Chapter 1 - Objectives and Main Characteristics of the Industrial Production Index (IPI)

The industrial production index (IPI) is a statistical indicator used to measure monthly changes in the output of French industry at an early stage. The IPI is one of France's oldest statistical indicators, the first index (using 1913 as the base year) having been calculated in 1924. The index has been published with 2015 as the base and reference year since March 2018.

1- Objectives of the Industrial Production Index

The industrial production index has traditionally been seen as one of the most important indicators for measuring economic activity. It is used in particular to identify turning points in the economic cycle at an early stage.

1.1- A Tool for Tracking Industrial Activity at an Early Stage

The industrial production index is a short-term monitoring tool made quickly available (approximately 40 days after the end of the month). The index is constructed from surveys (the "Monthly branch surveys") of industrial and non-industrial enterprises (trade, transport and services) engaged in industrial activities. The monthly branch surveys are designed to measure the productive activity of enterprises and, more specifically, the volume of industrial output. Although "industrial production index" is used as a generic term, particularly for industry or manufacturing as a whole, the index actually covers several hundred indices at different levels of detail.

The IPI is designed to measure changes in industrial output but not the level of output. It is based on the concept of indices as measures or magnitudes to be interpreted relative to a specific reference (i.e. a year in the case of the IPI) and not in absolute terms. Thus, for example, the index for a given month (m) with 2015 as base and reference year provides information on the status of industrial activity relative to the average monthly production observed in 2015. The advantage of an index-based approach is that changes in production within different families of industrial products can also be compared (with all families being standardised to 100 on average in the reference year).

To be able to analyse cyclical changes, monthly changes in the indices are adjusted for seasonal and working-day effects.

1.2- What Does the Notion of French Industry Actually Cover?

Drawing on the traditional classification of economic activities divided into three sectors, the industrial production index (IPI) refers to the secondary sector, meaning manufacturing plants, construction sites, mines and quarries and manufacture of food products and beverages. The index provides information on industrial production by French and foreign enterprises on French soil. Conversely, the industrial output of French enterprises abroad is not included in the French IPI. For example, in the automotive industry, cars of French manufacturers may be manufactured abroad. In such cases, production is not included in the IPI, unlike the production of foreign car manufacturers on French soil.

The notion of "French industry" underlines the fact that the indicator is designed to be exhaustive: even if the computation is based on a selection of industrial products produced by a sample of businesses, these selection and sample must be sufficiently large and well selected for the combined production series thus obtained to be representative of total industrial output.

1.3- How to Measure Industrial Production

In theory, the industrial production index is intended to reflect changes in value added in the different branches of industry rather than changes in total output. In other words, the inputs obtained by one branch from another must be deducted from its gross output to prevent double counting and to ensure the results are not influenced by the degree of vertical integration of branches in the economy. In practice, however, it is difficult to collect value-added data on a monthly basis.

Industrial production consists of a wide range of products with different characteristics, including finished products, semi-finished products and work in progress. Industrial production includes consumer goods, intermediate goods and capital goods with different production cycles. Despite this heterogeneity, a volume indicator is computed for all activities based on a diverse range of collected indicators (see Chapter 4).

1.4- The IPI: A Key Indicator for National and European Economic Analysis...

The IPI provides vital information for monitoring France's business cycle, in parallel or in combination with other major macroeconomic indicators such as employment, price indices, indices of services production and external trade. Because of this, the IPI is incorporated into the main French economic indicators. It is also widely used in the national accounts to estimate the quarterly accounts and is therefore a very important indicator for quarterly GDP estimates.

The IPI is also included among the Principal European Economic Indicators (PEEIs), a concept first introduced in a European Commission communication in 2002. The PEEIs are a comprehensive set of infra-annual macroeconomic indicators that aim to describe the economic and labour market situation, as well as price developments. As Euro-indicators, they are of particular importance for steering economic and monetary policy within the euro area and the European Union. The choice of the PEEIs is approved by the Economic and Financial Committee (EFC) and the Economic and Financial Affairs Council (ECOFIN). The main categories of indicators cover the following topics: balance of payments; business and consumer surveys; consumer prices; international trade; industry, trade and services; the labour market; monetary and financial indicators; and national accounts. In the "Industry, trade and services" category, seven indicators are used for industry, including industrial production (IPI), turnover, domestic producer prices and import prices, and labour input.

1.5- … that Meets European Regulatory Requirements...

The compilation of many business statistics is governed by a framework defined by European Parliament and Council regulations. Such is the case of the IPI. Council Regulation (EEC) No 3924/91 of 19 December 1991 on the establishment of a Community survey of industrial production specifies the survey field and characteristics. The regulation ("Prodcom") was updated by Commission Regulation (EC) No 912/2004 of 29 April 2004.

Council Regulation No 1165/98 of 19 May 1998, as amended by subsequent amendments[1], concerning short-term statistics (or "STS"), specifies the scope and variables for the analysis of short-term trends (or business cycles) in supply and demand, production factors and producer prices. Commission Regulation (EC) No 1503/2006 of 28 September 2006 (as amended by subsequent amendments) sets out the definitions of variables, the list of variables and the frequency of data compilation.

A new framework regulation on business statistics in Europe, known as FRIBS, is in the process of being adopted and will need to be implemented in the coming years[2].

Box 1: Key Aspects of the European Regulation on "Production Indices in Industry and Construction"

Field of Application
- activities listed in Sections C to E of NACE Rev. 2 for industry;
- activities listed in Section F of NACE Rev. 2 for construction.

Unit of Observation - Variable
- the unit of observation is the kind-of-activity unit (KAU): an enterprise, or a part of an enterprise, which engages in an economic activity at NAF class level, corresponds to one or more operational subdivisions of the enterprise. The enterprise's information system must be capable of indicating or calculating for each KAU at least the value of production, intermediate consumption, manpower costs, the operating surplus and employment and gross fixed capital formation;
- in France, the notion of branch, corresponding to the intersection (legal unit x product), is used as a proxy for the KAU;
- many enterprises only have one activity. In this case, the KAU corresponds to the legal unit;

1and in particular Regulation (EC) No 1158/2005 of the European Parliament and of the Council of 6 July 2005.

2 Translator's note: the regulation was adopted and published in the Official Journal of the EU on 17 December 2019 (*Regulation* (EU) 2019/2152 of the European Parliament and of the Council of 27 November 2019 on European business statistics).

- data are not required for division 36 and groups 35.3 and 38.3 of NACE Rev. 2.

Format
- this variable must be transmitted in the form of unadjusted, working-day adjusted and seasonally/working-day adjusted indices.

Reference Period
- the reference period is one month.

Level of detail
- the variable is transmitted at the Section (one letter) and Division (two-digit) levels of NACE Rev. 2.
- in addition, for section C of NACE Rev. 2, the index of production is to be transmitted at the 3-digit and 4-digit levels of NACE Rev. 2;
- in the case of construction, the variable is transmitted based on a specific nomenclature defined by Eurostat[3] (abbreviated as CC) that distinguishes between buildings and civil engineering works.

Data Transmission Deadlines
- 1 month and 10 calendar days for industry, 1 month and 15 calendar days for construction.

1.6- … but also International Recommendations (UN)

The IPI is also governed by international recommendations. The UN report of January 2010[4] sets out recommendations for the introduction of the industrial production index in different countries and updates the initial 1950 report. The purpose of these recommendations is to facilitate international comparisons and promote best practice.

The report notes that the industrial production index is used to measure changes in production volume within an economy by providing a measurement unaffected by price variations. There have been many changes since the 1950 publication, requiring the manual of recommendations to be updated. The 2008 System of National Accounts (ISBN 978-92-1-261223-2 in 2013), the International Recommendations for Industrial Statistics 2008 (ISBN 978-92-1-261226-3 in 2009), the 2010 European System of Accounts (ISBN: 978-92-79-31243-4), the IMF's Producer Price Index Manual (ISBN 1-58906-330-9 in 2004), the European Union's methodological manual on the harmonised calculation of industrial price indices within the European Union (ISSN 1977-0375) and the international revision of classifications of activities and classifications of products (CPA Rev. 2.1, 2015) (https://www.insee.fr/en/information/2107765) are all changes that have affected the IPI.

Recent developments in classifications and reference systems have resulted in changes to some aspects of the IPI, including:

- the scope of the indicator: industry now covers Sections B (mining and quarrying), C (manufacturing), D (electricity, gas, steam and air conditioning supply) and E (water supply; sewerage, waste management and remediation activities);
- calculation methods: whereas historically indices were calculated using fixed weights revised at the time of re-basing every five years, the chained index method with annually updated weights is now the preferred approach;
- depending on the types of activities considered, the UN also recommends that certain monitoring variables (quantities, invoicing, etc.) be given priority. France is endeavouring to comply with these recommendations (see Box 2) in calculating its industrial production index and is continuing to work on improving its methods. The transitions to the 2010 base and subsequently to the 2015 base were an opportunity for a range of improvements to be made.

Box 2: Main UN Recommendations

Statistical units, classifications and the business register
- the establishment is to be used as the recommended statistical unit since information is generally available within this unit;

3Under the new FRIBS Regulation, it should be transmitted at the NACE two-digit level, as in industry.
4'International recommendations for the Index of Industrial Production' 2010, ISBN 978-92-1-161532-6.

- the International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 4 and the Central Product Classification (CPC) Rev. 2.1 are to be used;
- the IPI is to be compiled from a sample based on a business register as a way of minimising the response burden on businesses and lowering operational cost; the sample selection is to be updated each year;
- opportunities to use administrative sources should be examined.

Scope and frequency
- the IPI is to be compiled for activities in ISIC Rev. 4 Sections B, C, D and E. The industrial production index traditionally excludes construction;
- the IPI is to be compiled monthly so turning points can be identified at the earliest possible point in time.

Sources and methods
- producer price indices are recommended to deflate values; the deflator is to be applied to value indices at the lowest level possible but not higher than the 4-digit level of the classification;
- to approximate industrial production, the value of output or the physical quantity of output are preferred to input variables (labour or materials consumed);
- the two preferred data sources for providing information for the IPI are statistical surveys and administrative sources.

Index compilation
- a Laspeyres index is recommended;
- missing data are to be estimated using imputation techniques;
- quality changes should be incorporated into the calculation of the IPI;
- gross value added at basic prices is recommended as the weight variable at aggregate and intermediate levels;
- value of output is recommended as the weight variable at the most detailed level;
- aggregate level weights should be updated annually and at least every five years at the more detailed levels;
- when weights are updated, the new series should be linked to the old series to produce a continuous series;
- the quantity reference period is the monthly average of the base year;
- aggregation from basic data items should be done directly based on enterprise data (at the product or product group level) without calculating indexes for enterprises or establishments. The indices obtained should then be aggregated in steps through each level of the classification;
- seasonal adjustment should be applied to the data at the lowest level of aggregation for which reliable estimates can be obtained;
- a quality review should be undertaken every four or five years, or more frequently if significant new data sources become available;
- the IPI may be reconciled with other sources, including national accounts data, to ensure its relevance.

Publication and dissemination
- the IPI should be published adjusted for trading-days and seasonal effects;
- index numbers rather than monetary values should be used to present industrial production volume measures;
- index numbers should be presented to one decimal place;
- a reference period needs to be determined and convention is that this period is set to an index number of 100;
- the main contributors to change in the index are to be presented to users;
- the key concepts, the chosen methodology, the weighting system, revision practices and the way in which product changes in the market and quality changes are taken into account must be provided;
- for the dissemination of the IPI, it is recommended to release the data as soon as possible, to comply with the timetable and to accompany the data with any relevant methodological explanations and commentary that assist users to interpret developments and deduce the main economic messages;

Countries should also develop a policy on data revisions based on the following practices:
- the main users of statistics should be consulted to identify the specific needs and priorities of each country;
- information must be provided by the national statistical office on the reasons for and timing of revisions;
- the revision cycle must be relatively stable from year to year;
- major conceptual and methodological revisions should be introduced where appropriate, taking into account the need for change and user concerns;
- backcasting must be carried out over several years to obtain consistent time series;
- revisions must be documented and communicated to users, along with explanations on the sources of revisions and breaks in series.

2- Characteristics of the French Industrial Production Index

2.1- Scope, Frequency and Publication

Industrial production indices (IPIs) are compiled monthly covering the field of industry. They cover Sections B, C, D and E of NAF Rev. 2. A production index is also calculated for construction, i.e. Section F of NAF Rev. 2, using a similar methodology[5].

The index is released no later than 40 days after the end of the month[6]. It is published in the "*Informations Rapides*" series. In these publications, the indices are disseminated at levels A 10, A 17 and A 38 of the aggregated classification (*nomenclature agrégée*, or NA) associated with NAF Rev. 2; they are also published in accordance with the main industrial groupings (MIGs) defined by Eurostat. More detailed levels (NAF Rev. 2 divisions, groups and classes) are available on INSEE's e-database.

Industrial production indices are also disseminated by Eurostat by branches according to European classifications.

2.2- Sources

Industrial production indices are compiled by INSEE based on the monthly branch surveys (in French, *enquêtes mensuelles de branche*, or EMB) conducted on a sample of enterprises by INSEE, the Statistics and Forecasting Service (SSP) of the Ministry of Agriculture, the Statistical Data and Studies Service (SDES) of the Ministry for the Ecological and Inclusive Transition and, in the case of some branches, by professional bodies. The products tracked are located at all levels of production processes, thereby ensuring that the activity of manufacturing as a whole is accurately represented.

The responses provided by enterprises are collected online[7]. For the branches surveyed by INSEE, responses are provided using the COLTRANE portal[8]. The sample of enterprises surveyed (approximately 4,500 to 5,000 units) is revised each year to ensure it is as representative as possible of the field studied. The new sample is put in place when changing years.

2.3- Variables Used to Estimate Industrial Production

The variables measured focus on production and, in some cases, on factors of production. The variables used to monitor industrial output vary according to the branch of activity considered. In practice, it is not possible to identify a single variable that can be used for all activities.

Production can be collected in monetary terms or in physical quantity terms. In theory, the product should be recorded at the time it is produced and valued at the base price[9] prevailing at that time. In practice, it is sometimes difficult to estimate such production during the reference period, whereas it may be easier for businesses to measure the value of production sold during the reference period.

When not directly collected in physical quantity terms, volume measures use value data deflated by producer price indices. One of the advantages of the deflated value method is that it allows quality to be taken into account in measuring volumes, unlike quantity measurements. The producer price indices used should be as close as possible to the product groups the value of which is to be deflated and used at the highest possible level of detail.

Industrial production is approximated by measuring inputs (labour and materials consumed) when no reliable measure of output is available. Labour input can be in the form of number of hours worked, full-time equivalent jobs or numbers of persons engaged. In practice, the use of productivity-adjusted hours worked is particularly useful when the production of a single product extends over several months (e.g. shipbuilding, locomotive manufacturing). With this type of measure, the risks are the stability of the variables, the difficulty of measuring productivity changes and changes in the composition of production factors, which may result in the increase in value added being underestimated.

5The compilation of the index of production in construction will not be detailed here. In this sector, surveys on enterprises are conducted by the statistical service of the Ministry for the Ecological and Inclusive Transition (see Chapter 2) in partnership with the French building (FFB) and public works (FNTP) federations.
6In accordance with the European Regulation on short-term statistics (STS Regulation), the IPI for month m must be sent to Eurostat by m+40 at the latest. The publication of the index by INSEE is announced and scheduled for m+40 at 8:45 am. However, if m+40 falls on a Sunday or Saturday or a public holiday, publication is announced and scheduled for the previous Friday at 8:45 am. INSEE may also decide to bring forward the publication. A schedule is made available several months in advance.
7Historically, collection was conducted using paper questionnaires.
8https://entreprises.stat-publique.fr
9This is the amount received by the producer from the purchaser for a unit of good or service as output, minus any tax payable, and plus any subsidy receivable on that unit. It excludes any transport charges invoiced separately by the producer.

Material consumption is useful when there is a clear relationship between material use and production. Energy use (e.g. electricity) has been historically used for certain specific sectors, especially capital intensive sectors.

2.4- Index Compilation

The industrial production index (base year 2015) is now a chained Laspeyres index[10] with annually updated value-added weights (see Chapter 6). The annual weights are calculated using data from the national accounts, the ESANE (standing, in French, for *Elaboration des statistiques annuelles d'entreprises*, or Elaboration of Annual Statistics of Companies[11]) system and the annual production survey (EAP) in industry.

Previously (base year 2010 and prior base years), the IPI was constructed as a Laspeyres index with constant weights. The transition to a chained index with annually updated weights has provided more robustness in estimating long-term trends and reduced the problem of revisions to past data due to changes in weights, as was the case with previous base year changes.

The IPI series are based on three main construction levels (see Figure 1). At the highest level of detail, production monitoring is based on a carefully selected set of products. The aim is to ensure wide coverage of a branch using a minimal number of products that are as homogeneous as possible. A sample of enterprises[12] is defined for each product monitored and the sampled enterprises are then surveyed monthly to establish the volume of their production of that product. The production data are then aggregated to form the "elementary series", which correspond to homogeneous groupings of products and represent the first true level of economic analysis of the IPI. Elementary series are estimated in terms of volume, meaning that they should not take into account price changes. If necessary, they should therefore be deflated first (in cases where the data collected are invoices).

At the second level, the elementary series are aggregated using weights from the Annual Production Survey (see Chapter 2) to form the series at the "subclass" (i.e. 5-digit) level, i.e. the most detailed level of the official classification of economic activities (NAF Rev. 2).

Beyond that, "subclass" level series are successively aggregated to form all the aggregates corresponding to the different branches of industry (see Chapter 6).

2.5- Seasonal and Working-Day Adjustments

The series are adjusted for seasonal and working-day effects using the X13-ARIMA method implemented by applying JDemetra+ (developed by Eurostat). These effects are estimated at the NAF Rev. 2 class (i.e. 4-digit) level. The seasonally/working-day adjusted indices for higher-level items are obtained by aggregating the seasonally/working-day adjusted indices of the classes composing them (indirect seasonal adjustment).

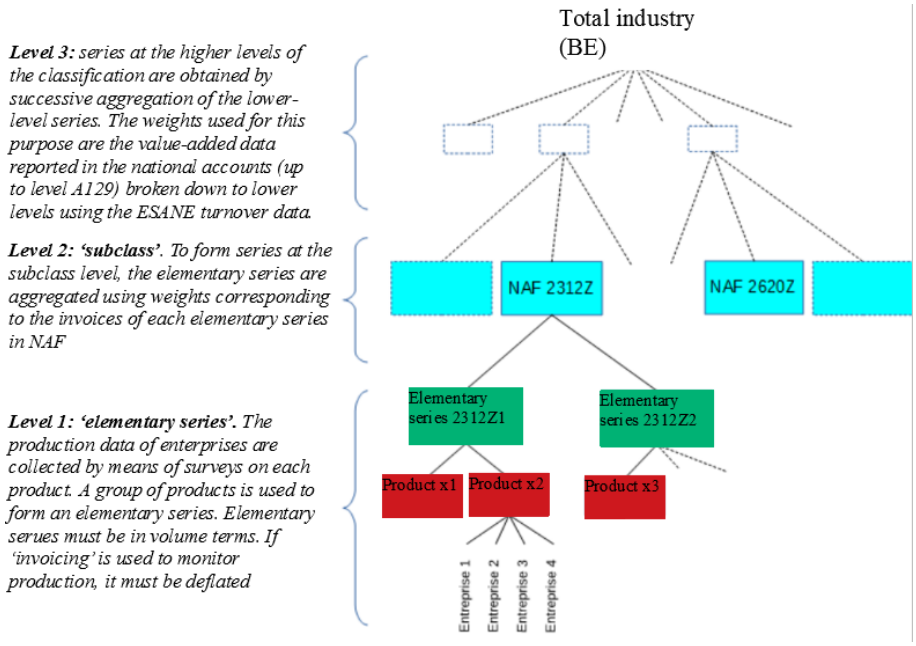
The annual average of the seasonally/working-day adjusted indices may differ slightly from that of the gross indices, in particular because it takes into account year-on-year changes in the annual composition in working days (leap years, position of public holidays in the week, etc.).

10 At least over the period running from the reference year, the form of the index differing slightly prior to that.

11 This is the mechanism for producing annual structural business statistics – on the basis mostly of an annual survey and company accounting data collected from the tax authorities – in order to satisfy the requirements set by the Structural Business Statistics (SBS) Regulation.

12 More specifically, legal units (see glossary).

Figure 1: Principle of Compilation of the IPI at Different Levels of Detail



2.6- Revisions, Extension and Periodic Updates

The responses provided by the enterprises are not always available at the time of the first publication of the index. In such cases, an estimate is required. The incorporation of late responses into the index may give rise to a revision of the raw data in subsequent months, with a potential impact on all indices.

INSEE also conducts annual surveys providing more detailed and complementary results for the year preceding the last period covered by the IPI. Monthly and annual data are then compared, which may result in revisions to the IPIs.

Lastly, the models used to adjust for seasonal variations and calendar effects are updated annually. Between two updates of the models, the seasonally/working-day adjusted coefficients are updated monthly to reflect the most recent data (including any revisions to raw data relating to previous months). With each publication of the indices, all seasonally/working-day adjusted indices published on the INSEE website are updated (see Chapter 7).

2.7- Review of Product Monitoring and Extension Methods

New products and industries develop while others tend to decline or even disappear. It is important that the products monitored by the IPI be updated to ensure France's industrial output is accurately represented.

2.7.1-The 2010 Re-Basing

In addition to updating the weights with the new reference year, a major revision of the IPI series was conducted as part of the 2010 re-basing. To align the French IPI with the best international standards, including UN recommendations (see above), the number of series observed in invoicing terms (then deflated) was increased while the number of series observed in quantity terms was reduced. This change allows for the growth generated by changes in the quality of these products to be better taken into account. Furthermore, declining activities whose weight had become too small were grouped together, while expanding activities were broken down into detailed categories. In addition, to improve the coverage of the IPI, the scope of some series was extended to new products and entirely new series were created (for further details, see Chapter 3). These developments have been accompanied by backcasting of the series since 1990.

2.7.2-Annual Rebasing or Annual Product Review

Since the implementation of the new base year (2015), and by way of replacing the previous process, which involved updates to the products every five years, the branches monitored by the IPI will be reviewed at the rate of one fifth of the series each year. This annual update will ensure that the process of branch monitoring is adapted to economic and technical developments by including new industrial products or, on the contrary, removing products if their output has fallen to excessively low levels. The first wave of annual re-basing, launched in the summer of 2017, resulted in changes introduced with the March 2019 publication relating to January 2019 indices, in particular with the creation of three new series not previously monitored (see below). The second wave was launched in the summer of 2018 and will result in changes to the production of the indicator with effect from March 2020.