self-selected from those that filed in 2012–13 choosing to file also in 2013–14. Any blow-up factor that does not model self-selection, and appropriately allows for it, will lead to inconsistent and biased estimates, with unknown size and direction of bias. In particular, one cannot rule out the possibility that a company's decision to report or not might depend on the contents of the report were one to be submitted.

The implication of the self-selection of companies in the MCA 21 database is that ceteris paribus comparisons of the values of GDP and its components for 2011–12 in the new series—based on data from self-selected companies from MCA 21—with the corresponding values for the same year from the old series, would be vitiated by the self-selection bias of the new series. This is likely to be of particular relevance for comparisons of total GDP, its industrial composition, the relative shares in GDP of the household, and PCSs when such comparisons are made without adjusting for the self-selection bias of MCA 21-based estimates. Moreover, there is the fact

22. Press reports quoted the Revenue Secretary to the Government of India in April 2017 saying that "There are 15 lakh registered companies … as many as 8–9 lakh are not filing returns with the Corporate Affairs Ministry." See http://www.financialexpress.com/economy/8-9-lakh-registered-companies-not-filing-returns-says-hasmukh-adhia/646840/.

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that the composition of the household and PCSs are not the same in the old and new series—QCs have been shifted from the household sector in the old series to private corporations in the new series—so that there is a "non ceteris paribus" factor as well in the comparisons.

5.1.2. Measurement of Labor Input and Labor Income: Production Functions

For the unorganized manufacturing and service sectors,[23] which are part of the household sector of NAS, the new series uses the concept of an "effective LI" by defining it as a weighted sum of the LIs of owners, hired labor, and helpers, using as weights their marginal productivities in value added terms in the base year relative to that of hired labor. It is to be noted that by this definition, different categories of labor are perfect substitutes for each other in production, a rather restrictive and avoidable assumption. The weights of the labor categories are derived by estimating nested CD production functions for the base year for each of the relevant estimation categories/sectors.

As of May end 2017, the parameters of the estimated production functions, and in particular, the data used for non-LIs, such as capital and land, have not been released. Nor is there any information available on whether any robustness checks on the empirical results were done. However, an unnumbered slide in CSO (2015c) lists, for eight categories of non-financial service sectors, what it calls conversion factors for converting a unit of owner and helper labor into equivalent units of hired labor. These are the production function parameters. It turns out that except in education and other services, where more than one

23. The distinction between organized and unorganized sectors, though economically important, plays only a minor role in NAS. In the annual publication of NAS, the unorganized sector is explicitly mentioned only as contributing a part of industrial value added from unregistered manufacturing.

Conversations and exchanges at various fora organized by CSO with their officers, supplemented by CSO (2015b), suggest that:

In the old series, the unorganized sector consisted of the household sector (unorganized sector not maintaining accounts), unorganized enterprises maintaining accounts, and nonprofit institutions serving households (NPISHs). This was nothing but a residual, negative list of sectors not included in the public sector or the PCS.

In the new series, all unincorporated enterprises that do not maintain accounts and NPISHs are classified as part of the household sector. Unorganized enterprises maintaining accounts are classified as QCs and included in PCS.

As noted earlier, it appears that NSS consumption expenditure has been used extensively in the new series for deriving implicit prices (ex-farm price) and also to work out new ratios for use in estimating PFCE. Benchmark estimates for the household sector for the survey year are obtained from NSS surveys and are used to project relevant estimates for both enterprises maintaining accounts (QCs) and not maintaining accounts (household sector). The estimates for QCs are not published separately.

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unit of an owner's labor is equivalent to a unit of labor of a hired worker, in all the other 14 cases of activity by labor type, less than one unit of owner's or helper's labor is equivalent to that of a unit of labor of a hired worker. It is unclear whether production functions were estimated for compilation categories or sectors other than the eight sectors.

For some CCs, for example, trade and repair services, "where it was felt that the productivity of different categories of labor may not have a significant impact on GVA, especially in the unorganized segment, the labor input (LI) method was used" (CSO 2015b, 10). In this case, all workers were, in effect, deemed to be equally productive. Clearly, whether significant marginal productivity differences exist across categories of workers or not is an empirical issue, given technology, that is, the production function, and quantities of other inputs. This being the case, there is no reason why a production function was not estimated for all relevant CCs/sectors in the base year, letting the data determine whether or not significant productivity differences exist. Comparing the average VAPW in the old series, in which all workers were assumed to be equally productive, with the weighted average productivity of a workforce composed of workers with differing productivities without correcting for selection bias, is inappropriate.

The annexures 2.3.1–2.3.4 of CSO (2015b) list compiling categories by their method of LI measurement. The effective LIM is used in 34 categories of unincorporated manufacturing in 2.3.1 and 13 categories of unincorporated non-financial services in 2.3.3; a modified effective LI is used in 11 categories of unincorporated non-financial services in 2.3.4; and finally, a simple LI is used in 9 categories of unincorporated non-financial services in 2.3.2. For each of the 57 CCs, a production function could have been estimated, with the parameter values determining the weighting of the three categories of labor, instead of an ex ante specification of the LIM to be used, as in Annexures 2.3.1–2.3.4.

Beyond these problems, there are also technical issues relating to the particular production function used by CSO, and whether differences in the marginal productivities of different types of labor, while statistically significant in individual sectors, cancel out in the aggregate. Appendix 1 discusses these issues.

5.1.3. Measurement of Value Added at Current and Constant Prices: Choice of Price Indices and Deflation Procedures

For extrapolating value added in years succeeding the base year for each CC in the unorganized non-financial services sector, some indicators reflecting the current situation—such as sales tax revenue in the case

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of unorganized trade and service tax receipts for some services (CSO 2015c)—are used in the new series. Annex 2.5 of CSO (2015c) lists the indicators used for each of 37 CCs, with Annex 2.5.1, listing indicators for value added at current prices, and Annex 2.5.2 listing indicators for value added at constant prices.

The rationale for the choice of indicators is not set forth. For example, in the CC "Maintenance and repair of motor vehicles and motor cycles," the indicator listed in Annex 2.5.2 for extrapolating value added at constant prices is, plausibly, "Motor Vehicles Sales Growth." The corresponding indicator for extrapolating value added at current prices in Annex 2.5.1 is "Motor Vehicles Sales Growth × WPI." Thus, the index for extrapolating value added at constant prices is unaffected by choice of a price index for deflating the value added at current prices, such as WPI, which in turn has nothing to do with the repair and maintenance of motor vehicles and motor cycles, or for that matter any service.

The lack of rationale for the choice of price deflators is equally striking in the case of CCs 7–11 relating to "land transport of passengers and freight." The indicator for current price value added in Annexure 2.5.1 is "growth in registered vehicles × consumer price index (CPI) (transport and communication)." For constant price value added, the index is "growth in registered vehicles!" Again there is no reason to expect CPI (transport and communication) to have anything to do with value added in land transport of passengers and freight. Replacing CPI (transport and communication) with any arbitrary price index would change value added at current prices without affecting constant price value added.

Value added at constant prices of different sectors and in the aggregate are important indicators of real growth. Section 6 of CSO (2015b) is devoted to a summary of the estimation procedures for compilation of national accounts in the new series. Table 6.1, entitled "Gross Value Added (GVA) at Basic Prices," lists products and services in its rows by sectors. Columns 3 and 4 describe the method of estimation of GVA at current and constant prices. Again, it is evident that a multiplicity of price indices is being used without much of an explanation of the rationale of their choice. Defining and measuring real value added has attracted the attention of economists. Appendix 2 of this paper is devoted to a brief discussion of the issues. Other issues relating to price indexes, including the absence of a regular procedure for incorporating new goods as they come on the market, rather than waiting for the next base year revision to do so, are also discussed in Appendix 2.

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5.1.4. Institutional Sectors

In the new series, there are six "institutional" sectors comprising private sector financial and non-financial corporations, their two public sector counterparts, general government, and a heterogeneous sector misleadingly called the "household sector," which in effect consists of all CCs of the economy other than those included in the four corporate institutions and general government.

In the old series with base 2004–05, the "household sector" included what are called "QCs." In the new series, QCs have been included under private non-financial corporations. No evidence on changes in their structure and inherent characteristics warranting the shift is offered. It seems to have been done for no reason except that the corporate form of organization is emphasized in SNA 2008. Thus, the so-called "household sector" in the new NAS includes much more than conventional households consisting of individuals eating from the same kitchen. It includes entities such as NPISHs and privately owned partnerships and other noncorporate financial and non-financial entities. In fact, much of unorganized and unregistered manufacturing, including enterprises either with no employees other than its owner, or with the owner and an unpaid family member as employees, is now part of the household sector.

In my view, the statistical implications of the interdependence between the measurement errors and biases in estimating household incomes, consumption and investment, and in estimating corresponding statistics for the other five sectors have not been carefully analyzed. We refer to this issue, and to its treatment in CSO (2012), in Appendix 2. For example, investment in fixed capital assets such as equipment, etc., and in stocks in the aggregate and by public and PCSs is estimated by the commodity-flow method, while the funds available for financing the investment from domestic saving and net capital inflow from abroad are estimated by a flow-of-funds method. The CSO doctrine holds that the data on flow of funds are more reliable than the data on commodity flows, so that the discrepancy between the two is treated as statistical errors of omission, commission, and measurement. It is to be stressed that this is only a doctrine, albeit plausible. We are not aware of any study providing theoretical or empirical support for it.

Another aspect of the residual nature of the household sector is that its GCF is derived as the residual after subtracting from the aggregate GCF (estimated by the commodity-flow method) the directly estimated GCF of the public and PCSs. It is not only a part of the household sector's aggregate GCF by definition but is also a part of the sector's GDS: it is for this reason

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that it is called "direct household saving in the form of physical assets," which includes valuables.

Since no information is available to distribute the aggregate discrepancy, for example, between estimated GCF by the commodity-flow method and the funds from domestic and foreign saving available for financing it (as estimated by the flow-of-funds method), the assumptions one makes about the joint probability distribution of the aggregate discrepancy and its distribution among the five sectors implies a probability density of the discrepancy for the residual household sector. Interestingly, investment in "valuables" was shown in the table showing capital formation by asset categories for the old 2004–05 series but with no attribution as to which institutions financed the whole or part of it. In the new series, the investment in valuables is assumed to be done and financed by households. However, the saving and capital formation by all the six institutional sectors do not appear to be depicted in a consistent fashion to reflect this assumption in the consolidated investment and financing accounts of the country (Srinivasan 2014).

5.1.5. Private Final Consumption Expenditure: CES and NAS

An issue that has attracted attention from the late 1950s is the growing excess of NAS-based estimates of PFCE of households over that of the consumer expenditure surveys of the NSS. As mentioned earlier, the aggregate and commodity patterns of expenditure from the CES play only a limited role in the estimation of their corresponding values in the NAS. The volume edited by Angus Deaton and Valerie Kozel (2005) includes several papers going back to the late 1950s on the issue, in particular, the careful analysis and conclusion of Minhas ([1988] 2005). Minhas found that

> The independent data set (NAS), it would seem fair to conclude, is far short of the touchstone of quality expected of an independent validator dataset. A number of its components are based on such weak evidence and unverified assumptions as to seriously diminish its value in a cross validation exercise, On the other hand, the NSS estimates of expenditure on such minor vices such as tobacco and intoxicants, and consumer durables and modern consumer services are of doubtful reliability. Nevertheless, despite these difficulties, which have to be overcome in both data sets, an overwhelming proportion of household consumer expenditure data of the NSS and independent private consumption estimates of the NAS do get cross validation. (Minhas [1988] 2005, p. 91).

Deaton and Kozel, writing in 2005, concluded, and we agree with them more than a decade later, that

> [T]he Minhas paper should be compulsory reading for anyone concerned with the issue of national accounts, particularly anyone who does not understand the complexities and

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approximations involved in the construction of the former. Minhas' chapter lays out the issues that have dominated the contemporary debate, the differential definition and coverage of NAS and NSS consumption, differences in timing, and the heavy reliance in national accounting practice on various rates and ratios that link the observable but irrelevant quantities to relevant but unobservable ones. (2005, p. 5).

Indeed, our experience in the course of writing this paper suggests that difficulties in NAS and NSS datasets that Minhas cautioned that needed to be overcome still remain. In my view, overcoming them and generating data whose reliability would no longer be in doubt should have been of greater priority than the rush to incorporate SNA 2008.

5.1.6. Revalidation of the Industry Classification of Companies in MCA 21

Paragraph 23 and the Annexure to CSO (2016) mention changes in both levels and growth estimates of GVA that follow from the use of latest available data from various (unnamed) sources and the consequent revalidation of the classification of companies in the MCA 21 dataset. Since new data become available every year, the revalidation exercise has to be an ongoing process. Furthermore, companies that have filed annual returns for some time may choose not to file in some years and never come back or may come back after a lapse of time. It is not clear whether the filed statements give any clues to a company's decision to stop filing or to resume filing. It would be of great help if CSO would publish and show how relevant NAS estimates were extracted from the annual statements and the procedures followed for that purpose and in the revalidation exercise.

5.1.7. Conclusions

The substantial changes in the new NAS are basically two: the use of a new data source, namely, MCA 21, and the production function methodology for estimating LIs. In principle, both would have been indeed appropriate and sensible had they been done right. It is very unfortunate that CSO has not acknowledged that not strictly enforcing the mandatory filing of their annual balance sheets by companies would lead to a selection bias in the NAS of unknown size and direction. Abandoning the new series and returning to the old series, which by no means is free of problems, however, would be inappropriate. In my view, whatever legal remedies—along with incentives and punishments—are needed to achieve full compliance with the filing mandate should be adopted as soon as possible. In the meantime, statisticians in government and the private sector should acknowledge that the new NAS series suffers from biases and pursue the needed technical

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and statistical work for estimating NAS while correcting the estimates for possible selection bias.

5.2. Comments by R. Nagaraj

Professor Srinivasan's views on self-selection bias in the MCA database and the previously used RBI sample of companies are well known, and these have also been acknowledged by the 2001 National Statistical Commission.

It is hard to deny the problems of selection bias. But we are faced with a bigger problem of not even knowing the universe of working companies to draw a suitable sample. We have argued that in the absence of knowing the universe of working companies, the methods used by the new NAS to obtain estimates for the universe of companies in the new series have accentuated the problems already present in the old series rather than solving them. The solution adopted by the NAS revision seems worse than the disease, as discussed in Section 4.

The only way to take the debate forward and hopefully resolve it, as we have jointly recommended, is by making public the MCA data and the NAS methodology for using that data so that other users can independently verify the official estimates.

We have described in Section 2 how shifting QCs from the household sector in the old series to PCS in the new series, and assuming them to grow at the same rate as corporate firms, has affected the structure of GDP. In Section 4, we have explained how the methodological changes (and their shortcomings) could have affected size and growth rates of the PCS. For details we have referred to Nagaraj (2015d).

I agree with Professor Srinivasan that the legacy issues are very important. But they perhaps cannot explain the observed discrepancies in the growth rates, the changes with every revision even in the base year, and changes in the structure of GDP in the new series compared to the old series. These are the outcomes directly of the changed methodologies and databases used.

To say that the methodological changes are appropriate, but their implementation is wrong seems as correct as saying that "Indian planning was perfect but its implementation was wrong." I have questioned both the methodological changes introduced and their implementation, whereas Professor Srinivasan seems to focus only on the latter. Either way, the issues can be best resolved by a thorough and independent investigation of the entire process as well as by giving researchers full access to the MCA database.

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6. The Way Forward

The 2011–12 revision of the Indian national accounts has greatly altered the size and composition of domestic output in the following manner:

1. The absolute size of domestic output in the 2011–12 base year is smaller by 3.4 percent, compared to the old series.
2. Industry's share in GDP has expanded by about 5 percentage points, and the share of services or tertiary sector contracted proportionately, with the agriculture sector share remaining the same.
3. In terms of institutional composition, PCS' share has expanded by about 11 percentage points, and the household or unorganized sector's share has declined proportionately, with the public sector's share remaining the same.

If these compositional changes represented actual adjustments of the economy's sub-sectors without any change in methodology, then there would be no issue. However, these are apparently the result of changes made in the methodologies and databases used in preparing the new NAS. As many of the changes seem questionable, the compositional changes in domestic output in turn become questionable, and as a result the new NAS estimates have been contested widely.

Analytically, the new NAS conceives India, except for the household sector and general government, as a corporate economy with the dominant, unorganized sector sheltering most of the labor force, the bulk of whom are self-employed or unpaid family labor. In the old series, the economy was first divided into the organized and the unorganized sectors, and then the organized sector was divided into the public sector and the PCS. The new NAS has narrowed the distinction between the organized and the unorganized sectors; the primary distinction now is between the corporate and the noncorporate sectors, and the secondary distinction is between the financial and the non-financial sectors within each ownership category.

The methodological changes made in the new NAS are widespread, affecting the estimates for all sectors except the public sector and for agriculture and allied activities. This is so because the institutional composition of NAS has changed significantly, together with the methods of estimation and the databases used for the purpose. The institutional sectors have not changed, but their composition in terms of enterprises has.

The most significant change in the new NAS—as the CSO admits—is the direct estimation of the macroeconomic aggregates for the PCS using

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the statutory filing of financial returns by corporate firms. Previously, only the saving and investment of the PCS were estimated using the RBI sample of large firms (with high PUC), value added in PCS could only be indirectly obtained—and was not reported officially—as a residual within the organized sector.

The PCS is now expanded to include QCs (defined in SNA 2008 as "an unincorporated enterprise that has sufficient information to compile a complete set of accounts as if it were a separate corporation and whose de facto relationship to its owner is that of a corporation to its shareholders," having moved them from the unorganized sector. This expansion of the domain of the PCS and the use of the newer database has enlarged the share of PCS in GDP (with a corresponding contraction in the size of the unorganized and the household sector).

Another reason for the contraction of the unorganized sector is change in the methodology for estimating output per worker, which has been reduced sharply (under the view that the older series overestimated output per worker).

As this sectoral shuffling is analytically questionable, and the new methodologies are widely debated, the new macro aggregates have also become deeply contested. Furthermore, as the FRE (released in January 2016) have even altered the base year (2011–12) estimates, which, to the best of our knowledge and going by past practice, never change during the life of the series, they have cast further doubt on the veracity of the new NAS.

Our conclusions and suggestions for the way forward are as follows:

1. What has the new GDP series really accomplished? Our view is that the legacy issues remain, and a host of new problems have been added that may have rendered the new GDP estimates even more unreliable.
2. So what should be done? In our view:
   i. We need a statistical audit of the new NAS, drawing upon the best expertise from everywhere.
   ii. The principal problem centers around the use of the MCA 21 database. In our view, since the MCA data are based on the responses of self-selected companies (not the entire population mandated to respond), and, as is well known, uncorrected self-selection can lead to biased estimates of unknown magnitude and sign, efforts must be made to address this problem. Making the MCA 21 data public will allow independent experts to begin to find solutions and test them with peers and policy makers.

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iii. Other changes, such as the adoption of the move from factor cost to basic prices, and a new base year, are less controversial. But the CSO needs to make progress in other areas, such as improved price deflators and validation of its new procedure for extrapolating output of the unorganized sectors on the basis of the effective LIM.

We are all for updating the NAS to the latest global templates. However, their adoption for a specific country must be made to reflect the country's context and its experience.

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Appendix 1. Some Technical Issues Relating to Production Functions for Estimating Value Added

CSO (2015b) points out that:

[I]n the Labour Input Method (LI Method), as was being used in earlier series, while compiling Gross Value Added Per Worker (GVAPWI) from the Enterprise Survey, it is assumed that there is equal contribution from all categories of workers engaged in an

economic activity, i.e. the productivity of an employer, a casual wage worker, or a family worker is equal. The new method addresses differential labour productivity by assigning weights to the different categories of workers engaged in an economic activity based on their productivity. The weights were compiled using data on establishments covered in the NSS 67th Round on Unincorporated Enterprises (ES). A nested Cobb–Douglas Function has been used for computing the weights for different categories of workers. (Para 2.18)

Thus, the total LI in person days is a weighted average of the person days of LIs of the three types, with the weight of a person day of labor of each type expressed in equivalent person days of hired labor. It should be noted that instead of treating different categories of labor as different inputs, CSO is assuming that they are perfect substitutes for each other so that total LI is a weighted sum of the inputs of different categories of labor.

The production function in natural logarithms estimated by CSO is:

$$Log\,Y = Log\,A + \beta\,Log\,K + \alpha\,Log\left[L_2 + \delta_1 L_1 + \delta_2 L_3\right] + \gamma S + \varepsilon \qquad \text{(I)}$$

Where

Y is GVA
K is the capital input
L_1 is the LI of owner (in person days per year)
L_2 is the LI of hired worker (formal and informal, in person days per year)
L_3 is the LI of helper (in person days per year)
S is a dummy variable with rural = 0, urban = 1
ε is the random error term

There are many implicit assumptions in this formulation of the production function. First, value added by assumption is the difference between the value of goods and services produced by an enterprise—valued at the "prices they fetch" in the market (the enterprise is assumed to be a price taker in the markets for all goods and services it produces and sells)—and the value of non-primary factor inputs (that is, intermediate or material inputs it uses in production)—again valued at the "prices it pays" for them (the enterprise is assumed to be a price taker in its markets for factor and nonfactor inputs). Since the production function is being estimated over several periods, the question arises whether GVA is being computed at current or constant prices. Also, since GVA is the difference between the value of outputs and the value of material inputs, if it is to be computed at constant prices should the difference be deflated by the single price index, or should the value of outputs be deflated by an output price index and value

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of material inputs by an input price index? We discuss the price deflation issues in Appendix 2, assuming here that Y is the real value added obtained through some deflation procedure.

Unlike a commodity or service for which there is a natural unit of measurement and an associated price per unit there is no natural unit of measurement with an associated price per unit for value added. In a classic paper, entitled "Measurement of Real Value Added," Kenneth Arrow (1974) addressed this issue in the context of an enterprise with a single output X which was produced with a vector F of n primary factors as well as a vector M of m material inputs using a production function

$$G(F, M) = G(F_1, F_2, F_n, M_1, M_2, M_m) \tag{1}$$

Arrow's analysis, which we reproduce here, proceeded under the assumptions that G is homogeneous of degree (that is, the technology of production has constant returns to scale) and is separable in primary factors and material inputs, so that it can be written as

$$G = H\left[J\left(F_1.....F_n\right), N\left(M_1.....M_m\right)\right] \tag{2}$$

Where without loss of generality G, H, and N can be chosen to be homogenous of degree 1.

In (2), J can be interpreted as a value added production function in primary factors and given that it is homogeneous of degree 1, its unit isoquant describes the technology of production function in full.

$$[(F_1.....F_n) \geq 0 \mid (\mathrm{H}(F_1.....F_n) \equiv 1)] \tag{3}$$

Similarly, N can be interpreted as a production function for an aggregator of intermediate inputs. Once again given that N is homogeneous of degree 1, its unit isoquant describes the technology of aggregation of intermediate inputs in full.

$$[(M_1.....M_m) \geq 0 \mid (\mathrm{N}(M_1.....M_m) \equiv 1)] \tag{4}$$

So far we have been discussing purely technological aspects. Bringing in economics, and using output as the numeraire for measuring prices (so that its price per unit of output $P^x \equiv 1$). Let the unit primary factor prices be

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P_1^F ..... P_n^F and the unit material input prices be P_1^M ..... P_n^M, then the cost of producing a unit of output X will be

$$= \sum_{i=1}^{n} P_i^F F_i + \sum_{j=1}^{m} P_j^M M_j \tag{5}$$

$$\text{Subject to } H\left[J\left(F_1.....F_n\right), N\left(M_1.....M_m\right)\right] \geq 1 \tag{6}$$

Assuming J and N to be quasi-concave, the first-order conditions for minimization of unit cost (5) will be

$$\frac{\delta H}{\delta J}\frac{\delta J}{\delta F_i} \geq P_i^F \text{ with equality if } F_i > 0, \ \forall i \tag{7}$$

$$\frac{\delta H}{\delta N}\frac{\delta M}{\delta M_j} \geq P_j^M \text{ with equality if } M_j > 0, \ \forall j \tag{8}$$

where in the left-hand side of (7) we denote the product of the partial derivative of H with respect to its argument J and the partial derivative of J with respect to its i^{th} argument F_i. Analogously the left-hand side of (8) we denote the product of the partial derivative of H with respect to its argument N and the partial derivative of N with respect to its j^{th} argument M_j.

Multiplying by F_i both sides of (6) for each I and each sides of (7) by M_j for each j and noting that J and N are homogeneous of degree 1 we get

$$J\left(F_1.....F_n\right) = \sum P \frac{F}{i}\frac{\delta J}{\delta F_i} \tag{9}$$

$$N\left(M_1.....M_n\right) = \sum P \frac{M}{j}\frac{\delta N}{\delta M_j} \tag{10}$$

$$\text{and } \frac{dH}{dJ}J + \frac{dH}{dN}N = H\left(J,N\right) = 1 \tag{11}$$

We can interpret (9)–(11) as follows: At the unit cost minimizing levels of F_i^* and M_j^*, the "quantity" of real value added produced is $J(F_1^*, \ldots F_n^*)$

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and its "price" per unit is $\frac{\delta H}{\delta J}$ at (F_1^*, … F_n^*, M_1^*, … M_m^*), and the quantity of aggregate intermediate inputs is $N(M_1^*, ... M_m^*)$ and its price is $\frac{\delta H}{\delta J}$ at (F_1^*, … F_n^*, M_1^*, … M_m^*). Equation (11) says that just 1 unit of output and no more is being produced, that (6) is an equality, which is an implication of the efficiency of input use in production.

These results could be generalized to homothetic production functions, etc. Also one could consider enterprises producing more than one output by viewing X not as a scalar measure of the physical output of a single good or service, but as a vector (X_1, ... X_q) of physical outputs of Q goods and services. As long as the appropriately defined production possibility set is convex, most of the above results will hold. We will not pursue this here.

Coming back to the new series, the nested CD production function can be formally viewed as a special case of Arrow's more general formulation above. It starts with an estimate of value added Y for a sector as the difference between value of output and the value of material inputs M at basic prices and expresses it as a multiplicative function of a function of primary factors of capital and three types of labor, a sectoral dummy, and a random measurement error term. Thus, taking analogs of (I), this function is

$$AK^{\beta}\left[L_2 + \delta_1 L_1 + \delta_2 L_3\right]^{\alpha} S^{\alpha} e^{\varepsilon}$$

One can understand the choice of the CD functional form for the production function for estimating value added from the perspective of computational convenience—for example—that the observed share of wages in the cost of output under pure competition would equal the exponent of labor in the CD function, etc. However, given CSO's presumed access to up-to-date computation methods and software, there is no reason for the CSO not to estimate other production functions to check whether they explain the data better.

At the very least, CSO could have estimated the Constant Elasticity of Substitution (CES) Production functions, originally worked out in the doctoral thesis at Stanford of the late B. S. Minhas of the Indian Statistical Institute and a former member of the Planning Commission. The CD function with its elasticity substitution equaling 1 is a special case of the CES function, which allows an elasticity from 0 (corresponding to a fixed coefficient, that is, a Leontief production function with L-shaped isoquants) to infinity (perfect substitution, with linear isoquants). Moreover, instead of linearly aggregating the three types of labor by weighting them by their marginal productivity, in estimating CES there would have been no need to

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aggregate at all by treating the types of labor, along with capital as producing real value added through a CES production function.

In our specification of a separable production function for a single output through $H(J, N)$, each of the aggregates of value added J and of material inputs M could be modeled as CES aggregates, with H itself being a CES function of J and M. The generalization to several final outputs could be accomplished by viewing the enterprise's technology as one that enables it to produce a CES index of several final outputs from primary factors and material inputs.

Appendix 2: Price Deflators

In any national income system, the evaluation of aggregates such as GVA, GDP, GCF, private and government final consumption expenditure, and gross national income at current and constant prices, and their components and offshoots, is an important task. By definition, the constant price or "real" version of any aggregate is its version at current prices deflated by some price deflator or price index. It is, therefore, important to assess how the price indexes are put together, their strengths and weaknesses, and their ongoing improvements. Furthermore, inflation, and policies to keep it from becoming sustained and excessive, requires an appropriate index for measuring inflation. Srinivasan (2008a, 2008b) discusses many aspects of price indices available as of 2008. Kumar and Boopathy (2013) update the factual details in the Srinivasan paper. We would like to emphasize a few issues here.

First, GVA at current basic prices is the difference between the value of aggregate gross output of goods and services and the value of intermediate or material inputs used in production. In general, there is no physical unit and price for value added, so how does one deflate GVA at current prices? Do we deflate with a single deflator for GVA or use at least two deflators, deflating the value of gross output by an output price deflator and the value of material inputs by an input price deflator, with the resulting difference between the two deflated values as Real GVA? Christopher Sims (1969) has provided a theoretical justification for double deflation.

However, in practice, CSO mostly uses single deflator, except for few sectors. The latest NAS manual published in 2012 on sources and methods of NAS applies to the old series with base 2004–05 (CSO 2012). In its Chapter 3 on net factor income from the rest of the world, it says "estimates at constant (2004–05) prices have been prepared using single deflation method by

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adopting(sic) implicit price deflators of service sector on the current price estimate of net factor income from abroad" (CSO 2012, para 3.5). However, for the agricultural sector Chapter 9, para 9.68 says, "For estimation of value added at constant prices, the double deflation method is used…."

A single deflator for value added has to balance its role as a deflator for the current price value of gross output and its role as a deflator for the current price value of material/intermediate inputs. CSO (2015b) unfortunately does not even attempt to explain its particular choice of single deflators in the new series.

Turning to price indices, there have been many improvements in the compilation and dissemination of price indices since Srinivasan (2008a). The numbers of villages and towns from which price quotes are collected have increased substantially. Commodity coverage has increased as well. However, two important issues relating to the wholesale price index (WPI) have not been addressed yet: to introduce services into the index and to convert WPI, which is neither a producer price index (PPI), nor a CPI, into a proper PPI. Both these issues were especially emphasized on the terms of reference of the Abhijit Sen Committee, established in 2003, that prepared the shift of the base year of WPI from 1993–94 to 2004–05. The committee submitted its report in 2008, and the base year change was implemented from April 2010. But the committee left the two issues to be addressed the next time the WPI was revised (Ministry of Industry [MOI] 2010).

The news about the CPI is better. The base year of the National Rural, Urban, and Combined CPI, for example, was changed to 2012=100 from its prior base of 2010, along with other improvements, according to the May 12, 2016 press release from CSO/MOSPI (CSO 2016a).

Srinivasan (2008a, 2008b), taking his cue from the report of the Boskin Commission in the United States, argued that by not incorporating the availability of new goods and improvements in the quality of existing goods in a systematic and analytically appropriate way, we could be overstating estimated inflation rates. In India, while new goods and new versions of existing goods do enter the price indices during a base year change, there is no systematic procedure for the introduction of new goods and new versions of existing goods as they become available.

The approach of Divisia in putting together continuous, time differentiable price and quantity indices, their use in the measurement of value added and total factor productivity, and its growth is worth exploring, but is not discussed here for the sake of brevity. Diewert and Nakamura (2002, 2003) discuss it in detail.

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Comments and Discussion*

B. N. Goldar
Institute of Economic Growth

I think I should begin by saying that in my comments I shall try to highlight some of the issues raised in the paper, and I shall offer some suggestions on how the paper can be improved.

The paper contains a comprehensive discussion on the methodology of the new national accounts series, pointing out several weaknesses of the methodology and accordingly making recommendations. This is a valuable and welcome contribution to the literature. What are the main conclusions of the paper? On the question whether it is really worthwhile pursing the new national accounts series, as it is at present, the authors say no. They point out a number of changes that are needed, and take the position that methodological changes should be made after a statistical audit. The paper suggests that the principal problem lies in the use of the MCA data.

Why is there a problem with the MCA 21 data? The paper holds that there is an estimation problem caused by a process of self-selection: many more well-performing companies are likely to be reporting than poorly performing ones. There are people who feel that the use of MCA 21 data is a major step forward for the new national accounts series, but the authors suggest that this is its worst feature. In my view, the paper should have given greater attention to what needs to be done rather than merely finding fault. As an academic paper, a more balanced view, had it been taken, would have also highlighted the improvements made in the new series.

This leads me to ask, can the criticism in the paper be made more useful and insightful? I feel there are places in the paper where this could have been done. Consider, for example, the case of trade. The growth rate in gross value added (GVA) in trade, repairs, hotels, and restaurants in the new series was 11 percent in 2012, as against 4 percent in the earlier series.

* To preserve the sense of the discussions at the India Policy Forum (IPF), these discussants' comments reflect the views expressed at the IPF and do not necessarily take into account revisions to the conference version of the paper in response to these and other comments in preparing the final, revised version published in this volume. The original conference version of the paper is available at www.ncaer.org.

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For 2013, the growth rate was 7.2 percent, as against 1 percent earlier. So, clearly the growth rate in GVA in trade in the new series is quite high as compared to the earlier series.

Trade in India is mostly in the unorganized sector. Therefore, what is happening is that there is a benchmark estimate of value added in the base year that is being grown over time. In the new series, sales tax revenue is being used for this benchmarking purpose. The paper could have examined and contrasted the indicator used earlier with sale tax revenue that is being used now to grow the base year value added estimate. The question is: Is the new indicator better or worse than what was being used earlier? In my opinion, it is probably better, but this is a topic that the paper could have very usefully discussed. Is the high growth rate of GVA in trade that we are finding in the new series caused essentially by the change in the indicator? If so, it would have been very useful for the paper to have examined the indicator in depth and highlighted the limitations of using it.

At several places in the paper, the comment has been made that the size of the unorganized sector has gone down in the new national accounts as compared to the earlier series, but there is really no basis for saying so. Actually, with the data available, nobody can say if the size of the unorganized sector has declined in the new series. There are no publicly available data to meaningfully compare GVA of the unorganized sector in the new series with that in the old series. Let us look at this example of the estimate of GVA in unorganized manufacturing for 2011.

As also reported in the paper, the 2011–12 GVA estimate for manufacturing in the old series for the registered portion, which is organized, was ₹886 thousand crore (₹8.86 trillion), whereas for the unorganized portion it was ₹351 thousand crore (₹3.51 trillion). The classification changed in the new series. Now, it is ₹1,089 thousand crore (₹10.89 trillion) for the corporate sector and ₹180 thousand crore (₹1.8 trillion) for the household sector. Out of the unorganized manufacturing sector, units that maintain accounts, referred to as quasi-corporations, have been shifted out to the corporate sector. The remaining unorganized manufacturing is the household manufacturing sector. Hence, if one compares the figures, 351 and 180, and infers that the estimate of GVA in unorganized manufacturing has gone down in the new series, that is incorrect. To get a comparable estimate, we have to split the GVA of the quasi-corporate segment of manufacturing into both organized sector enterprises and unorganized sector enterprises. In order to have comparable numbers, we have to get the GVA of the unorganized component of the quasi-corporate sector and add that to the GVA

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of the household sector of manufacturing. However, this computation can be done only by the National Accounts Division of the CSO since academic researchers do not have access to the required data.

There is a need to recognize that there were certain problems in the earlier national accounts series, which have now been addressed. One problem with the 2004–05 series was that the use of the Index of Industrial Production (IIP) for computing growth in manufacturing GDP had often caused an under-estimation for the most current year, which used to get corrected a year or so later when Annual Survey of Industries data become available. The paper notes that for 2013, the growth rate in manufacturing GVA was negative in the earlier series and became positive 6 percent in the new series. Why did this happen? When the growth rate was initially computed, for example, for 2011, it was based on the IIP and was 2.7 percent. However, when the more reliable ASI data became available, manufacturing GVA was revised upward to 7.4 percent. Similarly, for 2013, the growth rate in manufacturing on the basis of the IIP went up from a negative rate to positive 6 percent when more reliable ASI data become available. The initial under-estimation of manufacturing GVA growth and the correction later has been a persistent problem in the previous national accounts series, which has now been solved. I thought this improvement might have got greater recognition in the paper.

The MCA 21 database has come under a lot of criticism in the paper, which considers this to be the biggest problem in the new national accounts series. The use of the MCA database really is a major change. Earlier, the estimates for GVA for services were being made from a small sample, maybe 1,000 companies or 1,500 companies. Now the estimate of the services sector GVA is being made from maybe 300,000 companies, that is, the number of companies being considered is huge. Let me explain the problem as perceived by the authors. The problem is that at present, a blow-up factor is being used based on paid-up capital. There are companies for which we have data, while there are other companies which are known to be active but for which we do not have the data. Therefore, a blow-up factor is being used to get an estimate of GVA for the active companies for which we do not have data. The authors have suggested the use of some sort of modeling for correcting the self-selection process. This is a valid point. The fact that there is self-selection means that the blow-up factor is not correct. The important question is how the modeling is to be done. One suggestion is to utilize income tax data. It is a useful suggestion, but is there a statistical method by which the correction for self-selection can be done?

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I feel that the problem relating to the MCA data has been somewhat exaggerated. How serious is the problem? If we assume that in the current MCA data the companies that are reporting account for 85 percent of the GVA of all active companies, then most of the GVA is actually being covered. As regards the issue of using a blow-up factor of 1.15, one can argue that there are companies which are not reporting, and the reason for this is that they are not performing well. So, this blow-up factor should not be 1.15, but lower. At worst, what should it be? Suppose companies that are not reporting have zero GVA, then the blow up factor should be equal to one. But if we assume that some companies with positive GVA are also not reporting, then may be a blow-up factor of 1.1 or 1.08 should be used.

The question is: Will that make such a big difference to the GVA numbers, and the bigger issue is, why should that affect the growth rate, if the blow-up factor is not 1.15 but 1.08? Suppose it is 1.08 in year 1, 1.08 in year 2, and 1.09 in year 3. This can affect the level of the GVA estimate, but how can it affect the growth rate? This is a real issue because most of the criticism of the new National Accounts series stems from the relatively higher growth rate being reported in the new series. But, why should the use of the blow-up factor cause a high growth rate and, in fact, why should it affect the growth rate at all? A related question the paper should discuss is: Why should the self-selection process in the MCA data always lead to an overestimation of the growth rate?

One important difference that has emerged in the new series is a shift from the establishment concept to the enterprise concept. Earlier, the manufacturing GVA estimate was based on establishment level data, and now the manufacturing GVA estimate is based on enterprise level data. The current method of computing GVA in manufacturing, which is based on company data, also needs to take into account the fact that a manufacturing enterprise may also have establishments providing services. This point has been noted by the CSO. Trade carried out by manufacturing companies, which has now become a part of manufacturing GVA, was earlier covered under trade. That is the reason why the relative share of manufacturing in the national accounts has gone up in the new series, because now a part of the services activity is also getting counted under manufacturing.

Most of the discussion in the paper concerns the years up to 2014–15. But, if we look at 2015–16, we find that the manufacturing growth rate, which was earlier about 5 to 6 percent, suddenly jumped to 9 percent. Is that possible? If we look at IIP growth, then the jump in the manufacturing growth rate does not seem credible. But, what about credit growth? This aspect has been discussed in the paper. If we study real credit growth, that

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is, credit flow deflated by the wholesale price index excluding crude oil and petroleum products, we find that in 2015–16 credit growth suddenly went up. One can then argue that as the credit growth rate was high, the industrial growth rate should also have been high, since it is commonly held that credit growth and industrial growth are connected.

Finally, there are two points regarding the estimation of the production function for estimating marginal products of different categories of workers in the unorganized sector. The authors have suggested that the nested Constant Elasticity of Substitution (CES) function should be used instead of the nested Cobb–Douglas function. This will, however, be difficult to estimate, as it will involve a nonlinear combination of many parameters. This does not mean that it cannot be done, but perhaps it could be done for checking the robustness of the estimates obtained by using the nested Cobb–Douglas function. The second suggestion in the paper is to deflate value added and capital for estimation of the production function. But, when regressions are being done separately for each National Sample Survey (NSS) round, why would we have to deflate? It is not clear to me that deflation is necessary here.

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When I got the paper, I was really quite excited. I thought I would learn something new. A lot of what is in the paper is of course known. T. N. Srinivasan has been saying for quite some time that the long-standing legacy issues must be addressed, and they really have been around, no question about that.

The real issue that I feel should exercise us is: How do we look at the national income accounts? Do we look at them as a statistical product, or do we look at them, as the nomenclature suggests, as a system of accounts? If it is the latter, then you really need to start from where all accounting starts, which is that there are well-established conventions and procedures that are laid down and agreed to, so that there is a commonality of approach. That is precisely what the national accounts are. The national accounts, in terms of the economics of a nation, have been pretty well known for a long time, but they are today a codified document, and it is the UN System of National Accounts (SNA) that lays down not merely the principles underlying the accounts but also the procedures with which these accounts are to be calculated under various scenarios.

All countries that are signatories are expected to follow the SNA. Now, the question was raised, why are we jumping to SNA 2008? The short answer is: we are not. Today, if you look around the world, there are three SNAs that coexist. You have the 1968 SNA, the 1993 SNA, and the 2008 SNA. Around 60–65 percent of countries continue to be in the 1960s, they did not or could not move to the 1993. Most other countries, with the exception of a handful of developed countries, are at 1993 and incidentally so are we. Not only are we at the 1993 SNA, but of the 1993 SNA we have actually incorporated only about 75 percent of the recommendations. We still have not been able to incorporate 25 percent of the 1993 SNA recommendations simply because we do not have the data. The biggest chunk of what is missing is that we do not have the ability to produce a balance sheet of the country. So, what we produce, in terms of the sequence of accounts, is essentially what in accounting would be called the profit and loss account. So, where does the SNA 2008 come in? Where the SNA 2008 does come in is in a few recommendations that change definitions, and nothing more than that, and these as signatories we are all expected to do.

Given that this is an accounting framework driven by conventions, what does it mean to say that the national accounts should be audited? The question is, audited by whom? Audited by statisticians or audited by national accounts experts? If it is the latter, because we are talking about conventions, then they have already been audited. The Central Statistics Office (CSO) has a central team which has audited and found the accounts to be consistent with the approved principles and procedures. The IMF has come in and has given the accounts a clean bill of health, end of the matter. They are the custodians of the accounting standards, and we have all agreed to that. Now, there can be and are differences of opinion, and that is something I will come to, and something that would have been useful for the paper to have talked about, because in my opinion that is where the fundamental issues are.

Where are really the problems? There has been a lot of talk about GDP shares shifting around, growth rates shifting around. All that is fine, if that is what the data is saying, that is what you get. But what is in the data that is really different has been discussed briefly in the paper, too briefly, and even then it really does not touch upon the fundamentals. The real issue is the following. What this particular revision of the national accounts has done is that it has moved a whole bunch of sectors from following a physical output approach to measurement to a value approach. Think of the Annual Survey of Industries (ASI). The ASI is one of the most comprehensive datasets. You can not only directly measure value added from that, but you can also measure the volume of output. The Ministry of Corporate Affairs (MCA)

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database, on the other hand, is pure values—there is nothing physical anywhere in the MCA database.

We talked about trade. Earlier, the way we were measuring the growth of the trade sector was to use the output of traded goods, not services, but traded goods. Now we are measuring it by the sales tax, which is a value added tax, so again we are measuring values.

The real question that we need to ask is: If we are shifting from measuring physical output to measuring values, how should we do the deflation, and are we doing it appropriately? The short answer is: No, we are not doing it appropriately. But the longer answer is that we are not sure about the type of deflation we should do. There is talk in the paper about single deflation and double deflation. But this raises the question, and this is an issue that the IMF also brought up in their audit of the revised series, whether we are clear about what the two approaches mean. Think of what we do, and we have been doing since the accounts began—I am surprised Professor Srinivasan did not point this out as a legacy issue—we have been doing single deflation all along, and we continue to do so. The question to ask is: While doing single deflation for the new series, are we making matters worse than they were before? There is actually a very strong case to be made for saying yes, we may be making matters worse. Earlier, at least for a whole bunch of sectors, we had physical indicators, and today when we have moved to values, a wrong deflation approach is making matters worse. That is a legitimate criticism. But as economists, we really need to ask ourselves what double deflation means. This is something I have been searching for in the literature. And I have never found a suitable explanation.

But think of it in the following manner. As the paper rightly says, there are three ways to measure GDP: the production approach, the income approach, and the expenditure approach. Presumably, we should use different deflators for each approach. Or, should we not? At the end of the day, it is the funds flow that matters. These three approaches should equate in nominal terms, then what do we mean by real income? As a consumer or as a spender, real income means what it buys for me in terms of consumer goods or investment goods. But, for a producer, what does double deflation mean? Mechanically, I take the product price and deflate the output value, and I take the input price and deflate the input values, and whatever I get as a residual, I say it is real value added. But when I say real, what is that animal? Why should it necessarily equal real GDP measured from the expenditure side?

Unless as economists we are very clear about how we should deflate nominal values, we will be tying ourselves into knots. The paper does ask this question, and it is, I think, the appropriate question to ask in the Indian

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context, where, as in most countries of the world, the dominant approach to measuring GDP has been the production approach. Both the income approach (which is irrelevant for India since we do not measure incomes directly) and the expenditure approach have straightforward deflators for arriving at real income. So, when we think about the issue of deflation and what we mean by real GDP, we have to think about appropriate deflators for the production approach. Asking this question, however, raises a whole bunch of even more fundamental questions, which I had hoped the paper would go into, but did not.

General Discussion

Rohini Somanathan said she found the discussion very useful and hoped that at least in manufacturing it may be possible through iteration to eventually resolve the two datasets. She suggested that it may be possible to match the MCA 21 returns of firms with their Annual Survey of Industries (ASI) data, which has been available at the plant level for a long time without identifiers and which the firms may also be willing to provide. If we can have access to both sets of data, we could iteratively match firms up until we got a reasonable fit, and this would then help resolve the differences between the two datasets and what they were telling us about manufacturing growth. She noted that the National Accounts Statistics (NAS) is both a system of accounts and a powerful tool to measure growth and change in the structure of the economy, and there was a strong need to understand why the same manufacturing sector appeared to be behaving in very different ways as measured by the old NAS series and the new one.

Surjit Bhalla suggested that it would be very useful for this paper, or a new paper, to document and analyze the academic criticism of the new NAS series, as distinguished from the critiques of investment bankers or the media. Second, Bhalla suggested that base revisions in GDP series do result in anomalies, and we should not get too exercised about few percentage point differences. He recalled that previous base revisions had also thrown up differences between the old and the new series, differences possibly much bigger than what the current revision was showing. He particularly recalled the base revision of 1993–94 where the change may have been as much as 25 percent. Third, Bhalla noted the genuine improvements in things like measuring wholesale and retail trade, which has moved from an archaic approach to one based on the analysis of sales tax data. He maintained that 75 percent of GDP remains unchanged between the old and the new series,

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with only wholesale and retail trade and manufacturing doing a switch in terms of shares. On the faster GDP growth shown by the new series, he agreed with Goldar's comments on how rapid "real" credit growth during this period could very well explain the acceleration.

T. N. Srinivasan noted that the Rangarajan Committee had recommended CSO's doing an integrated household survey including measuring consumption, saving, and productive investment. This has not yet been done on a full NSS round. Another important task for CSO to do was to put together a credible list of firms and enterprises based on the Economic Census, a follow-up enterprise survey from which to draw samples. This has also not been done. He felt that these were fundamental issues that need addressing, but instead the CSO has made some marginal changes that should have had lower priority.

R. Nagaraj, referring to their paper, pointed to the discussion of credit growth as a ratio of GDP and showing it to be flat or declining, and not growing. He agreed with Rohini Somanathan's suggestion to map the MCA 21 data on to the ASI data over the past few years to understand what was going on. He noted the problems with the IIP data, which had not been updated since 2004–05 as the base year. After revision, IIP and ASI move together in unison for 4 to 5 years, and then the IIP base becomes out of date and they start diverging. He finally turned to the fragilities of the MCA data. Even the data for the companies which were reporting had problems, and it would appear that CSO had not done the preparatory work required to make the data fully useable.

Vijay Joshi pointed out that as a consumer of the data what was troubling was that the rapid GDP growth suggested by the new series was not matching up with other high frequency data. How does one explain a vigorously growing economy at 7 percent per year and a negative growth rate of non-oil imports?

Sudipto Mundle also found the discussion very useful, but was also troubled by how polarized it was. This made it difficult to figure out a way forward out of the controversy around the new GDP series. To the authors, he asked the question of why growth rates should be affected so much even if we assume all the problems with the new series that have been highlighted are present, since they would affect both the base year and a measurement year. From Goldar and Sen, the discussants, he wanted to know if it would be possible to get the back numbers for the new series so that the comparisons between the old and the new series could be gone into greater detail. This would help greatly in reducing the apprehensions around the new series, particularly the disconnect with the high frequency economic data

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that Vijay Joshi had also referred to. Finally, Mundle wanted to know if the sharp divergence between WPI inflation, which had fallen dramatically as of July 2017 and had actually turned negative, and CPI inflation, which was higher and had continued to remain positive, meant that the share of domestic trade was going up sharply in recent years.

T. N. Srinivasan noted that their paper did deal with the divergence between WPI and CPI, and he was himself concerned about the impact of this divergence on the GDP deflator. He felt that issues such as this deserved much more attention than simply introducing the MCA 21 database. R. Nagaraj noted that with the number of companies submitting data in the MCA database jumping around from year to year, the blow-up factor also had to change from year to year. So the levels would be differentially affected from year to year, and it is not as simple as saying that even if there are errors in calculating levels, those errors would apply to all years and hence growth would not be affected. Growth will be affected if the methodology is affecting levels differently in different years. He also supported the concern voiced by Vijay Joshi about the disconnect between the faster growth shown by the new series and other data such as the import numbers.

Bishwanath Goldar acknowledged that the point made in the paper emphasizing the need to address the problem of self-selection in the MCA database was very appropriate. But he said that it was not clear what econometric technique should be deployed to obtain the adjustment for self-selection bias. He also felt that ultimately any adjustment would manifest itself in a smaller or larger blow-up factor, and the adjustment would be unlikely to fluctuate much from year to year and would not, therefore, make a big difference on growth. Similarly, even assuming that the MCA database had a lot of errors, it was difficult to believe that these errors would consistently only push up the growth rate every year, as seems to have happened with the GDP growth higher for four years under the new series. What is instead more credible is that there has been genuine growth. The other point he noted was that not all manufacturing firms were registered under the ASI. However, it is very likely that these firms would be covered by the Companies Act and would therefore have data in the MCA database. So there are problems with the ASI numbers as well, and it would not be fair to say that ASI was always more accurate and represented the real picture, and MCA 21 did not. Both have problems.

Pronab Sen responded to the concern expressed by Vijay Joshi about how to square the higher growth numbers with other macro-data that were not showing the same vibrancy. He noted that the ASI data consistently showed that for the longest time in Indian manufacturing the ratio of gross

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value added (GVA) to the gross value of output was stagnating at around 16 percent up to about 2004. Thereafter, during 2004–11, it went up marginally from 16 to just over 18 percent, and between 2011–12 and 2014–15, it went up further from 18 to 22.5 percent. The overall measure of value added in the economy is arrived at by multiplying this ratio by the gross value of output. This particular ratio going up by roughly 5 percentage points a year over the last 3 to 4 years, and with manufacturing growth hanging at around 7.5 to 8 percent, suggests that manufacturing turnover is growing at about 2 to 2.5 percent. Imports are really related to the volume of output and not necessarily value added. So value added is going up much faster than the gross value of output. A similar situation had also occurred during 1998–2002, after which the ratio had stabilized. He suggested that economists need to analyze why this measure of production efficiency has improved dramatically in the last four years, which would then also explain why the growth of value added appears to be faster than some of the other macro-variables.

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