Some areas of concern about

Indian Manufacturing Sector GDP estimation

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Abstract

In this paper we discuss some of the methodological issues involved in the computation of value addition in the manufacturing sector. We deal with (i) problems of blow-up of estimates (ii) choice of indicators in measuring output and (iii) a possible misclassification of companies in the MCA21 database that can distort the GVA estimates. A sample based blow-up exercise shows that Paid-Up Capital and GVA contribution of firms have no one-to-one correspondence and the method can lead to overestimation of value addition. We construct an alternate method of blow-up by using representative industry GVA growth rates to scale up previous GVA estimates to account for data of unavailable companies. We show that a potential misclassification of companies in the MCA21 can also lead to significant distortion in GVA estimates.

Keywords: Value addition, Manufacturing, National accounts, India

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1 Introduction

The new series of national accounts with base year 2011-12 was introduced in January, 2015. In comparison to previous base year releases of the national accounts, the 2011-12 series was seen as an advancement in areas of methodology and data sources. Major changes in definitions were incorporated to align our national accounts with international standards recommended by the System of National Accounts (SNA) 2008. In particular, new methods of presenting macro aggregates, such as GVA at Basic Prices, use of updated data sources, reallocation of components within the sub-sectors, among others were some of the key highlights of the new series.

Despite the comprehensive changes in the 2011-12 series, the release of new series was a subject matter of several public and academic debates. Methodological changes and revised figures of macro aggregates puzzled several stakeholders as the picture of the economy presented by the official figures was not in tune with the expectations of the industry or analysts. In general, the new series also drew more attention because in the past, base year revisions did not lead to major changes in sectoral shares or growth rates. This feature was because the source and methods of computing value addition largely remained unchanged. However, in the case of the new series, a base year change was accompanied by changes in both sources and methods of computation.

In the backdrop of the new sources and methods, the 2011-12 series has thrown up several questions and concerns. The revised figures of growth rates of overall GDP and sub-sectors have also been controversial as sharp upwards movements in growth rates were unexpected from all quarters. Industry analysts, commentators, academicians, among others questioned the reliability of the new series as the growth numbers were not reflective of the recent economic situation and performance of the economy. In particular, the high growth rates of the manufacturing sector were taken as a surprise, which eventually led to question the validity of the overall GDP growth rate. While several stakeholders continue to be engaged in unraveling the mystery behind the revised 2011-12 series, the debates and questions have not withered out.

In this paper we provide answers to two important questions in the debate. First, what are the issues with estimation and blow-up of GVA in the manufacturing sector? and second, are manufacturing companies being correctly identified? In the recent past, debates around the manufacturing sector have revolved around understanding the new presentation of GDP or GVA aggregates and finding explanations for high growth rates. However, we argue that with changes in both sources

and methods, the answers to key questions lie more in the details of new definitions and datasets. As the process of computation has also undergone a change, it requires a fresh and deeper look into the components of GVA to draw new insights. Since a large part of the details of the actual process of estimation are unavailable in public domain, we recreate the estimation process as a first attempt to understand the composition of GVA . We then turn to a related problem of blow-up of GVA and simulate using different samples to identify it as a potential source of problem.

One of the highlights of the 2011-12 series was the introduction of the MCA21 data base as a replacement to the RBI sample of firms in the private corporate sector. This introduction was seen as an advancement in areas of coverage of companies and capture of financial information. However, the dataset has posed new questions and few others areas of concern have also emerged. We use the financial dataset from CMIE Prowess to highlight concerns of choice of indicators for computing value addition and the identification of manufacturing companies. We also provide an alternate method of blow-up as a possible solution to avoid using the conventional Paid-Up Capital method. To elaborate on these aspects, the paper is arranged as follows. In section 2 we summarize the nature of debates on the GDP numbers and specifically on the manufacturing sector. Section 3 outlines the key questions regarding GVA estimation. Section 4 describes the basic estimation process as understood from CSO (2015b), Section 5 discusses the issues involved with blow-up of GVA, Section 6 presents an alternate method of blow-up by using representative industry growth rates, Section 7 deals with a potential misclassification of companies in MCA21 database and the last section concludes with a discussion.

2 The great Indian GDP debate

Following the release of the annual estimates of the NAS 2015, various stakeholders, international agencies and commentators were engaged in decoding the GDP and sub-sector growth figures. While the overall methodological changes in line with the SNA 2008 were seen as an improvement, their impact on the revision of levels and growth rates of sub-sectors was not clearly visible. Within the overall GDP, the estimates of the private corporate sector received wide scrutiny and criticism as they did not conform to industry expectations. The general discontent with the estimates was driven by the fact that large upward revisions in growth rates from 1.1% to 6.2% in 2012-13 were not reflective of the actual growth performance of the manufacturing sector. At a time when most other macroeconomic indicators such as IIP, industrial sales, non-food credit, etc. were showing nearly opposite trends, inflated GVA levels and higher growth rate of the manufacturing sector were seen as incon-

sistent. This revision led to question the reliability of the estimates and opened several fronts for examination regarding data sources and methods of estimation. In addition, the MCA21 dataset that was used for GVA computation remains publicly unavailable, thus making it difficult to pin down the actual sources of problems and confusions.

A set of papers critically examined the methodological aspects to point out shortcomings and even raised concerns of overestimation of value addition, see for instance Nagaraj (2015a, 2015b, 2015c) and Rajakumar (2015), Rao (2015). In contrast, several articles in popular media were engaged in finding explanations for the high growth rates. Reasons such as; higher tax collections, falling output prices, use of single vs. double deflator methods (Rajakumar & Shetty (2015), Dholakia (2015), Goldar (2015)), lower values of deflator, among others were advanced in support of the new estimates. Nagaraj (2015a, 2015b, 2015c) argued that Paid-Up Capital based blow-up leads to an overestimation of GVA in the sector. We conduct a sample based exercise to explore the possibility of overestimation. We provide an answer to the question and also corroborate the argument with empirical evidence that Paid-Up Capital based blow-up method has large variations in different samples and can lead to overestimation of value addition. The other interesting facets of the debate lie in the finer details of definitions and dataset used for computation. It is well known that in the past, elaborate details of the method of computations and dataset were not available in official publications such as the Sources and Methods. In the present case, the Goldar Committee Report (CSO, 2015b) and other documents related to the new series provide an improved view of the computation of GVA for the overall private corporate sector. While the level of details are only necessary, they are not sufficient in explaining and aiding the user to visualize the entire process of estimation.

Despite availability of such reports that formed the basis of revisions in the estimation process, the debates, by and large, have overlooked the finer details of definitions and dataset. With an increasing debate on issues of inconsistency and reliability of estimates, the literature does not provide insights into the estimation procedure and evidence on inconsistencies. This leaves two broad areas for investigation, first, what is the estimation procedure of value addition? and second, what are the potential sources that explain the inconsistencies involving the new estimates? We argue that a detailed scrutiny of the composition of GVA and its process of estimation can provide meaningful answers to some of the key questions.

3 Questions about GVA estimation

For the private corporate sector, the Goldar Committee report (CSO, 2015b) formed the basis of revision of the method and the dataset. The report outlines the use of MCA21 dataset for the purpose of value addition, which also marks the shift of data capture from the conventional *Establishment* approach to the new *Enterprise* approach. In this backdrop, it is useful to think about various facets of value addition, before one can attempt to answer some of the specific questions. 1. How do we conceptualize value addition at the enterprise level? 2. How do we compute or what are the fields of financial data that go into the computation of value addition? 3. How do we account for data of unavailable companies? and last, but more crucially, 4. how do we identify manufacturing companies in the dataset?

In answering these questions, the recourse is to first understand and simplify the complexity of the sources and methods used in the National Accounts. In this case, the recourse is to use the information available in CSO (2015a, 2015b and 2015d). The second challenge is to obtain a comparable dataset that can be used to compute value addition in the private corporate sector. Combining these two aspects, if the process of computation of GVA can be replicated, one can possibly identify the potential sources of problems in estimation of GVA. After we re-create the estimation process, we answer two key questions; (a) What are problems associated with the Paid-Up Capital based blowup? and (b) Are manufacturing firms being classified correctly in the MCA21 database?

The motivation to understand the process of estimation stems from the fact that a smaller though comparable dataset to MCA21 can be obtained from CMIE Prowess. Also, the existing debate has largely overlooked the detailed composition of GVA and has explicitly concentrated on issues of growth rates and use of deflators. We argue that questions relating to components of GVA are more relevant and fundamental in understanding the estimates of the new series. As the figures of the new series for the manufacturing sector are available only from 2011-12, a comparison of the trend growth is not possible. Thus, we estimate the level values of GVA for a comparable set of manufacturing companies that file in the XBRL format in MCA21. This is one of the important sub-sets of the overall manufacturing sector and covers a wide range of companies that are large in size and value. The choice of these XBRL filing companies is primarily due to data availability from CMIE Prowess and the comparative figures available in CSO (2015a, 2015b and 2015d). We elaborate on this in Section 4.1

The question of Paid-Up Capital based blow-up of GVA leading to an overestimation is an important one. We construct an alternate methodology of blow-up by using representative industry growth rates of GVA to scale-up the previous GVA estimates in case of unavailable companies. The purpose of the alternate method is to highlight the use of representative indicators for the sector, and also to arrive reasonably close to the actual estimates in case of data unavailability. We argue that this offers a possible solution to avoid using the Paid-up Capital factor.

Another crucial question to answer is whether manufacturing companies are being correctly identified? The MCA21 dataset poses problems of identification of the economic activities of companies as it is based on the NIC codes contained in the Company Identification Code (CIN). While CSO (2015b) highlights such a problem, they do not provide a systematic method of identification of companies. We use data from CMIE Prowess to analyze this problem and also the extent of distortion in GVA due to misclassification of companies. To begin with, we first present the basic sources and methods used in the new series and elaborate the process of GVA computation, as understood from CSO (2015a, 2015b and 2015d).

4 What is the process of GVA estimation?

The methodology adopted in the 2011-12 series is similar to the tradition RBI method, but differs in terms of computation. The RBI computed GVA based on its sample study of company finances and the estimates were blown-up on the basis of Paid-Up Capital of companies. In the case of estimating GVA using the MCA21 database, the CSO uses an *active* set of companies, which is defined as; 'companies having filed their financials, at least once in the past three years'. Within this active set, the GVA for a particular year is estimated using the data of companies that is available till a cut–off date of extraction (Dec. 1 of the previous year), while data for the remaining active companies is treated as unavailable. Thus, the GVA is estimated using the available data and is blown-up to account for the remaining active but unavailable companies. In terms of sources and methods, Table 1 compares the basic changes in the 2004-05 and 2011-12 series.

Table 1: Sources and methods in the manufacturing sector

Base Year	2004-05	2011-12
Entity	Establishment	Enterprise
Data source	IIP + RBI + ASI	IIP + MCA + ASI
GVA computation	Production approach	Production approach
Output	Sales	Sales + Other income

Compiled from CSO(2015b)

As part of a definitional change, GVA in the new series is estimated at the enterprise level. Previously, the establishment was limited to a factory registered under the Factories Act, that did not take into account the value addition at the head office or related ancillary activities of the company. The estimation process continues to be based on the production side identity of value addition, but uses the MCA21 database instead of the RBI sample studies.

The changes in definition and data source have also led to changes in measures of output, costs and intermediate consumption. In particular, the measures of output uses several disaggregated items of revenue in addition to industrial sales. We deal with these issues in detail in the following section. To re-create the process of estimation, first the relevant details of the dataset and fields needs mention.

4.1 XBRL taxonomy

In the MCA21 database, the eXtensible Business Reporting Language (XBRL) format has been made in concordance with the System of National Accounts (SNA) 2008 description of items in the balance sheet and Profit and Loss account of companies. Presently, the XBRL has over 3400 fields wherein companies are required to furnish disaggregated information on various revenue, cost and balance sheet items. These fields are utilized to construct the basic sequence of accounts, i.e. the production, generation of income, capital and distribution of income accounts as per the definitions of SNA. Similarly, for estimation of gross value addition, fields of the XBRL form are identified to estimate value of output and intermediate consumption (see the Goldar Committee's Final report on the Private Corporate sector including PPPs, CSO (2015b)). A complete description of the XBRL fields for this purpose is given in Appendix A. In addition to identifying the fields, CSO (2015b) also prescribed the formula for computation of GVA using the production account. The items and formula are described in Appendix A.

4.2 Computation

To recreate the process of estimation, a company's actual XBRL filing was obtained from the MCA21 database to identify the fields for computation. Of the 3400 plus fields in the XBRL form, about 65 fields were used in the GVA formula. Using the production side formula prescribed in CSO (2015b), the GVA of the sample firm was computed as a benchmark estimate. The XBRL fields were then mapped to fields of financial data in CMIE Prowess and an alternate estimate was computed for the sample firm. A list of mapped fields is presented in Appendix B. The exercise was

then extended to all available firms in the manufacturing sector in CMIE Prowess. In order to maintain comparability of estimates with the CSO's figures, a set of firms was made that fulfilled the XBRL filing criteria in MCA21, namely; (i) company having paid-up capital greater than INR 5 crores or (ii) a turnover greater than INR 100 crores or (iii) is a listed company. Table 2 presents the number and GVA of companies using Prowess and compares it with the CSO's estimate of companies that file in the XBRL format in the MCA21.

Table 2: Number of companies and GVA of manufacturing sector using CMIE Prowess (Current prices, Rs. Crore)

Year	XBRL Co. in Prowess	GVA (Prowess)	XBRL Co. in MCA21	GVA MCA21	Manuf. Co. in Prowess	GVA Manf. Co
1	2	3	4	5	6	7
2011-12	3017	684229.2	-	841623	4900	767311.7
2012-13	3010	744291.1	12682	943153	4154	819228.5
2013-14	2684	800106.6	-	-	3674	872178
2014-15	1915	772886.2	-	-	2522	861641.6

GVA computation is based on the formula in CSO (2015b), XBRL Co. and Manuf. Co. denote number of companies

We also use the pre-defined set of 'manufacturing' companies in Prowess to compute the GVA estimate. The difference between the XBRL criteria and the pre-defined Prowess set is that the companies in the XBRL set are first identified using the 2 digit NIC 2008 codes for the manufacturing sector and subsequently the qualifying criteria is applied. Thus, using the Corporate Identification Number (CIN) code of the company, the 2 digit range of 10 - 33 was first applied to companies and subsequently, the XBRL qualifying criteria was used. In the case of Prowess, companies are classified as 'manufacturing' based on their primary economic activity and product schedules.

Presently, in CSO (2015b) the disaggregated figures of GVA by industry groups and filing criteria are available only for two years. The GVA figures for the manufacturing sector companies that file in XBRL are presented in columns 4 and 5. Comparing these figures with our set from Prowess, it substantiates one of the arguments that a fraction of top (and large) companies contribute substantially to GVA. To develop on this argument, we need a detailed scrutiny of the fields that are used for computation of value addition and the size distribution of companies. To avoid problems of classification of companies based on CIN codes, we use the manufacturing set of companies as defined in Prowess for the purpose of estimation. The problems of identifying and classifying a manufacturing company is dealt separately in Section 7. The aggregate GVA of manufacturing companies that are comparable to compa-

nies filing in XBRL is given in column 7 for the year 2011-12. The computation of this aggregate is based on the mapping of fields with the XBRL form given in Appendix A. Table 3 shows the disaggregation into three basic components, namely output, taxes and subsidies and intermediate consumption.

Table 3: Components of GVA for manufacturing companies using CMIE Prowess (Current prices, Rs. Crore)

S. No.	Item	2011-12
Output	Revenue Sale of Product	3455812.45
	Revenue from sale of services	10084.43
	Miscellaneous other operating revenue	301623.73
	Revenue from other financial services	59459.09
	Other miscellaneous non operating income	5956.07
A	**Value of output**	3832935.77
B	Less: **Change in Stock**	38631.36
Taxes and Subsidies	Indirect taxes	233717.26
	Export incentives including duty draw back, etc.	7994.98
	Fiscal benefits (oil companies)	86761.59
	Sales tax and VAT benefits	368.86
	Other fiscal benefits and subsidies	43909.72
C	**Net Indirect taxes**	94682.11
Intermediate Consumption	Raw materials stores spares	2099607.27
	Purchase of finished goods	620023.56
	Royalties technical know how fees, etc.	11792.28
	Rent and lease rent	9212.21
	Repairs and maintenance	28216.21
	Insurance premium paid	3830.38
	Selling distribution expenses	144010.74
	Communications, IT expenses	1514.32
	Provision for Wealth tax	7.53
	Research and development expenses	14096.06
D	**Intermediate consumption**	2932310.56
A − B − C − D	Gross Value Added	767311.74
	Number of companies	4900

The major heads are further disaggregated into revenue and cost items, the details of which are given in Appendix 3. Using the production side identity, the GVA is computed as total value of output (market + own use) minus taxes and intermediate consumption, where the task is to identify items that constitute value of output, taxes and intermediate consumption.

In mapping the XBRL and Prowess fields we highlight the possibility of incorrectly identifying a field as the definitions of items in both these datasets are not identical. In the case of XBRL, the actual fields do not contain a definition and the details of the items can only be inferred from the labels attached to it. In some cases, references have been made to Schedule-III and the revised Schedule-IV of the Companies Act, 2013 for identifying components of the fields. However, for a majority of items, the details in the schedules are insufficient to decide on inclusion or exclusion of an item or on the treatment of an amount given in subfields. In the case of CMIE Prowess, items have been classified using definitions based on normalization to bring in homogeneity across companies as each one uses a non-standard nomenclature of financial items.

5 Issues in estimation

Based on the disaggregated fields used in the estimation, we highlight some issues that can have a considerable impact on the estimates. The first is of identification of fields for measuring value of output at the firm level.

5.1 What are the measures of output and costs?

The GVA formula uses several disaggregated components of revenue that includes revenues from products, services, operating revenues, revenue from financial services, rental income, incomes from brokerage & commission and other non-operating incomes. The aggregate of the revenues is similar to the definition of *total income* of the company, which takes into account incomes from all business activities. On the cost side, the formula takes into account expenses related to production activities, indirect taxes and other items such as rent, insurance, repairs and selling and distribution expenses. For a comparison, we compute first GVA by taking industrial sales as a measure of output of the manufacturing activity and later include other sources of revenue as given in CSO (2015b). Table 4 compares the difference in GVA due to addition of revenues from sources other than manufacturing.

Table 4: Values of GVA based on Industrial sales and other revenues as measure of output

Period	Based on Sales	Gr. Rate (%)	Based on Dis. Rev.	Gr. Rate (%)	Diff.
1	2	3	4	5	6
2011-12	701896.6	-	767311.74	-	65415.1
2012-13	742237.2	5.74	819228.5	6.76	76991.3
2013-14	780371.1	5.13	872178.0	6.46	91806.9

In column 6 we show the difference in levels of GVA due to the addition of revenue from other sources. The addition to such revenues shows a considerable increase in GVA which possibly explain part of the large revisions in levels of 2011-12 for the manufacturing sector. The level change also corresponds to a 1% increase in growth rate of the sector.

Based on these revenue and cost items, one can identify sources of potential over-estimation of GVA. On the revenue side, the addition of non-operating revenues, financial services etc. constitutes a substantial part of revenue for large and diversified firms. The representative indicator for the revenues generated solely out of manufacturing activities is industrial sales. Conventionally, subtracting the cost items (related to production) from sales provides a measure of value addition entirely from manufacturing activities. However, with large and diversified activities, identifying representative costs from financial data and aggregate data fields could pose challenges, thereby leading to imprecise estimates. A close scrutiny of the XBRL fields shows omission of several important cost components, such as; Power & Fuel, advertisement and marketing related expenses. These are sizable components and their omission can significantly underestimate costs, thereby overestimating GVA. It has also been pointed out in CSO's reports that such post-manufacturing or ancillary activities are being captured as part of the new 'enterprise' approach. However, given the composition of business activities and diversification under one roof, the value addition cannot be taken to be arising solely out of manufacturing activities.

It is also important to note that since the GVA is computed using the production side identity, a company for any given year may register a negative value addition. This is possible on account of large values of intermediate costs that can lead to losses. While aggregating across companies, negative GVA contributions do not appear prominently, but the extent of negative GVA contributions is certainly an issue in case of blow-up of estimates. Presently, in the absence of actual data of an active company, the existing GVA is blown-up based on the Paid-up Capital factor, while in practice, the possibility of the company registering a negative GVA cannot be ruled out. We highlight such possibilities in the following section.

5.2 Does Blow-up lead to overestimation of GVA?

Blow-up of GVA estimates has been a contentious matter of debate. Presently, the details and the procedure of blow-up has not been described in full details in the official releases of the NAS and related documents. Thus, in order to reconstruct the effect of blow-up, we conduct a sample based exercise to understand the process in detail. In CSO (2015a, 2015d), the blow-up factor (also called the Paid-Up Capital (PUC) factor) was computed as the ratio of Paid-Up Capital of available companies to the Paid-Up Capital of all active companies. In general, for any year, the blow-up factor can be computed as follows. Let the Paid-Up Capital ratio be given by

$$PUC_R = \left(\frac{\sum_i PUC_i^a}{\sum_j PUC_j^A} \right) \tag{1}$$

where (a) denotes the set of active companies, (A) denotes the set available companies, and (i) and (j) denote the companies in the respective set. The blow-up factor is then given by;

$$PUC_F = \left(\frac{1}{PUC_R} \right) \text{ i.e. } \frac{1}{\left(\frac{\sum_i PUC_i^a}{\sum_j PUC_j^A} \right)} \tag{2}$$

For the year 2012-13, the PUC of available companies was approximately 85% of the total PUC of all active companies. This implied that the ratio was 0.85 for the year 2012-13, and assuming that the GVA of available companies, say (X), was representative of 85% of the total GVA of active companies, the existing GVA was blown-up to 1.15(X) to account for the remaining 15% representation. However, the actual computation of this blow-up factor has not been described in detail in CSO (2015, 2015d). Statistically, given 85% coverage of PUC, the appropriate factor should have been (100/85) or 1.176, since that amounts to blowing-up of 85% GVA to 100%.

Rajakumar (2015) also pointed this while adding another dimension that a single blow-up factor for private and public limited companies was not appropriate. Nagraj (2015a, 2015b) while highlighting the problem of blow-up of estimates, argued that the structure of the private corporate sector in India is highly skewed as top 100 firms contribute nearly half of GVA of the sector. The remaining plethora of registered companies produce a minuscule output and exist only on paper as tax hedges and promoter firms for large public companies. In such a scenario, the procedure raises questions over blowing-up of GVA of 5 lakh available companies to account for over 10 lakh active companies, wherein majority of companies scarcely contribute to GVA. This scenario is also independent of the fact that relation of PUC and GVA is presently unknown for such a large set of companies in the MCA21.

In principle, the complication arises due to the definition of an 'active' company. Presently, the MCA21 database has close to 10 Lakh active companies that have filed

their financial statements alteast once in the past 3 financial years. Thus, given the variation in annual filing, the sample of available companies is also likely to differ on a yearly basis. In view of such a variation, the blow-up factor would vary as it accounts for the non-reporting companies. Using our existing sample of companies that qualifies the XBRL filing criteria, the effect of variation in the blow-up factor can be seen as follows.

Table 5: Blow-up of GVA estimates using Paid-Up Capital factor, (Rs. Crores)

S.No.	C_A	C_a	Sample % of C_a	P_a	P_A	PUC factor $\left(\frac{1}{\frac{P_a}{P_A}}\right)$	GVA_a (Rs. Cr.)	Blown up GVA (6*7)	Diff	% Error of sample 1
	1	2	3	4	5	6	7	8	9	10
1	3479	3479	100	137817	137817	1.000	757865	757865	0	0.00
2	3479	3306	95	130677	137817	1.050	707834	746510	−11354	−1.50
3	3479	3132	90	123905	137817	1.110	686168	763210	5345	0.71
4	3479	2958	85	119500	137817	1.150	656858	757541	−324	−0.04
5	3479	2784	80	100094	137817	1.380	593849	817653	59788	7.89
6	3479	2610	75	101511	137817	1.360	552675	750339	−7526	−0.99
	Avg.									1.21
	SD									3.82

In Table 5, C_A and C_a denote number of active and available companies, Sample % denotes the percentage of companies taken from the available set of 3479, P_a and P_A denote Paid up capital of available and active companies, GVA_a denotes the Gross Value Added of available companies, Diff denotes the difference of actual GVA of the 100% sample and blown up GVA of available companies, UC_a is the actual value of GVA of the unavailable or remaining companies that were not a part of the sample, and % error denotes the difference between the blown up and actual GVA as a percentage of the actual GVA (of sample 1).

The first sample is taken as 100 % in our case as data for the financial year (2011-12) is available only for 3479 XBRL qualifying companies. We then draw random samples of companies from this set (3479) with different levels of coverage ranging from 95% to 75%. These random samples represent the number of available companies as shown in column 2, with the corresponding active set of companies given in column 1. Columns 4 and 5 show the total Paid up Capital of each sample of companies. In column 6, we compute the blow-up factor using equation (2) as described earlier. Column 7 shows the GVA of *available* companies and column 8 shows the blown-up GVA by multiplying the factor to account for the unavailable companies. In column 9, we show the difference between the actual GVA of the 100% sample and the blown-up GVA. A percentage error of the difference as compared to the actual GVA is calculated for each sample in column 10.

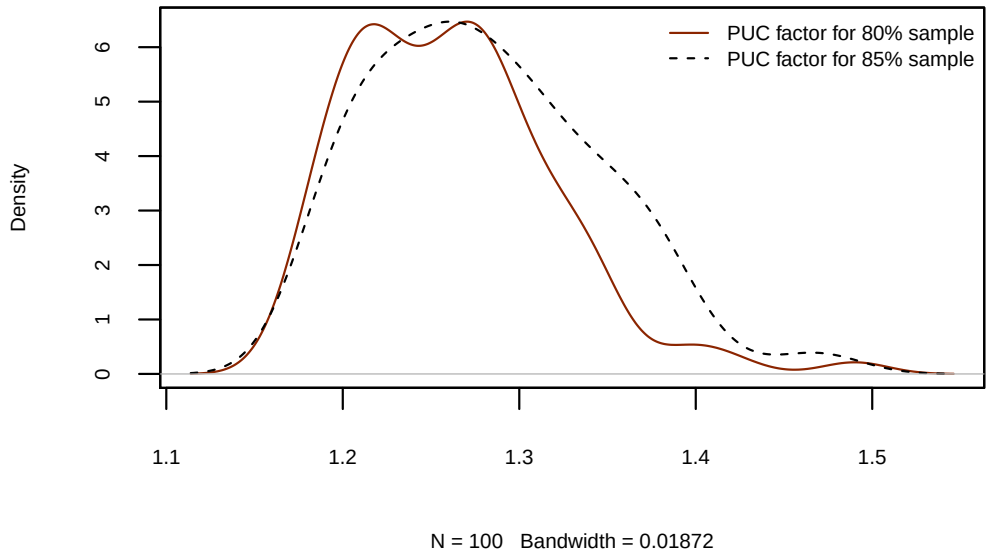
The estimation procedure revels several shortcomings of this method. First, the blow-up factor is sensitive to Paid-up Capital coverage and can show a considerable increase as the number of non-reporting companies increase. Second, the variation

in blown-up values is unpredictable as there is no systematic trend for different values of the PUC factor. This leads to an unknown degree of error as the addition due to blow-up can be significantly large as compared to the actual contribution of unavailable companies. From the last column in Table 5, it is evident that, on average, the error is positive and with large samples, this value can be of a significant proportion in terms of levels.

In the present case, statistically, our samples have only one realization. To get a clearer understanding of the blow-up effect, we can reconstruct the blow-up method for a particular sample. Analytically, a given level of sample coverage can be obtained from several random draws of companies from the active set. We experiment with two such cases. We fix the coverage to 80 and 85% and randomly draw 100 samples in each case. Since our variable of interest is the Paid-Up Capital factor, we compute and plot the density based on these 100 samples. Figure 1 shows the density plot of PUC factor for two sample coverages.

Figure 1 : Density plot for Paid-Up Capital factor

PUC factor distrubution computed for 80% and 85% sample coverages based on 100 random samples



The distribution of PUC factor for a given sample coverage shows large variations and with higher values it can lead to a considerable overestimation of GVA. The conceptual limitation of this method is that it uses the ratio of PUC to scale up existing GVA. The method is based on the assumption that PUC and GVA have a one-to-one correspondence and that the Paid up Capital of a company can be used to estimate

its GVA contribution. This is at best a weak assumption, as one cannot draw sufficient inference about a company's manufacturing activities by looking at its Paid-up Capital value.

This point is also evident from the fact that for any given year, a company may register a negative value addition, whereas the Paid-up Capital would never be negative. To visualize this statistically, one can compare the GVA contribution for various levels of PUC. Table 6 shows the PUC distribution for the manufacturing set of companies in Prowess based on the PUC range used in MCA21. Comparing columns 3 and 4, we can clearly see that PUC and GVA contribution have no systematic trend or a one-to-one correspondence. Also, for each range of PUC, one can have significant negative GVA contributions which in case of blow-up of estimates can lead to large distortions.

Table 6: Summary statistics of GVA as per size distribution of Paid-up Capital, of manufacturing companies, 2011-12

1	2	3	4	5	6	7	8
PUC Range (Rs. Cr.)	Count	PUC (Rs. Cr.)	GVA (Rs. Cr.)	Min (GVA)	Max (GVA)	Avg. (GVA)	SD (GVA)
Upto − 0.01	82	0.82	23.63	−2.56	20.81	0.29	2.46
Above 0.01 − 0.05	274	13.43	1977.39	−113.89	1854.66	7.22	112.48
Above 0.05 − 0.1	86	7.18	216.18	−436.37	186.5	2.51	55.23
Above 0.1 − 0.25	156	30.97	603.32	−103.01	186.59	3.87	18.27
Above 0.25 − 0.5	182	74.74	1569.92	−4.92	133.56	8.63	18.87
Above 0.5 − 1	298	235.06	4523.46	−17.85	495.56	15.18	41.27
Above 1 − 2	328	507.71	5975.45	−29.90	585.74	18.22	47.63
Above 2 − 5	902	3287.48	23002.44	−85.37	2515.77	25.5	101.99
Above 5 − 10	835	6030.89	42062.43	−189.58	2758.8	50.37	130.38
Above 10 − 25	971	15347.17	98608.91	−514.77	2048.36	101.55	181.88
Above 25 − 50	387	13329.87	98477.74	−876.50	5008.28	254.46	521.86
Above 50 − 100	202	14464.75	97073.49	−1088.10	7019.1	480.56	890.06
Above 100 − 250	115	17381.03	102984.05	−955.91	10215.99	895.51	1750.28
Above 250 − 500	40	13252.39	112373.86	−2.53	21144.37	2809.35	4186.68
Above 500 − 750	19	11140.56	17675.16	−266.67	8392.07	930.27	1886.55
Above 750 − 1000	8	6759.58	46366.18	−15.59	20625.66	5795.77	7600.25
Above 1000	14	38449.23	113777.36	−49.82	47787	8126.95	13462.05
Total	4899	140312.86	767209.97				

PUC is Paid-up Capital, GVA is Gross Value Added, SD is Standard Deviation

The size distribution also confirms that GVA contribution is skewed towards a small number of large size companies. In summarizing the main result of blow-up exercise, we find that PUC may not the most ideal factor for scaling up of GVA of unavailable companies. Since the GVA contributions can be negative for a particular year, a possible recourse could be to move the previous year's aggregate of the un-

available companies by the representative industry growth rate. Such a method can avoid the use of Paid up Capital factor as in absence of any other information, the representative industry growth rate can serve as a sufficient indicator for capturing the business environment faced by firms in that industry. We explore this method as an alternative in the following section.

In the annual filing by companies, the process of identifying the correct set of financial data is also a matter of concern. It is well known that companies also file their financial accounts for periods less than 12 months and 18 month or more. Within the active set, such filing can complicate the identification of data for a particular year for computation. For instance, given the current cutoff date of data extraction from the MCA21, the process does not elaborate on the treatment of financial statements filed for less than 12 months or for a 18 month period. This creates a problem for a particular year as the data for such companies has to be either apportioned for 12 months or considered for the following year. At present, no method or criteria has been specified to deal with this issue.

The magnitude of this problem or the distortion due to such filing is presently unknown, but nevertheless, it requires a systematic process to address the issue. One of the gains of moving to MCA21 has been to achieve a wider coverage of companies in the overall private corporate sector. However, as the year-on-year filing is likely to vary, a feasible process would be take data of companies on a frame or survey basis such that the annual variation in data availability can be minimized.

6 An alternate method of blow-up

As an alternative to using the Paid-Up Capital factor for blow-up of available GVA, we explore the possibility of using representative industry growth rates to move forward the previous year's GVA of unavailable companies. Using sectoral growth rates to move benchmark estimates for future years is an existing and acceptable method to account for data unavailability. Such methods are already in place for moving several lead indicators in the national accounts. Rao (2015) has made similar observations regarding alternate methods to blow-up of GVA. Similarly, in the case of manufacturing sector, industry wise growth rates are a reflection of the business environment of a given sector and should capture, on average, the performance of companies in that sector. This method gives an advantage over the PUC factor as it can capture the trends and volatility of the economic conditions faced by businesses. Thus, issues of economic downturns, negative GVAs or non-filing by companies can be addressed without having to resort to a blow-up factor that does not take into account such aspects.

To elaborate the process, we first construct the industry wide growth rates of GVA using our sample of companies in Prowess. Since Prowess reports industry groups and product codes, we are able to separate companies into various industry groups. For a particular year, we take a moving average of the past three years of the GVA levels to smoothen out the year-on-year fluctuations. We then take an annual growth rate of these levels and consider that as a representative indicator for the sector. Table 7 tabulates the 3 year moving average of the levels and the corresponding growth rates of the sectors based on all available companies.

Table 7: 3 year moving average of levels of avail. GVA by industry (Rs. Crore) and corresponding growth rates

Industry	GVA 08-09	GVA 09-10	GVA 10-11	GVA 11-12	Gr. % 09-10	Gr. % 10-11	Gr. % 11-12
Agri. products	4855.61	5870.29	6792.27	7635.38	20.897	15.706	12.413
Animal products	932.99	968.60	1010.92	844.28	3.816	4.369	−16.484
Base Metals	107610.61	119730.23	122965.26	136082.70	11.262	2.702	10.668
Chemicals	67554.98	78468.96	91532.86	101168.74	16.156	16.648	10.527
Diversified	19726.20	22928.43	23700.16	27165.84	16.233	3.366	14.623
Fats, oils, etc.	3219.08	3838.01	4314.08	4611.31	19.227	12.404	6.890
Food, beverages, etc.	23860.44	25902.42	29082.64	30634.25	8.558	12.278	5.335
Leather products	1226.62	1376.83	1471.15	1574.48	12.246	6.850	7.024
Machinery	57045.96	65782.43	73719.64	81740.56	15.315	12.066	10.880
Mineral products	72893.64	74350.85	75475.78	75752.66	1.999	1.513	0.367
Misc. Manuf.	945.16	898.77	925.02	947.98	-4.908	2.920	2.482
Non metallic	40588.68	48176.47	53833.85	62892.67	18.694	11.743	16.827
Others	82.48	80.28	72.66	207.22	-2.663	-9.492	185.196
Plastics & rubbers	15442.97	17761.09	19472.96	21477.10	15.011	9.638	10.292
Pulp & paper	8368.84	10554.44	12931.83	14768.29	26.116	22.525	14.201
Textiles	33630.22	38584.72	42048.12	43087.00	14.732	8.976	2.471
Transport equipment	32691.05	37594.89	44953.76	53625.98	15.001	19.574	19.291
Wood products	536.04	725.24	833.78	925.96	35.296	14.965	11.056
Total	491211.57	553592.96	605136.73	665142.40	12.699	9.311	9.916

We use data of the 80% sample as in the case of blow-up (see sample 5 in Table 3) as an illustration and identify the sector of the missing companies. Since, by definition, the unavailable company is a part of the active set, we would expect the company to have filed its financials at least once in the past three years. For the unavailable companies, instead of using the Paid-up Capital, we search for the last year in which data is available for all such companies. For each year, we then classify all missing companies (695) into their respective industry groups. This gives us a year wise set of companies in each industry group wherein the last estimate of GVA is available, as shown in column 1. Upon identifying past data, we pick the relevant growth rates computed in Table 7 for the corresponding year for each industry group. In this particular sample, data of all companies was available within

the past two years. In other cases, and with larger samples, the search may extend to past three years.

Table 8: Computation of GVA for 2011-12 by using industry growth rates for unavailable companies (Rs. Crore)

Industry	GVA Rs. Crore	N	Last avail. Year	Gr. % 09-10	Gr. % 10-11	GVA 11-12	GVA 09-10	GVA 10-11	GVA 11-12
1	2	3	4	5	6	7	8	9	10
Animal products	23.9	2	2010-11			-16.48			19.96
Agriculture prod.	2021.75	26	2010-11			12.41			2272.7
Mineral products	18369.64	8	2010-11			0.37			18437.03
Fats, oils & prod.	−22.56	17	2010-11			6.89			−22.56
Food, beverages, etc.	16732.84	48	2010-11			5.34			17625.57
Textiles	6302.13	82	2010-11			2.47			6457.84
Leather products	9.04	1	2010-11			7.02			9.67
Wood products	332.15	2	2010-11			11.06			368.87
Pulp and paper prod.	3465.78	36	2010-11			14.20			3957.96
Chemicals	11728.71	111	2010-11			10.53			12963.42
Plastics and rubbers	2876.99	43	2010-11			10.29			3173.09
Non metallic prod.	10493.23	31	2010-11			16.83			12258.97
Base Metals	33553.76	101	2010-11			10.67			37133.14
Machinery	14190.95	83	2010-11			10.88			15734.97
Transport equipment	6555.11	42	2010-11			19.29			7819.68
Misc. Manuf.	200.67	8	2010-11			2.48			205.65
Diversified	9255.94	23	2010-11			14.62			10609.44
Fats, oils & prod.	51.87	2	2009-10		12.40	6.89		58.3	62.32
Food, beverages, etc.	36.62	3	2009-10		12.28	5.34		41.12	43.31
Textiles	6.58	1	2009-10		8.98	2.47		7.17	7.35
Chemicals	369.58	7	2009-10		16.65	10.53		431.11	476.49
Plastics and rubbers	0.01	1	2009-10		9.64	10.29		0.01	0.01
Non metallic prod.	−0.01	1	2009-10		11.74	16.83		−0.01	−0.01
Base Metals	52.56	5	2009-10		2.70	10.67		53.98	59.74
Machinery	78.18	3	2009-10		12.07	10.88		87.61	97.14
Transport equipment	16.3	1	2009-10		19.57	19.29		19.49	23.25
Misc. Manuf.	−0.02	1	2009-10		2.92	2.48		−0.02	−0.02
Diversified	−171.73	1	2009-10		3.37	14.62		−171.73	−171.73
Textiles	0.03	1	2008-09	14.73	8.98	2.47	0.03	0.03	0.03
Pulp & paper prod.	151.85	1	2008-09	26.12	22.53	14.20	191.51	234.65	267.97
Plastics & rubbers	24.97	1	2008-09	15.01	9.64	10.29	28.72	31.49	34.73
Non metallic products	31.99	1	2008-09	18.69	11.74	16.83	37.97	42.43	49.57
Machinery	1843.11	1	2008-09	15.31	12.07	10.88	2125.38	2381.83	2640.98
Total		695							**152616.53**

To compute the estimate, we apply the corresponding growth rate to the last available estimate and move it forward by one year. Similarly, in cases where the estimate dates back to two years, the process is done twice by applying the next year's industry growth rate to the previously scaled up value. In this process of scaling up, the treatment of negative GVAs needs mention. Among possible alternatives of scaling down a negative GVA in case of positive industry growth rates, or further add to a negative quantity in case of negative industry growth rates, we choose not to move

the negative value and use the same value for the next year. This is based on the premise that one cannot make apriori judgments about a firm's loss making situations. In the case where the representative industry growth rates are positive, a loss making firm in the industry can only be assumed to reduce its losses or may turn profitable over a period of time. However, in absence of any firm level information, moving the GVA in either direction could be misleading and will cause an unknown degree of error. Although in this method the effect of scaling the negative value on the aggregate GVA is negligible, not moving it ensures that it will not contribute positively as in the case of blow-up using PUC factor. Lastly, we move all estimates till the current year (2011-12) and aggregate it to represent the scaled up estimate to account for the missing companies. Repeating this process for the same samples as in the case of blow-up, we get comparable estimates from both methods. Table 9 presents the figures for all samples for this method and compares then with the PUC factor based method.

Table 9: Estimate of scale up using industry wise growth rates

Sample	C_A	C_a	Sample % of C_a	GVA_a	Blown up GVA	GVA of UC_a	GVA scaled by PUC factor	GVA scaled by Ind. Gr.	% Error PUC factor	% Error Ind. Gr.
	1	2	3	4	5	6	7	8	9	10
1	3479	3479	100	757865	757865	0	0	0	-	-
2	3479	3306	95	707834	746510	50031	38676	41518	−1.50	−1.12
3	3479	3132	90	686168	763210	71697	77042	60807	0.71	−1.43
4	3479	2958	85	656858	757541	101007	100682	109894	−0.04	1.17
5	3479	2784	80	593849	817653	164015	223804	152616	7.89	−1.50
6	3479	2610	75	552675	750339	205189	197663	199134	−0.99	−0.80
	Avg.								1.21	-0.74
	SD								3.826	1.101

In Table 9, (C_A) and (C_a) denote number of active and available companies, Sample % denotes the percentage of companies taken from the available set of 3479, GVA_a denotes the Gross Value Added of available companies, Diff denotes the difference of actual and blown up GVA of available companies, UC_a is the actual value of GVA of the unavailable or remaining companies that were not a part of the sample, and Ind. Gr. denotes the GVA scaled by applying industry growth rates to previous year's GVA for missing companies. % error denotes the difference between the blown up and actual GVA as a percentage of the actual GVA (of sample 1) by both methods. This comparison is essential as it provides a direction and magnitude of the error in estimation. Column 7 gives the addition due blow-up based on the PUC factor, while column 8 gives the figures based on industry growth rates. Comparing the figures with the actual figure of the unavailable companies (column 6), the extent of blow-up based on the PUC factor can be clearly observed.

The figures based on industry growth rates are considerably close to the actual values, thereby substantiating that industry growth rates are reflective of the perfor-

mance and value addition by companies in the sector. Comparing the percentage errors due to both methods, the second method leads to an underestimation of value addition. On average, the error is negative (−0.74) with a lesser degree of variability across samples. In constructing the alternate method, the focus has been to use an indicator that is reflective of the business environment faced by the company in an industry, and to get an estimate that is closer to the actual contribution of the unavailable companies.

In practice, as in the case of CSO, the actual estimate of the unavailable companies for any given year is possibly unknown. In such a case, errors in estimation of levels will eventually translate into incorrect growth rates, thereby not reflecting the true picture of the sector. For instance, overestimation in a year would led to large revisions of the data in the following year as the actual data becomes available. Similarly, underestimation in a year and overestimation in a following would magnify and overstate the growth rates, where in fact, the true picture of the growth in respective industries may be unknown. Thus, in absence of data availability, choosing a method that is in part reflective of the business activities and provides estimates with a lower degree of error could greatly enhance the reliability of the estimates.

7 Issues in identifying manufacturing companies

The second key question is that are manufacturing companies being correctly identified? In the MCA21 database, the CSO relied on using CIN code to identify manufacturing companies. The decision to use CIN was made as the ITC-HS codes of products were either unreported or unavailable in the XBRL forms (CSO, 2015d). However, in absence of the ITC-HS codes, using CIN code can potentially lead to a misclassification of companies in identifying their business activity. This is primarily due to the fact that CIN, which contains the NIC classification, does not undergo a change once it has been created for a company. Over time, a company may change the nature of its business activity or diversify into any other sector. While doing so, the change of business activity is not reflected in the CIN code of the company. Thus, using CIN can be potentially misleading for identifying the nature of business of a company since its top revenue generating activity might be different from the one mentioned in its CIN code.

Also, the NIC classification undergoes a change over time as it is part of a systemic process of updation of industrial classification. This adds to the complexity of identification in two ways; first, changes in business activities of companies are independent of changes in NIC codes, and second, a particular NIC code may not reflect the same business activity over time. While the problem in using CIN code

was briefly raised in CSO (2015d), no systematic recourse was mentioned. To highlight this problem, Prowess database was used to construct a list of companies that were registered with CIN in manufacturing but had their main revenue generating product from a different economic activity. The list of companies is presented in Table 10.

Table 10: Business activity of companies with CIN registered in manufacturing (NIC 2008 2 digit classification code 10 - 33)

Industry activity (2 digit)	Number	Industry activity (2 digit)	Number
Trade in other manufactured goods	362	Financial services including leasing	328
Other asset financing services	279	Securities investment services	275
Renting services	163	Services	128
Software services	81	Commission agents services	76
Trade in electrical machinery	76	Trade in manufactured products	63
Trade in chemicals	59	Trade in minerals & energy sources	57
Real estate infrastructure services	54	Trade in transport equipment	49
Trade in drugs & medicines	48	Business services	43
Trading in food products	43	Trade in agricultural crops	40
Tech. Consultancy & Engg. serv.	31	Info. Tech Enabled Service/BPO	21
Hotel & restaurant service	22	Other Consultancy	17
Fund based financial services	19	Trade in non-electrical machinery	15
Finance related allied activities	15	Shipping services	13
Printing and related services	13	Research & development	10
Storage & warehousing services	11		

In the manufacturing sector, it is common to find that several companies operate as wholesale trading, financing, renting or as service providers in the name of manufacturing. A reverse problem could also exist, wherein companies registered in other economic activities may undertake manufacturing activities. Since the misclassification may lead to a distortion in the overall estimate, we compute the magnitude by estimating the GVA for such companies.

Table 11: GVA of companies with registered economic activity other than manufacturing, 2011-2012 (Rs. Crores)

Year	C_{wm}	GVA C_{wm}	C_{om}	GVA C_{om}
2011-12	539	17630.00	1083	173689.11

Table 11 shows the estimates of two categories of companies. C_{wm} denotes the number of wrongly classified companies, i.e. with registered CIN code in manufacturing but not having manufacturing as their primary activity, and C_{om} as the companies registered outside the manufacturing sector but having manufacturing as their primary activity. To visualize this in detail, we tabulate the break-up of GVA of such companies that may not get captured as part of manufacturing companies based on the NIC code contained in their company identification (CIN).

Table 12: Disaggregated GVA of companies with registered economic activity other than manufacturing, 2011-2012 (Rs. Crores)

Industry	Count	GVA
Transport equipment	142	43754.37
Machinery	162	40778.74
Base Metals	142	23438.58
Chemicals	117	17131.28
Food products, beverages & tobacco	65	10158.80
Non metallic mineral products	71	9494.67
Textiles	113	8378.18
Plastics and rubbers	67	6548.16
Mineral products	21	5412.47
Agriculture products	69	4270.52
Pulp and paper products	29	1532.36
Leather products	13	868.17
Fats & oils and derived products	19	835.02
Misc. Manufactured Articles	46	768.02
Wood products	5	227.96
Animal products	2	91.81
Total	1083	173689.11

The distortion in estimates due to misclassification can be substantial as indicated by the values of GVA. The classification problem is of crucial importance since it is equally difficult to identify the business activity of a company through its financial statements or registered economic activity. Instead, a more appropriate method is to scrutinize the product schedules to identify its primary activity and its top revenue generating product. The classification procedure requires a more careful and scientific approach to identify companies as it can distort the estimates significantly and bring in computational problems for future years.

The estimates of the overall sector are obtained as a sum of value addition in the organized and unorganized manufacturing sectors. The estimates of the unorganized manufacturing sector are computed from the data on Non-Corporate ASI and the final estimate of the sector is available with a lag of two years. Given the new method of computation using the MCA21, one can take note of the differences with the ASI method. First, the ASI approach continues to be based on the establishment approach, wherein the enumeration unit is a factory registered under the Factories Act. Second, entities falling under the unorganized sector are less likely to have revenues from diversified business activities, thus making the enterprise and establishment concept similar. However, in terms of computation, the GVA formula used in the ASI is more attuned to the concept of value addition as it clearly identifies the contributing items to output and costs; see for instance, block J, D &, G for outputs and blocks F, H, & I in ASI (2011). Given the complexity of fields in the XBRL format,

in order to make the shift from establishment to enterprise approach, it would be meaningful to first identify the fields similar to the establishment approach so as to clearly measure the outputs and inputs and further augment it to include fields that capture the value addition at the enterprise level. This distinction will also help in reconciling value addition in both organized and unorganized sectors, and in particular, account for the changes in business activities over time.

8 Conclusion

The release of the NAS 2015 presented the new 2011-12 series of macro aggregates after a comprehensive revision of methodology and data sources in many sectors. The new 2011-12 series also attracted attention as it presented a macro picture that, in general, did not conform to expectations and assessments of various stakeholders. Within the overall GDP, the general discontent with the estimates of the manufacturing sector was driven by the fact that large upward revisions in growth rates from 2011-12 were not reflective of the actual growth performance of the sector. Consequently, the official figures generated more questions than answers, and even as various stakeholders continued to engage in decoding the mystery behind the levels and growth rates, the debates and questions have not withered out.

On the questions of inconsistency and reliability of the estimates of the manufacturing sector, the literature at many places has overlooked the finer details of new definitions and dataset used for GVA computation. We use the information available in CSO (2015b) we recreate the estimation procedure to provide answers to two key questions in the debate. First, does the Paid-Up Capital based blow-up method lead to overestimation of GVA? and second, are manufacturing companies being correctly identified in the MCA21 dataset.

We use a CMIE Prowess as comparable dataset to MCA21 to estimate the levels of GVA for the manufacturing set of companies that file in the XBRL format in the MCA21. We also construct an alternate method of using representative industry growth rates to account for data of unavailable companies as a possible solution to avoid using the Paid-up capital factor. In a mapping of fields of the XBRL form and CMIE Prowess, we find that choice of revenue items to measure output can result into a considerable distortion in value of output at the firm level. Since the computation also includes revenues from several non-manufacturing activities, it can lead to overestimation of GVA as revenues from financial and other services cannot be taken to reflect the value arising solely out of manufacturing activities. On the cost side, a close scrutiny of the XBRL fields show omission of few important cost items, such as; Power & Fuel expenses, advertisement and marketing related ex-

penses. These components are significant for manufacturing and diversified companies and their omission can significantly underestimate costs, thereby leading to overestimation of GVA. While the new concept of estimating GVA is based on the enterprise approach, the process of identifying outputs and costs remains ambiguous and unclear.

We conduct a sample based exercise to understand the blow-up procedure and find that the blow-up factor is sensitive to Paid-up capital coverage and increases considerably with the variation in annual filing by companies. Since the GVA contribution for a firm can be negative for a particular year, the blow-up can lead to an overestimation as scaling up always contributes positively, whereas the actual contribution of a company may be negative. The addition due to blow-up also remains unpredictable, thereby leaving a scope for an error in estimation.

We propose an alternate method of scaling up by using representative industry growth rates of GVA to move forward the previous estimates of unavailable companies. We find that using the industry growth rate has an advantage over the PUC factor as it can capture the economic conditions faced by companies in different industries. The estimates moved forward using the growth rates closely resemble the actual contribution of unavailable companies, thereby making the estimates more reflective of the economic conditions of the sector. On average, the error in the PUC factor based method is positive and may vary considerably, while it is negative in the growth rate based method. We argue that this procedure can reduce the problem of overestimation and at the same time bring more predictability and reliability to the estimates.

We answer the second question by showing that misclassification of companies in the MCA21 dataset can be a potential source of distortion of the GVA estimate. It is well known that several companies operate as trading, financing or leasing companies in the name of manufacturing. This complicates the process of identifying the nature of business activity or the top revenue generating product of the company. The identification problem requires a scientific and consistent solution, especially when the present number is in excess of 10 lakh and new companies are added year on year. Lastly, for the purpose for preparing the national accounts, it is imperative that we get consistent and reliable data. However, in absence of data, one has to resort to alternative methods that can provide meaningful estimates. The focus in this paper has been to consider one such alternative method.

Overall, the findings have highlighted that there are contentious issues in the process of estimation and identification of companies, before we make a judgment on the sector's growth figures. After the estimation process has been replicated, a close scrutiny of the components of GVA provide the much needed insights into the new

series. Qualitatively, the findings also change our view about the value addition originating from the manufacturing sector. While the new enterprise approach is wider in coverage and on lines of the SNA, the points of focus are essentially on the items that make up for value of output and costs. Lastly, in the current scenario, there is limited availability of information on the MCA21 dataset and the actual estimation procedure. A detailed documentation by the CSO on the procedure of estimation is needed to bring more clarity and understanding of the estimates of the sector.

* * * * * * *

Appendix

A Mapping of XBRL fields with CMIE Prowess dataset

(See notes to variables in Section C for details and definitions)

S.No.		XBRL Fields: Production Account	Prowess Fields
1		**Market output** =	
2		(8) RevenueFromSaleOfProducts	Sales of Goods
3	Add	(9) RevenueFromSaleOfServices	Inc. from Raw Mat. & after sales services
4	Add	(43) MiscellaneousOtherOperatingRevenues	Inc. from scrap, Raw Mat., Job work, etc.
5	Add	(15) RevenueFromOtherFinancialServices	Dividends, Interest income, Other fee based services, hire-purchase, Bill discounting treasury operations, gain of forex trans.
6	Add	(47) RentalIncomeOnInvestmentProperty	Rent Income
7	Add	(66) IncomeFromPipelineTransportation	NA
8	Add	(60) IncomeOnBrokerageCommission	Brokerage, service fee
9	Add	(63) OtherAllowancesDeductionOtherIncome	Other non- operating income
10	Add	(64) MiscellaneousOtherNonoperatingIncome	Net Prior period & extra. ord. income
11	Add	(10) ExciseDuty	Excise duty
12	Add	(11) ServiceTaxCollected	Service tax
13	Add	(12) OtherDutiesTaxesCollected	Other indirect taxes
14	Minus	(21) ChangesInInventories...	Change in stock
15	Minus	(20) PurchasesOfStockInTrade	Purchase of finished goods
16	Minus	(19) CostOfMaterialsConsumed (for trade)	(for trade only)
17		**Output for own final use** =	
18	Add	(117) ExtractionCostPertainingToEAndPActivities	NA
19	Add	(119) GeologicalAndGeophysical..	NA
20	Add	(121) ResearchAndDevelopment..	Included in item (93)
21	Add	(122) PipelineOperationAnd..	NA
22	Add	(123) OtherExpenditure	NA
23		**(Taxes - subsidies) on products & imports** =	
24		(10) ExciseDuty	Excise duty
25	Add	(11) ServiceTaxCollected	Service tax
26	Add	(12) OtherDutiesTaxesCollected	Other Indirect taxes
27	Minus	(54) IncomeGovernmentGrantsSubsidies	Subsidies
28	Minus	(55) IncomeExportIncentives	Other Fiscal benefits
29	Minus	(61) IncomeOnSalesTaxBenefit	Sales tax & VAT benefits
30		**Intermediate consumption** =	
31		(19) CostOfMaterialsConsumed (for non-trade)	Raw materials, stores & spares
32	Add	(28) ExpenditureOnProductionEandPactivities	NA
33	Minus	(113) RoyaltyPertainingToEAndPActivities	NA
34	Minus	(114) CessPertainingToEAndPActivities	NA
35	Minus	(115) EducationCessPertainingToEAndPActivities	NA
36	Minus	(116) NationalCalamityContingency..	NA
37	Add	(29) OtherExpenses [=	
38		(83) Rent + (84) RepairsToBuilding + (85)	Rent & Lease rent
39		RepairsToMachinery + (86) Insurance + (92)	Repairs, Insurance premium paid
40		RatesAndTaxesExcludingTaxesOnIncome +	NA
41		(93) ResearchDevelopmentExpenditure + (94) InformationTechnologyExpenses +	R&D Expenditure
42		(95) DonationsSubscriptions + (96) TransportationDistributionExpenses +	Communication Exp.
43		(97) CostRepairsMaintenanceOtherAssets + (98)CostInformationTechnology +	Repair & Maintenance
44		(99) CostInsurance + (100) CostOctroi + (101) CostTransportation +	Selling & Dist. expenses
45		(102) CostLeaseRentals + (103) CostRoyalty + (104)	Included in Lease Rent
46		ProvisionBadDoubtfulDebtsCreated + (105)	Canceling
47		ProvisionBadDoubtfulLoansAdvancesCreated +	Canceling
48		(106) AdjustmentsToCarryingAmountsOfInvestments + (107)	NA
49		NetProvisionsCharged + (108) DiscountIssueSharesDebenturesWrittenOff +	Canceling
50		(110) WriteOffAssetsLiabilities + (111) LossOnDisposalOfIntangibleAsset +	Canceling
51		(112) LossOnDisposalDiscard..]	Canceling
52	Minus	(83) Rent	Rent
53	Minus	(91) ProvisionWealthTax	Prov. for Wealth Tax
54	Minus	(95) DonationsSubscriptions	Canceling
55	Minus	(103) CostRoyalty	Canceling
56	Minus	(104) ProvisionBadDoubtfulDebtsCreated	Canceling
57	Minus	(105) ProvisionBadDoubtfulLoansAdvancesCreated	Canceling
58	Minus	(107) NetProvisionsCharged	Canceling
59	Minus	(108) DiscountIssueSharesDebenturesWrittenOff	Canceling
60	Minus	(111) LossOnDisposalOfIntangibleAsset	Canceling
61	Minus	(112) LossOnDisposalDiscardDemolishment..	Canceling
62	Add	(74) CommissionEmployees	NA
63	Add	(82) OtherEmployeeRelatedExpenses	NA
64	Add	(69) OtherBorrowingCosts	NA

Source: CSO (2015b)

B Computation of GVA using XBRL fields

GVA formula based on Production approach

P1	**Output**
P.11	**Market Output including taxes**
	Sl. No. (8+9+43+15+47+66+60+63+64+10+11+12−21−20−19 (only for trade)
P.12	**Output for own final use**: Sl. No. (117+119+121+122+123)
P.13	**Output for non-market use– NIL**
D.21– D.31	**Taxes and Subsidies**: Sl. No.(10+11+12−54−55−61)
P2	**Intermediate Consumption** (IC)
	Sl. No.(19 (only for nontrade) + (28−113−114−115−116)+(29−83−91−95−103−104 −105−107−108−111−112)+74+82+69)
B1	**GVA: [P.11 + P.12 + P.13 − (D.21−D.31)]−P2**

Source: CSO (2015b)

Fields for computation of GVA using CMIE Prowess (Rs. Crore)

Items / Sub-items	Variable	2011-12 | Rs. Crore
1	**Revenue from sale of products**	**3455812.5**
1.1	Sales of goods	3455812.45
2	**Revenue from sale of services**	**10084.43**
2.1	Income from repairs, maintenance including after sales service	10084.43
3	**Misc. other operating revenues**	**301623.73**
3.1	Sale of scrap	9416.29
3.2	Sale of raw materials and stores	8673.86
3.3	Job work income	10947.36
3.4	Construction income	58320.79
3.5	Sale of electricity gas and water	26181.54
3.6	Other industrial sales	8998.01
3.7	Trading income	179085.88
4	**Rental Income on investment and property**	**870.16**
4.1	Rent income	870.16
5	**Revenue from other Financial service**	**59459.09**
5.1	Brokerage and financial service fees	31.36
5.2	Gain on securities transactions	10012.83
5.3	Gain relating to forex transactions	4597.5
5.4	Income from other treasury operations	17.09
5.5	Dividends	8398.71
5.6	Interest income	33383.29
5.7	Other fee based financial services	8.56
5.8	Bill discounting	0.23
5.9	Income from leasing, hire purchase and adjustment	3009.52
6	**Miscellaneous other Non-operating Income**	**5085.91**
6.1	Net Prior period and extra ordinary income	5085.91
A	**Value of Output**	**3832935.8**
7.	Change in Stock	38631.36
B	**Less: Change in stock**	**38631.36**
8	Indirect taxes	233717.26
9	**Less: Subsidies**	**139035.15**
9.1	Export incentives including duty draw back etc	7994.98
9.2	Fiscal benefits to oil companies	86761.59
9.3	Sales tax and VAT benefits	368.86
9.4	Other fiscal benefits and subsidies	43909.72
C	**Net Indirect taxes**	**94682.11**
10.1	Raw materials stores and spares	2099607.27
10.2	Purchase of finished goods	620023.56
10.3	Royalties technical know how fees, etc.	11792.28
10.4	Rent and lease rent	9212.21
10.5	Repairs and maintenance	28216.21
10.6	Insurance premium paid	3830.38
10.7	Selling distribution expenses	144010.74
10.8	Communications and IT services expenses	1514.32
10.9	Provision for Wealth tax	7.53
10.1	Research and development expenses	14096.06
D	**Intermediate consumption**	**2932310.6**
A−B−C−D	**Gross Value Added**	**767311.74**

C Notes and Variable description

C.1 Notes

- Fields denoted as 'NA' were not available in CMIE Prowess database.
- Presently, a detailed definition of fields of XBRL is not available. The meaning of a field can only be inferred from the heading and labels attached to it in the XBRL taxonomy available from the Ministry of Corporate Affairs (MCA) website. Some details about the fields can be obtained from Schedule - III , *General instructions for preparation of Balance Sheet and statement of Profit and Loss of a company*, Companies Act, 2013 and Guidance Note on the revised Schedule - VI, Companies Act, 1956.

C.2 Variable description

1. **Sales of Goods**: Income generated by companies from the sale of goods manufactured, or by sale of minerals extracted.
2. **Sale of scrap**: Income generated through the sale of scrap and waste and is defined as incidental residue from certain types of manufacture, usually of small amount and low value, recoverable without further processing
3. **Income from repairs, maintenance, including after sales service income**: Income earned by providing repairs and maintenance services. Repairs refer to restoring an asset to sound condition. Maintenance, on the other hand, refers to upkeep of property or equipment.
4. **Job work income**: Income generated by a company when it undertakes contractual manufacturing or processing of a product as per client's specifications.
5. **Sale of raw materials and stores**: Includes the sale of raw materials as well as sale of stores.
6. **Construction income**: Income earned by companies from construction and construction related activities.
7. **Sale of electricity, gas and water**: Income from electricity and gas related activities can be in the form of sale of electricity, meter hire charges, wheeling charges, other electricity service charges, sale of piped natural gas, sale of

compressed or liquefied natural gas, sale of industrial gases, gas transmission, gas service and fitting.

8. **Other industrial sales**: Included in Sales of Goods.
9. **Rent income**: Rent earned by companies by letting out their land or other properties.
10. **Brokerage and financial service fees**: Includes commission on foreign exchange transactions and income from money changing business.
11. **Trading income**: Income generated from the activity of buying and selling of goods.
12. **Net Prior period and extra ordinary Income**: Refers to incomes pertaining to prior periods such as recovery of bad debts and provisions written back. Expenses in the current period as a result of errors or omissions in the preparation of the financial statements of one or more prior periods are classified as prior period expenses. In computation, the net value is taken as income minus expenses.
13. **Gain on securities transactions on sale of investments**: Includes profits earned by the company from sale of investments, Buyback of equity shares, Buyback of other securities and other transactions involving securities and investments.
14. **Gain relating to forex transactions**: Profits on account of fluctuation in foreign exchange rates.
15. **Income from other treasury operations**: Provisions for diminution in investment written back and profit on revaluation of investments.
16. **Income from Dividends**: Income earned on instruments like equity shares, mutual funds, preference shares, etc. It also includes income from dividends from subsidiary companies.
17. **Interest income**: Income earned from lending money. This includes interest earned by banks, NBFCs and others from the loans and advances made by them, interest earned by them from deposits with RBI and from other inter-bank balances and interest earned by any company from loans extended to others including their subsidiaries, joint ventures, etc.
18. **Other fee based financial service including profit on securitisation of assets and loans**: Sum of income in the form of profit on securitisation of assets and income from financial services other than broking and bill discounting. These could include roll-over charges, cheque collection charges of banks, income

from custodial services, depository services, transaction charges or portfolio management fees, etc.

19. **Bill discounting**: Income from transactions on bills of exchange, promissory notes, etc. after deducting some amount from the face value of the bill as discounting charges.

20. **Income from leasing, hire purchase, lease adjustment**: Income from leasing and hire purchase income, lease equalisation adjustment, share of profit in partnership firms/subsidiaries/ joint ventures other companies.

21. **Indirect taxes**: Indirect taxes reported are excise duties, sales tax or value added tax, custom duties, service tax, municipal/local tax, octroi/entry tax, stamp duty, luxury tax or any other kind of indirect tax levied by the central, state or local governments.

22. **Sales tax and VAT benefits**: Monetary benefit obtained by the companies from sales tax authorities, such as set off against its sales tax liability and where the set off amount is greater than the sales tax liability, the company may show the excess set off as an income.

23. **Other fiscal benefits and subsidies**: Fiscal benefits other than export incentives, duty draw back, benefits derived by oil companies from the government and sales tax benefits.

24. **Fiscal benefits to oil companies**: Benefits announced by Government of India's deregulation policy of pricing & distribution of petroleum products for dismantling of administered price mechanism (APM).

25. **Export incentives including duty draw back, etc**: Includes duty drawbacks, excise rebates, import licenses, concession in import duty and tax exemptions under the Income Tax Act.

26. **Change in stock**: Defined as change in stock of finished and semi-finished goods less opening stock of finished and semi-finished goods.

27. **Raw materials, stores, spares**: Sum of the expenses incurred on (a) raw materials and on (b) stores, spares and tools consumed. They also cover sundry supplies, maintenance stores, components, tools, jigs, and other similar equipment.

28. **Purchase of finished goods**: Includes purchase of finished by manufacturing companies, besides selling their own products.

29. **Royalties, technical know-how, etc.**: Sum total of Royalty, Technical know-how fees and License fees.

30. **Rent, lease rent, etc.**: Includes all types of rent, lease rents, finance lease rents and operating lease rent.
31. **Repairs and maintenance, etc.**: Sum of Repairs and maintenance of buildings, plant and machinery, vehicles and others.
32. **Insurance premium paid, etc.**: Amount of insurance premium paid on the assets of the company, on goods in transit and on key persons of the company.
33. **Selling and distribution expenses**: Expenditure on advertising, marketing and distribution.
34. **Communications expenses**: Cost incurred by the company on telephone, telegram, postage, fax, satellite, Internet services and other information technology services.
35. **Wealth tax**: Provision for tax on the benefits derived from ownership of property. The tax is paid on the same property on its market value, whether or not such property yields any income.
36. **Research and development expenses**: Current expenses incurred and reported by the company on research and development. It does not include any capital expenditure on research and development
37. **Paid up equity capital**: Paid up equity capital of the company.

D GVA in the Manufacturing sector, 2001-02–2014-15

GVA of XBRL filing companies 2002-2015, (Current prices, Rs. Crore)

	Year	Output	Net Taxes	Int. Cons.	GVA	Count	Gr. rate
1	2001-02	786059.38	80415.32	503834.99	201809.07	2894	-
2	2002-03	893296.28	81477.88	602864.4	208954	2943	3.54
3	2003-04	1038973.6	94867.1	681966.27	262140.23	2928	25.45
4	2004-05	1266802.57	108892.44	879184.74	278725.39	3068	6.33
5	2005-06	1497085.69	120444.56	1075733.25	300907.88	3298	7.96
6	2006-07	1864666.41	134918.24	1322344.78	407403.39	3351	35.39
7	2007-08	2187870.82	140227.6	1559260.42	488382.8	3601	19.88
8	2008-09	2481138.44	75514.28	1827775.64	577848.52	3807	18.32
9	2009-10	2677288.33	120570.92	1962169.86	594547.55	3800	2.89
10	2010-11	3217555.54	142367.53	2432173.89	643014.12	3545	8.15
11	2011-12	3798458.31	109695.63	2930897.15	757865.53	3479	17.86
12	2012-13	4194934.27	129829.73	3255367.85	809736.69	3465	6.84
13	2013-14	4317499.38	156324.06	3294421.66	866753.66	3073	7.04
14	2014-15	3923854.14	208869.57	2858576.69	856407.88	2186	−1.19

GVA of XBRL filing companies based on NIC 2008 (10-33) classification, 2002-2015, (Current prices, Rs. Crore)

	Year	Output	Net Taxes	Int. Cons.	GVA	Count	Gr. rate
1	2001-02	695580.16	71549.67	435245.09	188785.4	2430	-
2	2002-03	779648.69	70834.96	517120.7	191693.03	2445	1.54
3	2003-04	891914.67	79574.82	571881.89	240457.96	2412	25.44
4	2004-05	1074405.26	86775.28	734833.41	252796.57	2601	5.13
5	2005-06	1256628.41	89227.91	889379.05	278021.45	2789	9.98
6	2006-07	1537352.69	96681.43	1074845.19	365826.07	2838	31.58
7	2007-08	1828748.45	98006.28	1285960.19	444781.98	3072	21.58
8	2008-09	2070944.77	15591.45	1540208.92	515144.4	3250	15.82
9	2009-10	2218512.45	74708.81	1596091.28	547712.36	3268	6.32
10	2010-11	2653159.24	91007.66	1977049.37	585102.21	3076	6.83
11	2011-12	3127739.71	57595.23	2385915.33	684229.15	3017	16.94
12	2012-13	3455694.75	78945.9	2632457.78	744291.07	3010	8.78
13	2013-14	3645458.84	111350.47	2734001.77	800106.6	2684	7.50
14	2014-15	3264340.47	167792.18	2323662.07	772886.22	1915	−3.40

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