Issues in Estimation of GVA in the Manufacturing sector

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Outline: What do we do?

Look at the nominal aggregate

- Study and recreate the process of GVA estimation in the manufacturing sector
- Identify two problems areas:
  - Blow-up of GVA estimates
  - Classification of Manufacturing companies
- Construct an alternate method of blowing up of GVA
- Summarize the results
- Take away: Points to consider

Background: What changed in the Manuf. sector?

Methodology and Data sources

- Compliance with recommendations of SNA (2008)
- Goldar Comittee report provided the road map for GVA estimation of the Pvt. Corporate Sector
- MCA21 data for Private Corporate Sector, instead of RBI study of company finances
- Shift from *Establishment* to *Enterprise* approach
- New formula and data from computing GVA

Manuf. GVA: Sources and Methods

2004-05 and 2011-12 series

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

- Data coverage has increased with the introduction of MCA21 - 10 Lakh companies
- **Establishment** approach captures data at the factory level
- **Enterprise** approach captures activities of head offices, ancillary and post manufacturing activities such as; marketing and other related services

New series: Key observations

Change in composition of value addition in Manf. sector

- A higher growth rate for the manufacturing sector with the new base year
- Sub-sector GDP growth rates do not match with the related high frequency proxy data
- Manufacturing sector now includes value addition from related/ancillary manufacturing activities

Key concepts for GVA estimation:

- Filing in MCA21 is done in two formats: Form 23ACA and XBRL
- XBRL is for a company if (i) Listed or (ii) has Paid-Up Capital more than 5 Cr. or (iii) has Turnover more than 100 Cr.
- Form 23ACA is for companies not qualifying in XBRL
- **Active set** - a company is considered active if it has filed in MCA21 atleast once in the past 3 financial years
- Economic activity classification - Identification is based on ITC-HS product codes reported by the company.
- If unreported, NIC codes in the 21 digit Company Identification Number (CIN) are used

GVA computation:

Using financial data from CMIE Prowess

- We pick the XBRL filing companies - major contributor to the total GVA
- Such companies have a good representation in CMIE Prowess
- Fields and formula for GVA computation taken from Goldar Committee Report
- An actual XBRL filing of a company was downloaded from MCA 21
- Mapped the fields at two levels:
  - Mapping of XBRL fields to the GVA formula given in Goldar Committee Report
  - Mapping of XBRL fields to fields in Prowess
- Constructed an active set of companies for comparability with the XBRL filing companies

Representation of companies

MCA21 and CMIE Prowess

Number and GVA of companies in XBRL and Form 23ACA in MCA21, 2011-12

Sector	XBRL Count	GVA Rs. Cr.	23ACA Count	GVA Rs. Cr.	Total MCA21
Manufacturing	12,682	8,41,623	1,23,120	1,38,522	9,80,145
Manufacturing (XBRL companies) (Prowess)	3,017	6,84,229			

Issue - I: Differences due to the enterprise approach

- ASI used *Sales* as an output measure (2004-05 series)
- MCA21 uses *disaggregated revenue* items as an output measure (2011-12 series)
- Disaggregated revenue includes incomes from non-manufacturing activities
- Capturing different activities under 'one roof'
- Does it explain the divergence between volume and value based indicators?

Differences in GVA values

Choice of output as Sales Vs. Sales + Other income

- Difference in GVA values with Sales and disaggregated revenue as a measure of output

Period	GVA Based on Sales (Rs. Cr.)	Gr. Rate (%)	GVA Based on disaggregated revenue (Rs. Cr.)	Gr. Rate (%)	Difference (Rs. Cr.)
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

- Sum of disaggregated revenue is close to total income of the company
- Two reason for increase in GVA values
  - First: Higher output
  - Second: Lower intermediate costs

Key issues in components of GVA

What should be we worried about?

- We observe items that add to revenue, but not to costs
- Example: Power and Fuel expenses
- Example: Advertising, Marketing expenses

Problem - I: Blow-up using PUC factor

- CSO uses a Paid up Capital (PUC) Factor to blow up available GVA to account for non available companies
- PUC factor is calculated as inverse of the ratio of PUC of available companies to active companies
- GVA of available companies is multiplied by PUC factor
- *Issue*: GVA of a company for a given year may be negative
- Sample based exercise to understand this in detail

Blow up of GVA: PUC factor method

Sample	C_A	C_a	Sample % of C_A	P_a (Rs. Cr.)	P_A (Rs. Cr.)	PUCF $\left(\frac{1}{\frac{P_a}{P_A}}\right)$	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	137817.46	137817.46	1.000	757865.53	757865.53	0.00	0.00
2	3479	3306	95	130677.18	137817.46	1.050	707834.26	746510.75	-11354.80	-1.49
3	3479	3132	90	123905.48	137817.46	1.110	686168.47	763210.76	5345.20	0.71
4	3479	2958	85	119500.48	137817.46	1.150	656858.21	757541.14	-324.40	-0.04
5	3479	2784	80	100094.75	137817.46	1.380	593849.73	817653.89	59788.30	7.89
6	3479	2610	75	101511.97	137817.46	1.360	552675.97	750339.08	-7526.42	-0.99
	Avg.								9185.576	1.216
	SD								29013.02	3.826

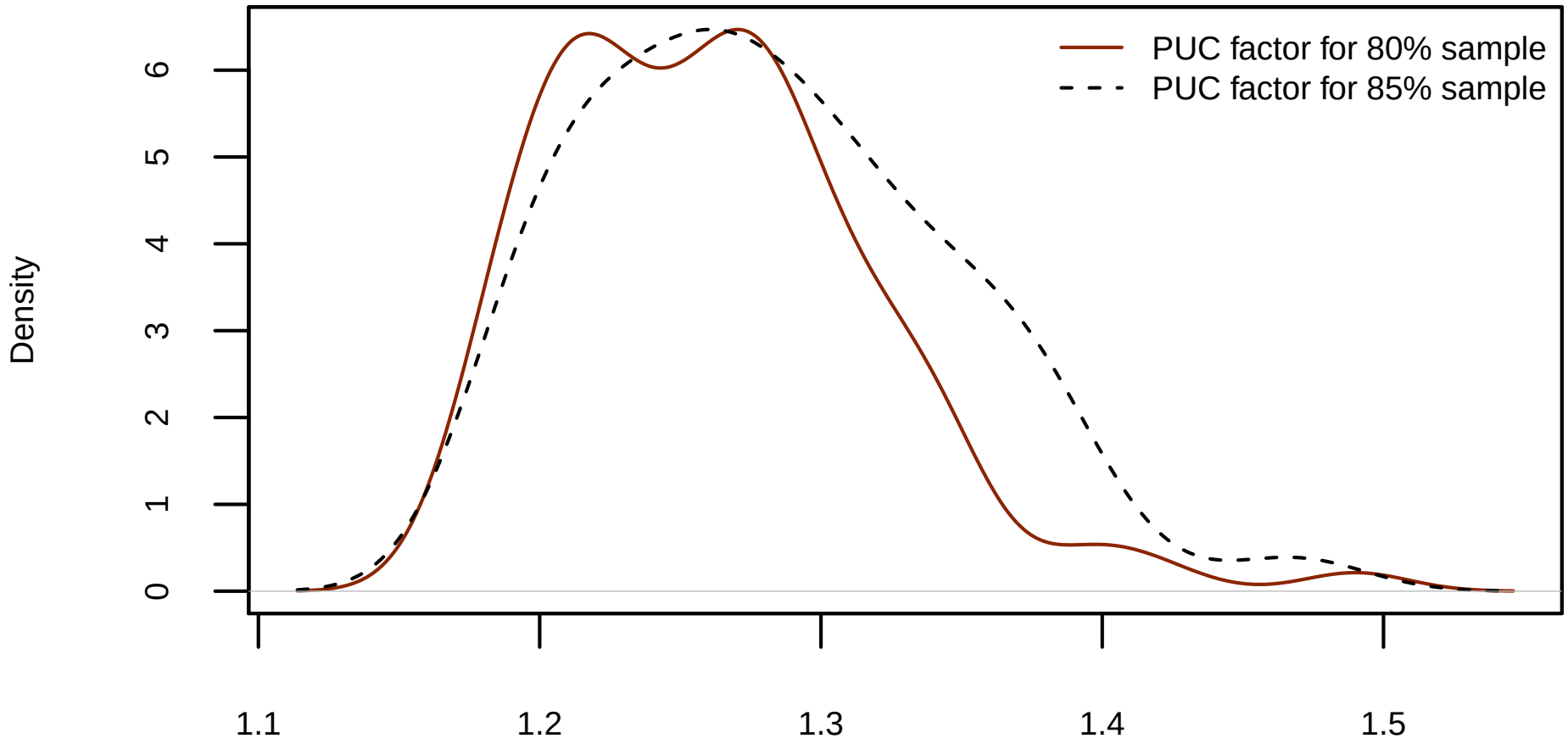
- Compare the addition due to blown-up for each PUC coverage
- Blow-up factor increases with lower PUC coverage
- The addition due to blow-up shows large variations
- Size distribution of PUC and GVA also confirms this fact

Simulation: Variation in PUC factor

100 samples for 80 and 85% coverage

- **Example**: Pick 80 and 85% PUC coverage

Density plot for Paid-Up Capital factor



Issues with PUC based Blow-up of GVA

- Blow-up is based on scaling up *available* GVA
- Blow-up can lead to overestimation, particularly in cases where the GVA contribution of the company is negative
- Blow-up factor is sensitive to Paid-up capital coverage and increases considerably given the variation in annual filing
- Distribution of GVA and PUC shows no one-to-one correspondence
- Small number of large companies majorly contribute to GVA

Blow-up: Alternate method

Based on industry wise GVA growth rates

- Using representative industry growth rates of GVA instead of Paid-Up Capital factor
- Industry growth rates are more representative of the economic conditions
- Method already in practice to move several benchmark indicators for other sectors
- Identify the industry based on the economic activity of the company
- Use a 3 year moving average of levels of GVA to compute industry growth rate
- To move forward the last available GVA estimate of the unavailable company by the respective year's growth rate

Scaling up: Steps

- **Example**: Sample in which 80% companies are available
- For the missing companies, identify the last available GVA in the past 3 years
- Aggregate the GVA for the number of companies available in each industry for each year
- For each industry in each year, apply the respective growth rate to move it forward by one year
- Continue the process till the current year (2011-12)
- Add the scaled up GVA to available GVA to get the overall estimate

Blow-up using Industry GVA Gr. rate

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
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							**152583.24**

Key findings: Blow-up using industry growth rates

- Using representative industry growth rates of GVA shows lesser variability of the error
- Sample based exercise shows that the scaling-up is close to the actual value of GVA of missing companies
- Better to use past values of GVA than Paid-Up Capital for scaling-up

Problem - II: Classification of Manuf. companies

CIN codes can be misleading

- CSO uses CIN code to identify the economic activity of companies filing in MCA21
- CIN is 21 digit unique number assigned to the companies at the time of formation, eg: L**28920**MH1945PLC004520
- This can be misleading as the economic activity and the registered NIC code may be different
- CIN for a company does not change with a change in business activity
- NIC codes change from time to time, eg: NIC 2004, 2008

Potential mis-classification of firms using CIN Code

No. of firms with CIN registered in Manufacturing activities but are services companies

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		

Mis-classification...

No. of firms with CIN registered in Non-manufacturing activities but are manufacturing companies

Industry activity	Count	Industry activity	Count
Misc. Manufactured Articles	424	Cement	13
Tea	79	Coffee	12
Drugs, medicines & allied products	27	Maintenance of buildings	12
Jewelery of gold	26	Articles of iron & steel	10
Drug formulations	25	Automobile ancillaries, etc.	10
Other entertainment activities etc.	25		
Wind energy-based electricity	23		
Automobile ancillaries	22		
Sugar	22		
Cloth (Fabrics)	21		
Cotton yarn	20		
Jewelery	20		
Apparels (Ready made garment)	17		
Management consultancy services	16		
Merchant / investment banking services	16		

Findings: What do we know?

- Choice of output measure can lead to significant difference in value of GVA
- Blow-up factor is sensitive to Paid-up capital coverage and increases considerably given the variation in annual filing
- Blow-up can lead to overestimation as it always contributes positively, whereas the actual contribution of a company may be negative
- Using representative industry growth rates of GVA to move the last available GVA estimates of unavailable companies can be an alternative to the existing PUC factor based blow-up method
- Using CIN codes for classifying companies in MCA21 can lead to a potential misclassification
- Identification requires looking into product schedules and main revenue generating product

Take away: Points to consider

Need a understand the composition of GVA

- Choice of Sales or Sales + Other incomes as a measure of output
- Re-look at the component of costs
- Dispensing with the PUC factor based blow-up
- Industry GVA growth rates can be used to scale up previous GVA of unavailable companies
- Need a scientific method for identifying and classifying companies in MCA21

Thank you

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Tables

Size distribution of GVA and Paid-up Capital, 2011-12

1	2	3	4	5	6	7	8
PUC.Range (Rs. Cr.)	No. of Companies	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

Industry wise GVA growth rates, 2008-09 to 2011-12

3 year moving average of GVA by industry (Rs. Crore) and corresponding growth rates (Current Prices)

Industry	GVA 08-09	GVA 09-10	GVA 10-11	GVA 11-12	Gr. % 09-10	Gr. % 10-11	Gr. % 11-12
Agriculture 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 & products	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 products	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 products	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