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## **A Step-by-step Guide to Compile IIP**

**1. Introduction:** A comprehensive guideline in the form of a brochure detailing the scope, coverage and methodological issues relating to selection of item basket and weighting diagram had been prepared by CSO (IS Wing) and the same was circulated to all the States/UTs in the zonal workshops for state IIP. It is understood that most of the State/UTs have now finalized their item basket and weighting diagram and some states have also started data collection for compilation of state IIP. Although the formula (Laspeyres) and the compilation procedure were given in the brochure, it was felt necessary to prepare a more detailed and comprehensive guideline on the compilation methodology. It is with this objective, this document is prepared which leads the user through the compilation process in a step-by-step manner with example. Presentation of the IIP after its compilation is also mentioned in brief.

**2. Procedure of compilation in brief:** The construction of IIP starts with the collection of basic production data relating to the items (item-groups) selected in the item basket. The basic production data are then combined using weights to produce data for the 4-digit class of NIC-2004. The subsequent upper levels, above the 4-digit class, of IIP are constructed by combining the lower levels using weights. That is, 4-digit NIC classes are combined to form 3-digit NIC groups, 3-digit NIC groups are combined to form 2-digit NIC divisions, 2-digit NIC divisions are combined to form 1-digit NIC sections (Mining, Manufacturing and electricity) and finally, these sections are combined to form the general Index. Diagram 1 gives a schematic diagram of how the IIP is compiled at stages.

**3. Step-by-step procedure to compile IIP:** The example below demonstrates the process to compile a monthly IIP using the Laspeyres approach. It shows the calculation of IIP for the first two months. Each step of this example to compile IIP includes a description of the process/step as well as illustration of the process with the use of data. **Box-1** presents the raw data that is used throughout the example. The data used in this example are purely hypothetical and used only for explaining the steps.

**Box-1: The basic factory-level data**

Factory srl. no.	NIC code	Item	Quantity of production		
			T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>
1	1511	A	120	150	165
2	1512	B	152	143	152
3	2402	D	202	250	270
4	1511	A	180	195	190
5	2401	C	150	175	200
6	2402	E	210	200	190
7	1512	F	50	60	65
8	2401	C	22	25	28
9	1512	F	115	110	120
10	1512	B	80	100	120

**Step 1:** The first step is to obtain and organize the necessary data from which IIP is to be constructed. Any imputation of missing data also occurs at this stage.

The quantity of production data presented in Box-1 represent the monthly data for 6 items (pertaining to 4-digit NIC class)

viz. A, B, C, D, E and F collected from 10 establishments (factories). The 6 items pertains to four distinct 4-digit NIC-2004 classes, say, 1511, 1512, 2401, and 2402. These 4-digit NIC classes are aggregated in line with NIC 3-digit groups to 151 and 240 respectively and then NIC 2-digit divisions 15 and 24 respectively.

The periods T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> are defined as:

T<sub>0</sub>: Reference Month-0 (say, April 2004) of base year 2004-05 and is calculated as the monthly average of the base year production.

T<sub>1</sub>: Reference Month-1, i.e., April 2005 of current year (2005-06, say), and

T<sub>2</sub>: Reference Month-2, i.e., May 2005 of current year (2005-06, say).

**Step 2:** The second step is to consolidate the item-wise production data given for the reference months T<sub>0</sub>, T<sub>1</sub> and T<sub>2</sub>. For example, Item-A is produced by two factories with serial numbers 1 and 4, and taken together, the production for the three months is to be calculated. Then, record item-level weights obtained already in a separate column. Item-level weights (w<sub>i</sub>) are the weights obtained from the weighting diagram already prepared. This is done in Box-2.

**Box-2: Data aggregated by item (item group)**

Item	NIC code	Weight in base year	Quantity of production		
			T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>
A	1511	50	300	345	355
B	1512	105	232	243	272
C	2401	40	172	200	228
D	2402	35	202	250	270
E	2402	150	210	200	190
F	1512	80	165	170	185

**Step 3:** The third step is to calculate the production relatives (R<sub>i</sub>) for each item i using the data from Box-2. The production relative R<sub>i</sub> for the i-th item is calculated by using the formula

$$R_i = Q_{i1} / Q_{0i}$$

Where Q<sub>i1</sub> is the quantity produced of

i-th item in the current month ( $T_1, T_2$ ), and  $Q_{0i}$  is the quantity produced of item  $i$  in the same month in the base year ( $T_0$ ).

This is done in Box-3. Column No. 5 and 6 give the production relatives for the months  $T_1$  and  $T_2$  respectively for each item. The production relatives at item-level are then combined with item-level weights to give the index at 4-digit level of NIC-04 using the formula

$$I = \frac{\sum W_i R_i}{\sum W_i} \dots\dots\dots(**)$$

Where  $I$  is the index,  $R_i$  is the production relative for the  $i$ -th item and  $W_i$  is the corresponding weight.

As only one item has been selected from the 4-digit classes 1511 and 2401 each, the production relatives/indices for these classes are same as that of the products (A and C respectively). However, in case of industry classes 1512 and 2402, which have more than one item, the indices are calculated using the formula given in (\*\*) and the same are shown as highlighted rows in Box-3.

**Box-3: Relatives and weights by items/ NIC 4-digit classes**

Item	NIC code	Weight in base year (wi)	Quantity of production			Production Relative	
			T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>1</sub> R <sub>i</sub>	T <sub>2</sub> R <sub>i</sub>
		[1]	[2]	[3]	[4]	[5]=[3]/[2]	[6]=[4]/[2]
A	1511	50	300	345	355	1.150	1.183
B	1512	105	232	243	272	1.047	1.172
F	1512	80	165	170	185	1.030	1.121
	<b>1512</b>	<b>185</b>				<b>1.040</b>	<b>1.150</b>
C	2401	40	172	200	228	1.163	1.326
D	2402	35	202	250	270	1.238	1.337
E	2402	150	210	200	190	0.952	0.905
	<b>2402</b>	<b>185</b>				<b>1.006</b>	<b>0.986</b>

**Step 4:** Indices calculated at 4-digit classes in Box-3 are combined with corresponding weights to give indices at 3-digit groups using the formula given in (\*\*). This is done in Box-4. Similarly indices calculated at 3-digit groups in Box-4 are combined to give indices at 2-digit divisions in Box-5 using the formula (\*\*) and finally the indices at 2-digit divisions from Box-5 are combined to give index of manufacturing sector. This is done in Box-6. In this particular example, Box-5 is practically not required as each of the two 2-digit divisions (15 and 24) has only one 3-digit group under it and hence indices at 2-digit and 3-digit level calculated in Box-4 and Box-5 respectively, came out to be same. But in a real situation such cases are less likely and

hence Box-5 has been calculated to maintain generality. The indices calculated at each level in each Box are highlighted.

**Box-4: Aggregating the indices at 4-digit classes to 3-digit groups**

NIC code	Weight in base year (wi)	Index at 4-digit level		Index * Weight	
		$T^1_{Ii}$	$T^2_{Ii}$	$T^1_{Ii} * wi$	$T^2_{Ii} * wi$
	[1]	[2]	[3]	[2] * [1]	[3] * [1]
1511	50	1.150	1.183	57.500	59.167
1512	185	1.040	1.150	192.400	212.750
<b>151</b>	<b>235</b>			<b>1.063</b>	<b>1.157</b>
2401	40	1.163	1.326	46.512	53.023
2402	185	1.006	0.986	186.110	182.410
<b>240</b>	<b>225</b>			<b>1.034</b>	<b>1.046</b>

**Box-5: Aggregating the indices at 3-digit groups to 2-digit divisions**

NIC code	Weight in base year (wi)	Index at 3-digit level		Index * Weight	
		$T^1_{Ii}$	$T^2_{Ii}$	$T^1_{Ii} * wi$	$T^2_{Ii} * wi$
	[1]	[2]	[3]	[2] * [1]	[3] * [1]
151	235	1.063	1.157	249.900	271.917
<b>15</b>	<b>235</b>	<b>1.063</b>	<b>1.157</b>	<b>1.063</b>	<b>1.157</b>
240	225	1.034	1.046	232.650	235.350
<b>24</b>	<b>225</b>	<b>1.034</b>	<b>1.046</b>	<b>1.034</b>	<b>1.046</b>

**Box-6: Aggregating the indices at 2-digit divisions to the manufacturing sector**

NIC code	Weight in base year (wi)	Index at 2-digit level		Index * Weight	
		$T^1_{Ii}$	$T^2_{Ii}$	$T^1_{Ii} * wi$	$T^2_{Ii} * wi$
	[1]	[2]	[3]	[2] * [1]	[3] * [1]
15	235	1.063	1.157	249.805	271.895
24	225	1.034	1.046	232.650	235.350
<b>Mfg</b>	<b>460</b>			<b>1.0488</b>	<b>1.1027</b>

**Step 5:** Finally the summary of indices at different level of NIC-2004 is given in Box-7 by multiplying the respective indices obtained from Boxes-4, 5 and 6 by 100.

**Box-7: Summary of indices at different level of NIC**

NIC-04	Index of Industrial Production (IIP)		
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>
1511	100.0	115.0	118.3
1512	100.0	104.0	115.0
2401	100.0	116.3	132.6
2402	100.0	100.6	98.6
151	100.0	106.3	115.7
240	100.0	103.4	104.6
15	100.0	106.3	115.7
24	100.0	103.4	104.6
Mfg	100.0	104.9	110.3

**Step 6:** The manufacturing sector index obtained in Box 6 are the combined with the indices of mining and electricity data to arrive at the general IIP using the sectoral weights.

**4. Presentation of the IIP:** The following presentation principles may be followed for an IIP:

- Index numbers may be presented to one decimal place.
- Changes between month-to-month (e.g. May 2005 over April 2005) and change from the same month one year earlier

(e.g. May 2005 over May 2004) are to be presented.

- Index number for the base year is to be taken as 100, and that for all subsequent periods are the percentages of the value for the base period.
- The main contributors to change should be presented to the user, i.e. those items or industries that are primarily responsible for the monthly movement in the IIP.
- Consistent presentation and reporting practices should be followed over time.
- Data should be accompanied by the methodological explanation.

**Diagram 1: Index Structure by level**

