Ministry of Statistics and Programme Implementation (MoSPI)

National Statistics Office (NSO)

Discussion Paper 1.0: Substitution of Factories in the Compilation of the Index of Industrial Production (IIP) with Base Year 2022–23

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1. Introduction:

The Ministry of Statistics and Programme Implementation (MoSPI) is currently undertaking a base year revision of the Index of Industrial Production (IIP) with the objective of improving sectoral representation, updating item weights, refining factory coverage, and incorporating methodological enhancements to strengthen the quality, accuracy, and reliability of the index.

Presently the IIP is compiled and released every month based on production data received from 14 source agencies, covering 407 items/item groups under Mining, Manufacturing, and Electricity sectors. The revision of the IIP base year to 2022–23 is being undertaken in alignment with the base year revision of the National Accounts, ensuring consistency across key macroeconomic indicators.

To make the new IIP series more robust, representative, and policy-relevant, MoSPI invites views and suggestions from domain experts, statisticians, academic institutions, industry bodies, Central Ministries, State/UT Governments, and other stakeholders on the proposed methodology for substitution of factories during the currency of the IIP series. This paper outlines the current challenges and proposed alternative methodology to address issues arising from the closure, or operational changes in the reporting units (factories), which may affect the continuity and representativeness of the IIP series.

2. Background

The Index of Industrial Production (IIP) measures short-term changes in the volume of industrial output in India, serving as a key indicator of activity in the **Mining, Manufacturing**, and **Electricity** sectors. Released monthly by MoSPI, it also disseminated indices on use -based categories viz. Primary Goods, Capital Goods, Infrastructure/Construction goods, Intermediate Goods, Consumer Durables and Consumer Non-Durables.

The IIP is compiled using the **Laspeyres index formula**, which incorporates three essential elements:

- **Base year weights**: Sector level weights are derived from the Gross Value Added (GVA) as reported in the National Accounts Statistics for the base year. The weights for

the 2-, 3-, and 4-digit levels of NIC are derived from the GVA estimates based on the Annual Survey of Industries (ASI) for the base year. Item/item group level weights are derived from the Gross Value of Output (GVO) estimates based on ASI for the base year.

- **Base year production data**: Production data (in volume /values) of items in the base year, used as a benchmark for comparison.
- **Current production data**: Monthly production data of the items collected from the selected factories through designated source agencies.

3. Why substitution is required?

Presently, the compilation of the Index of Industrial Production (IIP) relies on a fixed panel of factories selected based on the base year to represent industrial activity across various sectors. Over time, certain factories in the sample may experience operational disruptions, such as:

- Permanent closure,
- Change in the production line,

these concerns regarding factory closures and the consequent need for substitution have been frequently raised by the State Directorates of Economics and Statistics (DES), which are responsible for the compilation of the State-level IIP. Generally, the base year of the IIP is revised periodically; however, when there is a significant gap between revisions, such issues tend to arise e.g. over time, in the current series the weight of the closed factory comes to about 8.9% of the index. This situation poses challenges for maintaining the continuity of the IIP series. Continuing with factories that are no longer operational or no longer represent actual production leads to increased dependence on estimation or imputation methods. To address these challenges, substitution of factories has become necessary which involves replacing the permanently closed factory/factory change the production line with a suitable substitute that produces the same item/item group, ensuring continuity in the data series.

However, substitution raises important methodological issues, including:

- When will Substitution be performed?
- How to Identify factory for substitution?
- How the indices will be computed after substitution?

This discussion paper proposes the methodology for substitution of factories.

4. Proposed methodology

The matter of factory substitution in the compilation of the Index of Industrial Production (IIP) has been extensively discussed in the Technical Advisory Committee (TAC) constituted by the Ministry of Statistics and Programme Implementation (MoSPI). Further, during International Monetary Fund (IMF) Technical Assistance mission, this issue was deliberated in detail with experts to take a comprehensive view on the most appropriate methodology for substitution.

Experts felt that given that since IIP is a volume index weighted by base year GVA or GVO shares using a Laspeyres index methodology, it may inaccurately capture true production in instances where factories may change their production lines or fold up and be replaced by newer production capacities. In an era of disruptive innovations where Industry 4.0 structures can get phased in, it is important to build in needed flexibility in rightly capturing the production structures without compromising data integrity in any way. TAC noticed that often the production lines undergo changes where very near product substitutes of better quality with higher value additions replace the earlier products but due to fixed panel of factories not only is the new production remained uncaptured but the existing sample production falls to zero as the process of creative destruction takes place towards modernization of the industry. It is for this reason that international statistical practices actually adopt substitution of factories as a legitimate practice in computing volume indices with a rule-based methodology for the same. The TAC-IIP has favoured adoption of these standard international practices as a means of improvement in the IIP compilation methodology. After thorough examination, the following methodology is proposed for substitution of factories in the IIP compilation process.

4.1. When will Substitution be performed?

The substitution of a factory in the IIP framework is initiated based on monitoring of the factory's reporting status and operational condition. The process is triggered under the following conditions:

- If a factory reports zero production for three consecutive months, it raises concerns about the operational status of the unit.
- Production data is not reported by factory for continuous three month.

Verification by Source Agency

Upon such non-reporting/zero reporting, the source agency must confirm the actual status of the factory, specifically:

- Whether the unit is still operational or running,

- If yes, then whether the factory has changed its line of production,
- Or whether the zero production is due to temporary reasons such as maintenance, seasonal shutdowns, or other short-term factors.

In cases where a factory temporarily suspends production, it is not substituted in the IIP panel of factories. The unit continues to remain in the sample, and the reported production value for the reference period is recorded as submitted by the reporting factory. In most instances, the reported value during the temporary closure period is zero, reflecting the absence of production activity. This approach ensures that short-term fluctuations in industrial output, due to temporary shutdowns, are accurately captured without altering the sample composition. However, if the source agency confirms that the unit has either closed down permanently or changed its line of production, the substitution process is initiated.

4.2. Identification of factory for substitution

Factory for substitution will be selected from the latest ASI data, with following criteria

- ✓ Substitute factory must produce the same item or item group.
- ✓ GVA/GVO of new substituted factory to be nearer to original factory
- ✓ There should be common Operation period of 12-Month with the old factory
    - *This overlapping data is essential to calculate the Substitution Factor and ensure smooth adjustment of production data.*

4.3. Adjustment Factor calculation:

The production data of the substituted factory will be adjusted by the adjustment factor, which will be calculated by using formula mentioned below:

$$\text{Adjustment Factor (AF)} = \frac{\text{Average 12 overlapping months Production of New Factory}}{\text{Average 12 overlapping months Production of Old Factory}}$$

4.4. Adjustment of Production data of New substituted factory

$$\text{Adjusted Production of New factory} = \frac{\text{Reported Production new factory production}}{\text{Adjustment Factor (AF)}}$$

The new factory replaces the old one in the dataset. However, every month after substitution, the production of new factory is to be adjusted by using the adjustment factor before using for index compilation which is compiled by using Laspeyres index formula.

5. Operational Aspect

Substitution of a factory is implemented once the closure/change in production-line is officially confirmed by the source agency. After confirmation, 12 months of overlapping production data from the replacement unit are required for incorporation into the index. Until such overlapping data are obtained, 'nil' or imputed values may temporarily be used in the series. Consequently, depending on the timing, a few months of 'nil' production may appear before substitution is reflected.

Example:

Suppose five factories were identified for a particular item "A", from which data has been collected since the base year 2022-23. Subsequently, during the three consecutive months of October, November, and December 2027, Factory No. 4 not reported production data or reported zero production. Upon verification, it was found that the factory had either ceased operations (that's why not reported) or changed its line of production (that why reported zero production). Accordingly, Factory No. 4 requires substitution.

Let us assume that the period from October 2026 to September 2027 serves as the common 12-month reference period during which both the old and the new factories were operational and produced the same item or item group. Let **t**he average production during this common period is 11,000 units for the new factory and 9,600 units for the old factory, respectively. Then adjustment factor will be calculated by as under:

$$\text{Adjustment Factor (AF)} = \frac{\text{Average 12 overlapping months Production of new substituted Factory}}{\text{Average 12 overlapping months Production of Old Factory}}$$

$$= \frac{(\text{Oct 2026 to Sep 2027}) \text{for new substituted } Factory}{(\text{Oct 2026 to Sep 2027}) \text{ for old Factory}}$$

$$= 11000/9600$$

$$= 1.14583$$

Case 1: Production data is not reported by factory for continuous three month and source agency imputed production values by repeating the last reported value by the old factory.

Adjustment of production data will be done as under:

Factory/month	**Oct-27**	**Nov-27**	**Dec-27**	**Jan-28**
Factory 1	5600	5700	5800	5900
Factory 2	14300	14500	14800	14400
Factory 3	24600	24800	24700	24200
Factory 4 (**with imputed value)**	7000	7000	7000	7000
Factory 5	17000	17200	17300	17100
Item 'A' Total production	68500	69200	69600	68600
New Substituted Factory (Actual production)	10600	10800	11500	11200
Adjusted production of New Substituted Factory (Actual/AF)	9251	9425	10036	9775
Item 'A" Total production incl. New Substituted Factory	70751	71625	72636	71375

The item-level index, with and without substitution of factories-

Now, assume base year (2022-23) average monthly production, monthly production data for the item 'A' for the period October 2026 to January 2027 are as under:

	Base year Production	**Oct-26**	**Nov-26**	**Dec-26**	**Jan-27**		**Oct-27**	**Nov-27**	**Dec-27**	**Jan-28**
Item level Production data	44600	67700	68100	68700	68000	……..	68500	69200	69600	68600

*Oct 27 to Jan-28 production is without substitution

Then Index of item 'A' for October 2027 to January 2028 with and without substitution of factories will be as under:

Item Level Index	**Oct-26**	**Nov-26**	**Dec-26**	**Jan-27**	**Oct-27**	**Nov-27**	**Dec-27**	**Jan-28**
Without Substitution of Factory	151.8	152.7	154.0	152.5	153.6	155.2	156.1	153.8
With Substitution of Factory					158.6	160.6	162.9	160.0
Index growth Without Substitution					1.2	1.6	1.4	0.9
Index growth With Substitution of Factory					4.5	5.2	5.8	4.9

Case 2: Factory reported zero production for three consecutive months and source agency takes the production as reported by factory i.e. zero

Adjustment of production data will be done as under:

Factory/month	**Oct-27**	**Nov-27**	**Dec-27**	**Jan-28**
Factory 1	5600	5700	5800	5900
Factory 2	14300	14500	14800	14400
Factory 3	24600	24800	24700	24200
Factory 4 (**out)**	0	0	0	0
Factory 5	17000	17200	17300	17100
Item 'A' Total production	61500	62200	62600	61600
New Substituted Factory (Actual production)	10600	10800	11500	11200
Adjusted production of New Substituted Factory (Actual/AF)	9251	9425	10036	9775
Item 'A" Total production incl. New Substituted Factory	70751	71625	72636	71375

The item-level index, with and without substitution of factories-

Now, assume base year (2022-23) average monthly production, monthly production data for the item 'A' for the period October 2026 to January 2027 are as under:

	Base year Production	**Oct-26**	**Nov-26**	**Dec-26**	**Jan-27**		**Oct-27**	**Nov-27**	**Dec-27**	**Jan-28**
Item level Production data	44600	67700	68100	68700	68000	……..	61500	62200	62600	61600

*Oct 27 to Jan-28 production is without substitution

Then Index of item 'A' for October 2027 to January 2028 with and without substitution of factories will be as under:

Item Level Index	**Oct-26**	**Nov-26**	**Dec-26**	**Jan-27**	**Oct-27**	**Nov-27**	**Dec-27**	**Jan-28**
Without Substitution of Factory	151.8	152.7	154.0	152.5	137.9	139.5	140.4	138.1
With Substitution of Factory					158.6	160.6	162.9	160.0
Index growth Without Substitution					-9.2	-8.7	-8.9	-9.4
Index growth With Substitution of Factory					4.5	5.2	5.8	4.9

A similar exercise was conducted on two cases where the adjustment factor was less than 1, i.e., the average production during the overlapping period of the new factory was lower than that of the old factory. However, no significant differences were observed in the results.

6. Conclusion and Request for Comments

This paper has outlined the proposed methodology for factory substitution during the currency of the IIP series, including the rationale and potential implications. While the proposed methodology has been carefully reviewed and the paper has been shared publicly to promote transparency and allow stakeholders to review and comment on the proposed methodology. Early feedback is essential to ensure that the final approach is well-informed, robust, and broadly supported.

The feedback/comments are invited on the proposed methodology for substitution of factory in IIP compilation in the new series and may be sent at iipcso@nic.in by **25th November, 2025.**