Exploring an Alternative Index of Industrial Production

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Abstract

The present article proposes to construct the Index of Industrial Production by adopting a methodology that is different from the approach which has been in vogue since long. The alternative methodology centres around selection of all registered manufacturing units above certain employment size criterion and building up the index based on the total value of production by the selected factories after deflating them to a constant price. It has been demonstrated based on the data of Annual Survey of Industries for the latest three years that this alternative methodology captures the growth rate in industrial production in a much better manner.

1. Introduction

1.1 In the absence of any monthly or quarterly surveys on industrial sector, Index of Industrial Production (IIP) becomes a very important statistical indicator to measure the short-term growths in industrial production of the country. In fact, growth rates based on the monthly IIP are keenly watched and monitored by the planners and policymakers as well as by the business community at large. Further, quarterly/annual growth rates as revealed by the IIP are used in the compilation of provisional estimates of quarterly and annual GDP by registered manufacturing sector till detailed survey results based on Annual Survey of Industries (ASI) become available.

1.2 The present IIP is being compiled with 2004-05 as the base year[2]. Many a times, concerns have been raised about the accuracy of the growth rates as revealed by the IIP. Quite a few studies conducted in the past point out the mismatch in growth rates of industrial production between the IIP and ASI[3]. The present article suggests the compilation of an alternative IIP adopting a methodology that is likely to capture the growth rates of industrial production for the registered manufacturing sector in a much better way.

2. Shortcomings with the Existing Approach

2.1 A major shortcoming of the existing approach is the divergence of the growth rate (GR) based on IIP with the same according to ASI. Estimates of GR based on ASI are likely to be robust, at least for the registered manufacturing sector as a whole, given the large sample size and a sound sampling procedure adopted in the ASI[4]. **Table 1** and **Charts 1.1**

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[2] A decision has already been taken to switch over to 2011-12 as the new base period for which the preparatory work is in progress. Report of the Working Group for Development of Methodology for Compilation of the All-India Index of Industrial Production with Base Year 2009-10 / 2011-12 is available in www.mospi.nic.in.

[3] See, for example, Manna (2013), A Study of Cross-validation of Growth Rates of Industrial Production Based on IIP and ASI for Some Important Item-groups, The Journal of Industrial Statistics (2013), 2 (1), 83-95.

[4] A sample of about 60,000 factories, out of a total of little more than 200,000 factories in the frame, is selected in each year of ASI after stratifying the units according to their number of employees.

to 1.3 present alternative GRs emanating from IIP and ASI for six industrial categories and registered manufacturing sector as a whole for three years namely, 2009-10 till 2011-12. GRs as per the ASI have been derived after deflating the total estimated value of products and by-products manufactured for each NIC 2-digit/industry and all industries combined[5] by corresponding deflators based on WPI, i.e., after converting the production figures at 2008-09 price. For all the three years divergence between the alternative GRs is alarmingly high, with ASI reporting a much higher GR. For the year 2011-12, two alternative GRs differ by as high as 11.9 percentage points.

2.2 For GDP calculations, initially, IIP-based GR is used for the registered manufacturing sector. Subsequently, with the availability of results based on ASI at a later stage, the initial figures are revised by using the estimates of gross value added based on ASI. **Table 2** shows the percentage change in the GDP estimates between the first 'Revised Estimate' (RE) using the IIP figures and the second RE that uses the results of ASI for the years 2010-11 and 2011-12. It may be seen that with the use of ASI-based estimates, the increase in the GDP estimates at constant (2004-05) price is as high as 5 to 6% for the registered manufacturing sector and it is of the order of about 0.6% for the overall GDP, which is not insignificant given the current levels of growth of the Indian economy.

2.3 In the existing method of compiling IIP, which is consistent with the international recommendations, first an item basket comprising important items in terms of their share in overall production of each industry / NIC 2-digit is finalized based on the data of base year of IIP. Thereafter, for each item, a sample of factories i.e. major units producing the item in the base year is drawn for collecting monthly production data (mostly in terms of quantity) for the item. Then for the purpose of calculation of the index/IIP, Laspeyres method is used to multiply the quantity relatives of total quantities of current period in relation to the base year period with appropriate weights at the item level, and finally, these are added to derive the index. One limitation of the existing approach is its inability to include new units for the purpose of reporting of data – particularly the large ones with major production – that may be coming up in the economy subsequently after the year selected as the base period. Another limitation with the current IIP series is that for some of the 'item-groups', the number of factories in the panel reporting the monthly production data seems to be not representative of the universe either in terms of number of factories in the panel or in terms of their share in the overall output for the given item-group. As per the study of Manna (2013) referred earlier, out of 92 important item-groups studied, for as many as 19 item-groups, the units in the panel had a share of less than 10% only of total estimated output for the item-group as per ASI 2009-10.

3. The Proposed Methodology of Compiling Alternative IIP

3.1 The alternative methodology that we propose basically involves the steps as follows: **one,** selection of cut-off in terms of total number of employees in the factory for each NIC 2-digit so that the contribution of the selected factories with employee size exceeding or equal to the cut-off in total value of products and by-products manufactured in the given NIC 2-digit is quite substantial (at least 75%) as per ASI 2011-12 coinciding

[5]For the remaining industry/NIC codes, the relevant deflators based on WPI are not readily available.

with the proposed new base year; **two,** collection of data on monthly production in value/ monetary terms considering all products and by-products manufactured by the factory (in place of quantity figure of the selected item only as per the existing practice) from all the units in the country[6] qualifying the stated cut-off criterion within each NIC 2-digit; **three,** deflating the monthly total value figures of production of the factories at NIC 2-digit level by corresponding WPI deflators to convert them to constant (base year) price; **four,** deriving the production relative for each NIC 2-digit; and **five,** obtaining the weighted average of the production relatives as the alternative IIP with weights being the percentage share of the NIC 2-digit in the overall gross value added (GVA) by the entire registered manufacturing sector according to the ASI[7].

3.2 **Chart 2** and **Table 3** present percentage shares of factories with different employment size classes (ESC) in total production as per ASI 2011-12. It may be seen that for many NIC codes, ESC of 100+ has a substantial share (more than 77%) in the overall production. However, for NIC codes 16, 18, 22, 31 and 33, ESC of 30+ can probably capture a significant share of production. As per the methodology described in the previous paragraph, finally proposed ESCs for different NIC codes with a view to constructing the alternative IIP are indicated in column 6 of Table 3. The consequent workload to be involved in the collection of production data in terms of number of factories can be seen from column 7 of Table 3. It is needless to mention that although by lowering the ESC, a higher share in overall production can be captured, but the same would involve additional workload in terms of increase in number of factories that may become unmanageable.

4. Testing the Proposed Methodology

4.1 The methodology suggested in paragraph 3.1 to compile the alternative IIP has been tested by taking into account the data for the latest four years of ASI (2008-09 till 2011-12) and by deriving the alternative IIP and corresponding annual growth rates (GRs) in production. This has involved the use of annual estimated production of different ESCs for various years at NIC 2-digit level and use of the weighting diagram with 2008-09 as the reference point. **Table 4** and **Charts 3.1 to 3.3** summarize the findings. It may be seen that as compared to the GRs based on the current IIP, the GRs approximated by the alternative methodology are much closer to the ASI-based estimates.

5. Concluding Remarks

5.1 The alternative IIP as per the proposed methodology is likely to reflect the true behaviour of industrial growths since it takes into account the production data of factories having significant share in the overall production for each NIC 2-digit. Unlike the existing IIP derived by considering the quantity figures, the alternative IIP based on value figures would capture the quality and price differentials of products in a much better manner.

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[6] This list is to be built up by considering the list of factories as per the ASI frame to be supplemented with other eligible units, if any, as per the alternative sources like the sixth Economic Census and lists maintained by the CBEC, Department of Industrial Policy & Promotion and Ministry of Corporate Affairs.

[7] For the purpose of deriving weighting diagram, it would be preferable to use average of consecutive three years' GVA with base year as the mid-point (after converting them to a constant price) instead of using only the base year's data to smoothen the fluctuations in the estimates of GVA at NIC 2-digit level.

Further, the methodology proposed for compiling the alternative IIP permits inclusion of new and large units that may be coming up in the economy in the subsequent periods for reporting the data on production. And finally, the growth rates based on the alternative IIP are likely to be in fair agreement with those based on the ASI.

5.2 The alternative IIP reflecting the growth of industrial production for the registered manufacturing sector will, as usual, be integrated suitably with the indices for mining and electricity sectors to derive the overall alternative IIP. The alternative IIP so obtained can be dovetailed with the index for the MSME (Micro, Small and Medium Enterprises) sector being contemplated with due weights to derive the overall index and the consequent growths of industrial sector of the Indian economy.

5.3 From Table 4, it may be worth noting that considering total output (i.e. including receipts other than value of manufactured products and by-products) and total GVA in real terms as per the ASI, although growth rate in GVA perfectly matches with the growth rate in total output for the year 2009-10, the alternative growth rates differ quite significantly for the succeeding two years with growth rate in GVA being substantially lower[8].

5.4 One limitation of the alternative IIP is its inability to estimate growth rates in production at the item-group/product level or by the 'use-based' classification of products that has been in vogue since long[9]. However, given the extent of volatility in the growth rates of production at the item-group level, this should not be a guiding factor to discard the alternative approach which has, otherwise, got many distinct advantages as deliberated in this article. It is needless to mention that the compilation of alternative IIP is constrained by the availability of WPI deflators at NIC 2-digit level. And the same needs to be ensured in the greater interest of strengthening the database of the Indian Statistical System.

6. Acknowledgement

6.1 The author acknowledges with thanks the valued support by Shri Sudipta Bhattacharya, Deputy Director, Central Statistics Office, Industrial Statistics Wing, Kolkata for providing the requisite tabulation of data based on ASI. The author is also thankful to the referee for his comments on the draft of this article.

[8] With increasing adoption of outsourcing, growth in GVA may fall short of growth in output because with outsourcing GVA may go down even if output remains the same. Increasing use of imported materials, parts and components in manufacturing may lead to fast growth in output, even though GVA does not grow proportionately.

[9]Another practical difficulty could be in terms of collection of data from so many (38,000 and odd) units on a monthly basis. This problem may be tackled with web-enabled data collection system.

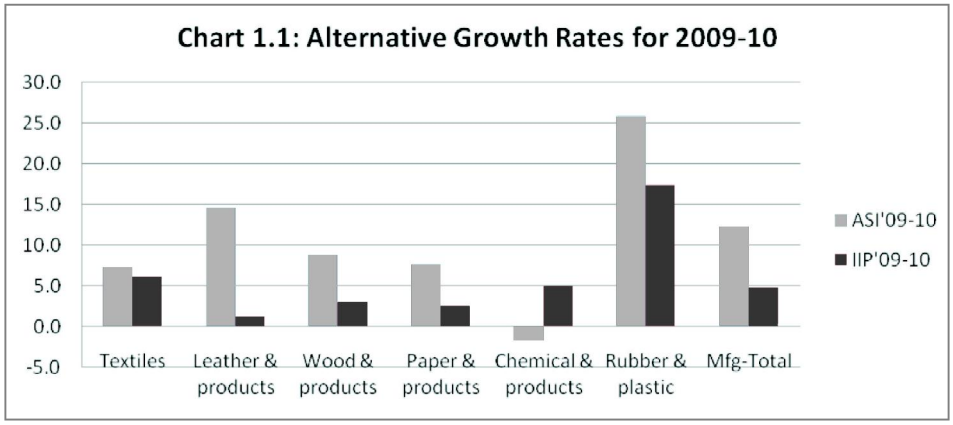
Chart 1.1: Alternative Growth Rates for 2009-10
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Textiles
Leather & products
Wood & products
Paper & products
Chemical & products
Rubber & plastic
Mfg-Total
ASI'09-10
IIP'09-10

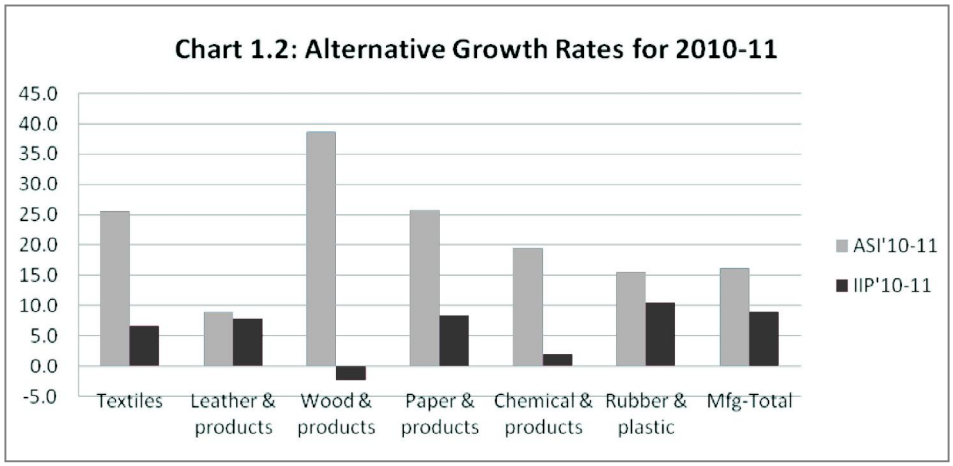
Chart 1.2: Alternative Growth Rates for 2010-11
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Textiles
Leather & products
Wood & products
Paper & products
Chemical & products
Rubber & plastic
Mfg-Total
ASI'10-11
IIP'10-11

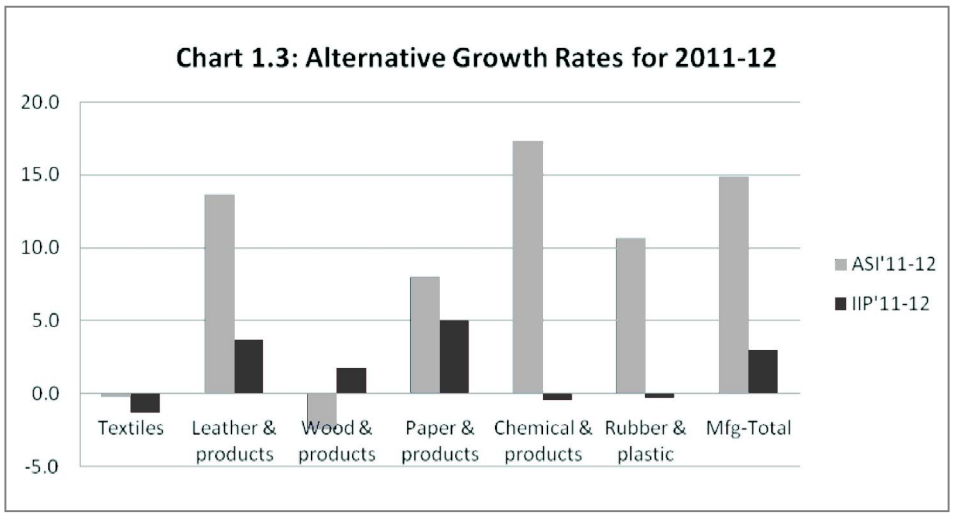
Chart 1.3: Alternative Growth Rates for 2011-12
20.0
15.0
10.0
5.0
0.0
-5.0
Textiles
Leather & products
Wood & products
Paper & products
Chemical & products
Rubber & plastic
Mfg-Total
ASI'11-12
IIP'11-12

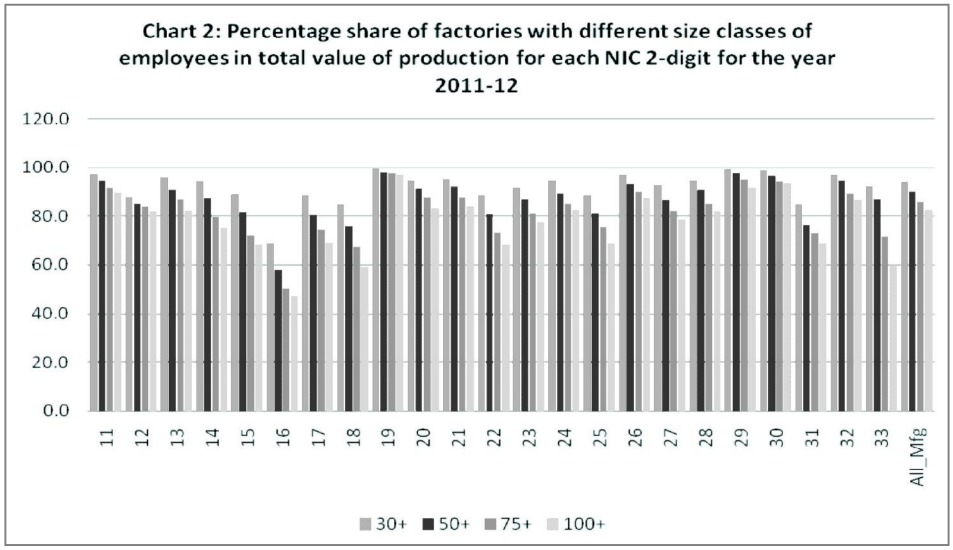
Chart 2: Percentage share of factories with different size classes of employees in total value of production for each NIC 2-digit for the year 2011-12
120.0
100.0
80.0
60.0
40.0
20.0
0.0
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 All_Mfg
30+ 50+ 75+ 100+

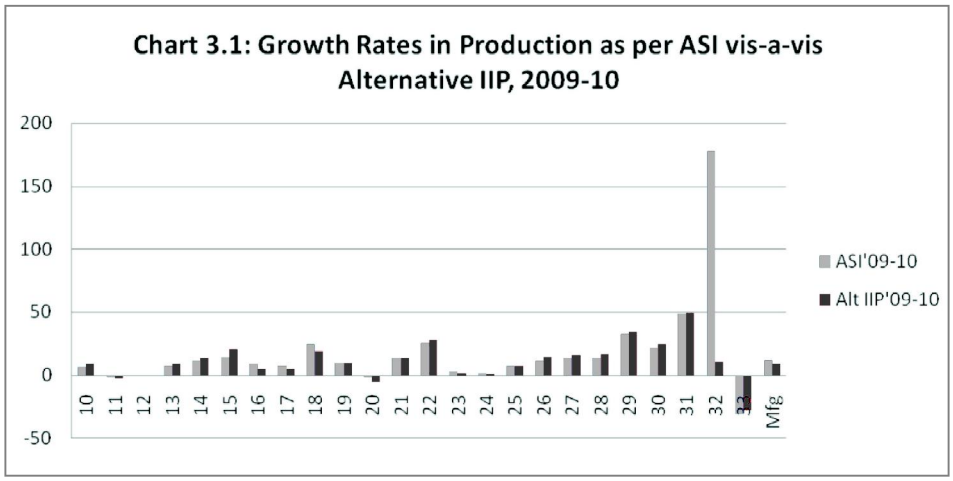
Chart 3.1: Growth Rates in Production as per ASI vis-a-vis Alternative IIP, 2009-10
200
150
100
50
0
-50
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 Mfg
ASI'09-10
Alt IIP'09-10

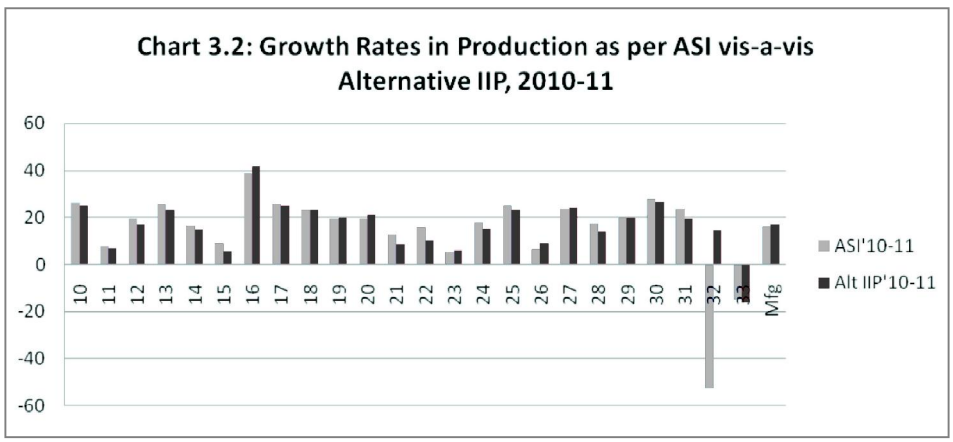
Chart 3.2: Growth Rates in Production as per ASI vis-a-vis Alternative IIP, 2010-11
60
40
20
0
-20
-40
-60
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 Mfg
ASI'10-11
Alt IIP'10-11

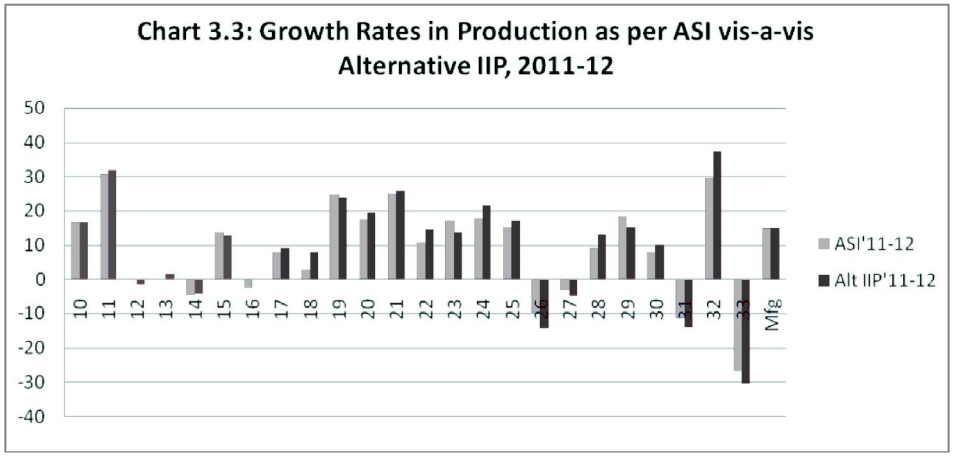

Table 1: Alternative Growth Rates of Industrial Production as per IIP and ASI

NIC 2008	Description (Manufacture of)	Divergences in the annual growth rates (%) of industrial production as per IIP and ASI					
		2009-10		2010-11		2011-12	
		IIP	ASI*	IIP	ASI*	IIP	ASI*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
13	Textiles	6.1	7.3	6.7	25.6	-1.3	-0.2
15	Leather & products	1.3	14.5	8	9.0	3.7	13.6
16	Wood & products	3.1	8.8	-2.2	38.7	1.8	-2.5
17	Paper & products	2.6	7.6	8.5	25.7	5	8.0
20	Chemical & products	5	-1.7	2	19.4	-0.4	17.3
22	Rubber & plastic	17.4	25.7	10.6	15.5	-0.3	10.7
10-33	**All manufactured products**	**4.8**	**12.3**	**8.9**	**16.2**	**3.0**	**14.9**

* At 2008-09 price

Table 2: Change in the GDP Estimates for Use of ASI-based Estimates in Place of IIP

Sector	2010-11				2011-12			
	GDP as per the 1st RE (Rs. Cr.)	GDP as per the 2nd RE (Rs. Cr.)	% Change due to the use of latest		GDP as per the 1st RE (Rs. Cr.)	GDP as per the 2nd RE (Rs. Cr.)	% Change due to the use of latest	
			Data of all sources	ASI data only			Data of all sources	ASI data only
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				At 2004-05 price				
Mfg-reg.	532219	559407	5.11	5.11	573761	607589	5.90	5.90
Mfg-unreg.	241943	242069	0.05	0.00	249262	246509	-1.10	0.00
Mfg	774162	801476	3.53	3.51	823023	854098	3.78	4.11
All (GDP)	**4885954**	**4937006**	**1.04**	**0.56**	**5243582**	**5247530**	**0.08**	**0.65**
				At current price				
Mfg-reg.	720376	760650	5.59	5.59	848734	885547	4.34	4.34
Mfg-unreg.	319969	320100	0.04	0.00	353352	350635	-0.77	0.00
Mfg	1040345	1080750	3.88	3.87	1202086	1236182	2.84	3.06
All (GDP)	**7157412**	**7266967**	**1.53**	**0.56**	**8353495**	**8391691**	**0.46**	**0.44**

Table 3: Share of Different Employment Size Classes of Factories in Total Production

ASI: 2011-12

NIC	% Share of Different Employment Size Classes of Factories in Total Production				Selected Employment Size Class*	Estimated no. of factories in the Selected Size Class
	30+	50+	75+	100+		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
10	84.4	77.3	71.3	65.5	50+	6,878
11	97.0	94.3	91.4	89.1	50+	542
12	87.4	84.9	83.7	81.5	75+	646
13	95.4	90.3	86.5	82.0	100+	3,085
14	93.9	87.1	79.5	74.9	50+	3,224
15	88.4	81.2	71.8	68.0	50+	1,293
16	68.5	57.8	50.2	46.8	30+	467
17	88.3	80.3	74.3	68.9	50+	933
18	84.7	75.7	67.2	59.1	30+	1,248
19	99.3	97.6	97.2	96.7	100+	206
20	94.4	91.2	87.5	82.7	100+	1,556
21	94.8	91.7	87.5	83.8	100+	1,210
22	88.3	80.6	73.1	67.9	30+	3,499
23	91.4	86.6	80.8	77.1	100+	1,885
24	94.4	89.0	84.8	82.4	100+	1,995
25	88.3	80.8	75.2	68.5	50+	2,634
26	96.5	93.1	89.6	87.0	100+	607
27	92.6	86.5	82.0	78.4	75+	1,422
28	94.5	90.4	84.9	81.6	100+	1,435
29	98.7	97.4	94.8	91.5	100+	1,496
30	98.2	96.3	94.1	93.1	100+	471
31	84.6	76.0	72.9	68.5	30+	321
32	96.6	94.5	88.9	86.5	100+	695
33	91.7	86.9	71.4	59.6	30+	254
Mfg	**93.8**	**89.5**	**85.6**	**82.3**	--	**38,002**

* Selected by considering both share in total output and additional workload involved in terms of no. of factories

Table 4: Alternative Growth Rates of Industrial Production

NIC 2008	Wt. Diag. (ASI:	SSC	Growth Rates (%) in Industrial Production								
			Current IIP*			ASI			Alternative IIP**		
			2009-10	2010-11	2011-12	2009-10	2010-11	2011-12	2009-10	2010-11	2011-12
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
10	6.308	50+				6.9	26.1	16.5	8.6	24.8	16.6
11	1.777	50+				-1.7	7.9	30.7	-2.2	6.9	31.8
12	1.586	75+				-0.5	19.5	0.1	0.3	17.1	-1.6
13	4.715	100+	6.1	6.7	-1.3	7.3	25.6	-0.2	9.1	23.1	1.6
14	2.087	50+				11.4	16.6	-4.5	13.7	14.8	-4.1
15	0.675	50+	1.3	8.0	3.7	14.5	9.0	13.6	20.5	5.8	12.7
16	0.172	30+	3.1	-2.2	1.8	8.8	38.7	-2.5	4.9	41.5	-0.2
17	1.455	50+	2.6	8.5	5.0	7.6	25.7	8.0	5.1	24.9	8.9
18	0.791	30+				25.2	23.3	2.6	19.3	23.2	7.9
19	13.012	100+				10.0	19.3	24.5	9.9	19.8	23.7
20	9.496	100+	5.0	2.0	-0.4	-1.7	19.4	17.3	-5.3	21.2	19.4
21	5.969	100+				13.6	12.7	25.0	13.5	8.6	25.7
22	3.561	30+	17.4	10.6	-0.3	25.7	15.5	10.7	27.7	10.2	14.4
23	7.038	100+				2.9	5.2	17.1	1.5	6.1	13.7
24	14.445	100+				1.8	17.8	17.6	0.8	15.1	21.5
25	3.366	50+				7.7	24.8	15.2	7.4	23.0	17.1
26	3.151	100+				11.2	6.5	-9.6	14.1	8.9	-14.2
27	4.419	75+				13.4	23.5	-3.0	16.2	24.1	-4.8
28	7.205	100+				13.9	17.4	9.0	16.8	14.1	13.1
29	4.738	100+				33.2	19.9	18.3	34.6	19.9	15.0
30	2.407	100+				21.7	27.9	8.0	24.6	26.4	9.8
31	0.209	30+				48.6	23.5	-11.4	49.7	19.4	-13.9
32	1.013	100+				178.1	-52.4	29.6	10.8	14.5	37.2
33	0.405	30+				-30.9	-14.8	-26.8	-27.6	-16.1	-30.5
Mfg	**100**		**4.9**	**8.9**	**3.0**	**12.4**	**15.9**	**14.9**	**9.3**	**17.0**	**14.7**
Mfg: Growth rate in total output in real terms						**11.6**	**18.5**	**15.2**			
Mfg: Growth rate in total GVA in real terms						**11.6**	**12.0**	**10.4**			

* Presented only for 5 industry codes corresponding to NIC 2004 Codes 17, 19, 20, 21, 24 and 25 having concordance with NIC 2008 Codes 13, 15, 16, 17, 20 and 22 respectively for which corresponding WPI deflators are available to convert ASI output figures at constant (2008-09) price.

**For NIC 2008 codes other than 13, 15, 16, 17, 20 and 22 and for the entire manufacturing sector, WPI for all manufactured products has been used for constructing the index.