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Industrial Production Index

with Base Year 2015

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Industrial Production Index with Base Year 2015

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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).

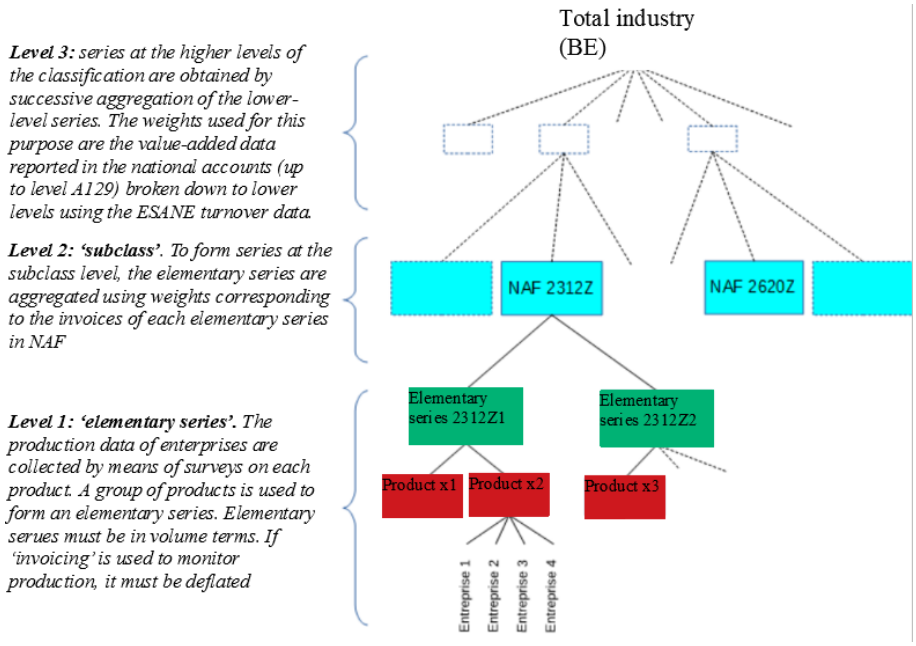
The annual average of the seasonally/working-day adjusted indices may differ slightly from that of the gross indices, in particular because it takes into account year-on-year changes in the annual composition in working days (leap years, position of public holidays in the week, etc.).

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.

Chapter 2 - Statistical Surveys on Enterprise Production

The data needed to calculate the industrial production index are collected from enterprises by means of statistical surveys: the monthly branch surveys (EMB), which provide the data needed to calculate the index each month, and the annual production survey (EAP), which serves as the sampling frame for the EMBs and also provides the weights of the IPI at the most detailed level. In other words, the general principle is the combination of a light-touch monthly cyclical survey and a more detailed and exhaustive annual structural survey.

Many actors are involved in the process of collecting these surveys:

- INSEE is the main body responsible for collecting data from enterprises in the industrial sector excluding food and agriculture. In addition to collecting the data, it is also responsible for their analysis and integration (see Chapter 8) prior to the calculation of the IPI. INSEE delegates some monthly branch surveys to approved professional bodies (in French, *organismes professionnels agréés*, or OPAs). ;
- The Statistics and Forecasting Service (SSP), attached to the Ministry of Agriculture, is responsible for all surveys relating to food and agriculture. Like INSEE, it oversees both direct surveys and surveys delegated to OPAs. It then transmits the data on food and agriculture to INSEE;
- The Statistical Data and Studies Service (SDES), attached to the Ministry for the Ecological and Inclusive Transition, is responsible for all monthly surveys relating to energy. The aggregated data are also transmitted to INSEE. Lastly, with respect to construction, the SDES is responsible for overseeing two monthly surveys on activities in metropolitan France in buildings and civil engineering works, with the former being delegated to the French Building Federation (FFB) and the latter to the National Federation of Public Works (FNTP) [13].

Production surveys are governed by European regulations:

- The PRODCOM regulation (Council Regulation (EEC) No 3924/91 of 19 December 1991) defines the obligations of Member States in respect of European structural business statistics on industrial production. A classification of products known as the "PRODCOM List" has been developed based on the external trade nomenclature (Combined Nomenclature, or CN) but adapted to the specific needs of industrial statistics. The list is updated each year;

- The STS Regulation: Council Regulation (EC) No 1165/98 of 19 May 1998 as amended in 2009 and Commission Regulation (EC) No 1503/2006 of 28 September 2006 implementing and amending Council Regulation (EC) No 1165/98 concerning short-term statistics as regards definitions of variables, list of variables and frequency of data compilation define the obligations of Member States in respect of the production of short-term Community statistics.

1- The Annual Production Survey (*Enquête annuelle de production*, or EAP)

It has three main goals:

- To identify the different activities carried out by enterprises in the industrial sector *via* a breakdown of their turnover into subsectors (or branches) and to deduce their main activity (APE). In other words, the EAP contributes, within the framework of the ESANE system, to the process of compiling the annual structural business statistics. This objective is critically important since a correct sectoral classification of enterprises in INSEE's sampling frames will ensure the quality of the sectoral statistics produced. The EAP also provides the information needed for making the sector/branch transition necessary for

13DARES also provides data on temporary employment in construction.

compiling national accounts on industrial enterprises (for other sectors, this information is collected as part of the annual sectoral survey, or ESA);

- To provide the necessary information for producing detailed data on industrial production, both in order to meet the requirements of the European PRODCOM regulation and associated directives and to meet the demands of national users and, in particular, those of professional bodies;

- To provide the sampling frame for short-term statistics in industry excluding food and agriculture. The EAP ensures a detailed annual tracking of industrial products manufactured in France for the industrial production index (IPI) and the producer price indices (PPI). The survey is used as the sampling frame for the annual EMB sampling process (see below) and provides some of the information needed to calculate the weights of the elementary series.

The EAP was first conducted in 2009 and concerned data for 2008[14]. Approximately 40,000 legal units are surveyed, exhaustively above a given workforce and turnover threshold and randomly below that threshold.

1.1- The Scope of the EAP

The scope of the EAP corresponds to the manufacturing activities of enterprises whose main activity is classified in sections B to E of NAF Rev.2:

- B Mining and quarrying;
- C Manufacturing
  - Except division 10: manufacture of food products
  - Except division 11: manufacture of beverages
  - Except division 12: manufacture of tobacco products
  - Except subclasses 1610A and 1610B (sawmilling, planing and the impregnation of wood), which are a matter for the SSP;
- D Electricity, gas, steam and air conditioning supply;
- E Water supply; sewerage, waste management and remediation activities.

Approximately 150,000 enterprises (in the sense of legal units; see glossary) are included in this field.

Non-industrial enterprises (in the sense of their main activity) with one or more significant industrial activities (approximately 1,000 units) are also included to complete the responses to PRODCOM. They are the subject of a shorter questionnaire.

1.2- The Concept of Industrial Production

In PRODCOM, the main concept used is the notion of production sold during the survey period (calendar year) in terms of value and physical quantities.

The concept of "industrial production" covers relatively complex concepts and is not referred to directly in the questionnaire, with the questions focusing on the sale of industrial products, which is more easily measurable, rather than on production itself.

The information required from each enterprise surveyed focuses on the products sold by the enterprise and on how the enterprise obtained those products: did it purchase them, have them manufactured or manufacture them itself, etc.? Depending on the case, the operations are linked to the production of goods or the production of industrial services. Industrial output is more difficult to define in activities related to gas and electricity and water and waste treatment.

14 The EAP replaced the Annual Survey on Enterprises in Industry (in French, *Enquête annuelle d'entreprise dans l'industrie*, or EAE), the Survey on Small Industrial Enterprises (*enquête sur les petites entreprises industrielles*, or EPEI) and the Annual Branch Survey (*Enquête annuelle de branche*, or EAB).

1.3- Content of the Questionnaire

A first set of contextual data relate to the turnover of the legal unit over the calendar year. If the enterprise has a different financial year, the declaration will not reflect the turnover reported in the accounts.

Distribution of Total Turnover

Turnover is divided into five items:

- the sale of industrial products, covering all products produced by the manufacturing and mining industries as defined in the relevant classifications. These are mainly goods, but may also include industrial services, particularly in cases where total or partial production relates to inputs belonging to the customer (invoicing of a service);

- the installation of industrial products is surveyed separately from the manufacture of products, in accordance with the relevant classifications;

- the repair and maintenance of industrial products is also surveyed separately from the manufacture of products, again in accordance with the relevant classifications. Thus, for example, the sale of a product accompanied by a maintenance contract should give rise to two declarations, one relating to the sale of the product and the other relating to repair and maintenance;

- other sales of industrial products, covering all products from industry not classified in manufacturing and products from mining and quarrying, namely electricity, gas, steam and air conditioning supply and water supply; sewerage, waste management and remediation activities;

- the sale of non-industrial products and services corresponds to the remaining turnover that does not fall into the four previous categories. These correspond to marginal or secondary activities carried out by industrial legal units.

Some of these items are then described in detail. For example, sales of industrial products are described by aggregate and detailed products. The legal unit must indicate the total amount invoiced per product and the percentage distribution of each of these amounts based on the economic model underlying the sale of the product (see below). Lastly, for each product, when it makes sense to do so, the legal unit indicates the quantity of product sold, which must correspond exactly to the invoice amount shown on the same line of the questionnaire.

1.4- Breakdown of Invoicing According to the Economic Model for the Sale of Industrial Products

The invoicing for a product corresponds to all the invoices issued for that product between 1 January and 31 December. This amount must be exclusive of taxes and transport costs, which are invoiced separately.

The analysis of the turnover of each product sold is based on the declaration of different possible economic models. Five economic models are used. Models M1 and M2 refer to products sold by the legal unit but manufactured externally by a third party (which may be another legal unit within the group), regardless of the geographical location of that third party. The other three models (M3, M4 and M5) relate to products manufactured by the legal unit on French soil, including French overseas departments. A product manufactured outside the national territory is invariably treated as having been manufactured by an external legal unit.

Manufacturing outside the legal unit, including in another legal unit of the same group

Model 1 (M1): the product sold was purchased in the same condition as it was on the market, or its manufacture was entirely outsourced to a subcontractor, without having provided it with inputs, i.e. raw materials and other components used in its manufacture free of charge. Invoicing corresponds to a retail or sale price.

Model 2 (M2): the product has been entirely manufactured by a subcontractor by providing it with the inputs free of charge. Invoicing corresponds to a production cost of the product.

Production by the legal unit on French soil (including overseas departments)

Model 3 (M3): this model covers products specific to the legal unit and manufactured by the legal unit itself, including by assembling purchased components. Invoicing corresponds to a production cost of the product.

Model 4 (M4): manufacture of a product for a third party that has designed it or holds the rights to it, without free supply by that customer of the raw materials and other components used in the manufacture. Invoicing corresponds to a production cost of the product.

Model 5 (M5): the legal unit manufactures the product for a third party, with the latter supplying inputs free of charge. This case also corresponds to any partial manufacturing operation for a third party, such as the processing carried out on a part supplied by the customer. Invoicing corresponds to a service price.

The measurement of production is based on aggregates (M2) to (M5)**.**

2- Monthly Branch Surveys (*Enquêtes mensuelles de branches*, or *EMB)*

The industrial production index is compiled based on the monthly branch surveys (EMBs). In the current system, the EMB operates autonomously but the design (i.e. the choice of products surveyed) and sample selection are largely based on the EAP.

2.1- The Scope and Statistical Unit of the EMBs (Excluding Food and Agriculture and Energy)

Enterprises (population concerned by the survey) included within the scope of the monthly branch surveys meet the following criteria:

- they are located in France;
- they operate in at least one industrial branch, whether as a core or secondary activity;
- they have more than 20 employees or generate more than €5 million in turnover in at least one of the branches listed in Table 1 (excluding food and agriculture and energy[15], the data on the latter fields being collected by the Statistics and Forecasting Service (SSP), attached to the Ministry of Agriculture, and the Statistical Data and Studies Service (SDES), attached to the Ministry of Ecological and Social Transition, respectively).

The statistical unit surveyed is the unit resulting from the combination (or intersection) of an enterprise (in the sense of legal unit; see glossary) and a product. The products studied are derived from those analysed in the EAP.

Table 1: List of Branches Included within the Scope of the Monthly Branch Surveys (Excluding Surveys on Food and Agriculture and Energy):

- "Mining and quarrying" (Section B)

NAF 08.11Z	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate
NAF 08.12Z	Operation of gravel and sand pits; mining of clays and kaolin
NAF 08.93Z	Extraction of salt
NAF 08.99Z	Other mining and quarrying n.e.c.

- "Manufacturing" (Section C)[16]

15The scope of the IPI is therefore broader than the scope of the EMBs managed by INSEE since, for some branches, the index draws on other surveys or sources.
16Some NAFs are not monitored in the EMBs, mainly because production is low or non-existent in France or because monitoring is not required under European regulations (see Chapter 3).

Division 13	Manufacture of textiles
	except for NAF
	13.94Z Manufacture of cordage, rope, twine and netting
Division 14	Manufacturing of wearing apparel
	except for NAF
	14.11Z Manufacture of leather clothes
	14.20Z Manufacture of articles of fur
Division 15	Manufacture of leather and related products
Division 16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
	except for NAF
	16.10A Sawmilling and planing of wood, excluding impregnation *16.10B 'Impregnation of wood'*
	16.22Z Manufacture of assembled parquet floors
Division 17	Manufacture of paper and paper products
NAF 18.12Z	Other printing
NAF 18.13Z	Pre-press and pre-media services
Division 20	Manufacture of chemicals and chemical products
Division 21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
Division 22	Manufacture of rubber and plastic products
Division 23	Manufacture of other non-metallic mineral products
	except for NAF
	23.43Z Manufacture of ceramic insulators and insulating fittings
	23.44Z Manufacture of other technical ceramic products
	23.49Z Manufacture of other ceramic products
	23.52Z Manufacture of lime and plaster
	23.64Z Manufacture of mortars
	23.65Z Manufacture of fibre cement
	23.69Z Manufacture of other articles of concrete, plaster and cement
	23.70Z Cutting, shaping and finishing of stone
Division 24	Manufacture of basic metals
Division 25	Manufacture of fabricated metal products, except for machinery and equipment
Division 26	Manufacture of computer, electronic and optical products
	except for NAF
	26.80Z Manufacture of magnetic and optical media
Division 27	Manufacture of electrical equipment
Division 28	Manufacture of machinery and equipment n.e.c.
	except for NAF
	28.24Z Manufacture of power-driven hand tools
Division 29	Manufacture of motor vehicles, trailers and semi-trailers
Division 30	Manufacture of other transport equipment
	except for NAF
	30.40Z Manufacture of military fighting vehicles
	30.99Z Manufacture of other transport equipment n.e.c.
Division 31	Manufacture of furniture
Division 32	Other manufacturing
	except for NAF
	32.11Z Striking of coins
	32.20Z Manufacture of musical instruments
	32.40Z Manufacture of games and toys
	32.91Z Manufacture of brooms and brushes
Division 33	Repair and installation of machinery and equipment

except for NAF

33.17Z Repair and maintenance of other transport equipment

33.19Z Repair of other equipment

- "Water supply" (Section E)

Division 36 Water collection, treatment and supply

Division 37 Sewerage; sewage sludge

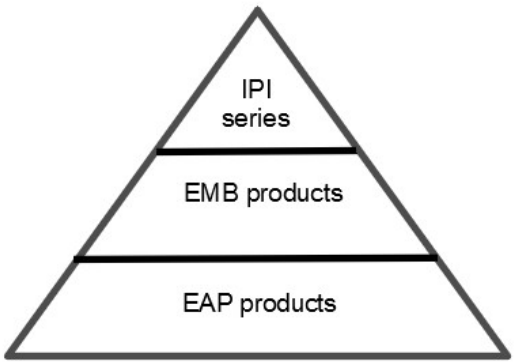
(surveyed as part of the EMB survey but not yet included in the calculation of the IPI)

2.2- From the EAP to the EMBs: Definition of the Boundaries of Monitored Products and EMB Sampling

EMB products (known as 'ProdEMB') represent an intermediate link between the very detailed list of EAP products and the level of detail of the IPI series:

- an IPI series can consist of one or more EMB products;
- an EMB product (ProdEMB) corresponds to one or more EAP products (ProdEAP);
- to define the chosen level of detail (the "boundaries" of the products monitored), a general rule is to track products with widely different business cycles separately.

Figure 1: Interlocking Logic Between Products and IPI Series



The links between IPI series, EAP products and EMB products are defined at the time of each IPI base year change or now as part of the annual re-basing of products (see Chapter 3). They are updated each year in line with changes in the EAP and/or EMB product lists to ensure the homogeneity of the products tracked by a series over time and thus the quality of the measured changes.

Once the list of product boundaries has been defined, a sample[17] is selected for each product monitored from a sampling frame based mainly on the result of the last EAP available at the time of sampling (year N-2). The sampling frame includes legal units that carry out an industrial activity and that meet a number of criteria:

- the scope criteria referred to in 2.1 (at least 20 employees and/or a turnover of more than EUR 5,000k in at least one industrial activity);
- in the event of a secondary manufacturing activity, this must represent a sufficient proportion of the enterprise's total turnover;

17The sample for year N is selected in November N-1 and is fixed for the entire data collection year from January to December N.

- The sampling frame covers legal units that reported having sold products according to economic models 2 to 5 as part of the EAP[18];

- the sampling unit is the intersection (product x legal unit). A legal unit may therefore be selected for several of the goods that it produces;

By design, the sample is drawn from the legal units having responded to the EAP and which are therefore already familiar with the economic and statistical concepts used in the survey (such as the concept of economic model).

The sampling procedures have changed somewhat in recent years. Different selection methods are used depending on the product:

- where the number of legal units for a given product is less than or equal to a given threshold S_1 (generally 6 legal units), exhaustive sampling is used;
- if the number is between threshold S_1 and threshold S_2 (where threshold S_2 is of the order of 150 to 200), a cut-off (70% in the case of direct surveys, 75% in the case of delegated surveys) is applied (see below),
- when the number is higher than S_2, a cut-off at 50% is applied followed by stratified sampling.

A number of other criteria have been introduced more recently, such as the need to improve the accuracy with which certain products of particular importance (given their economic weight) are tracked, resulting in a possible modification of the number of enterprises surveyed according to the size of the sector.

2.3- Direct and Delegated Surveys

Excluding food and agriculture, construction and energy, EMBs are overseen by two types of bodies:

- "direct" surveys are conducted by INSEE;

- "delegated" surveys are conducted by OPAs by decree as part of the conduct of the EMBs.

At the end of 2012, INSEE began a major process of standardising surveys for professional bodies. In 2013, 33 monthly branch surveys were delegated to OPAs while 162 surveys were conducted directly by INSEE. The number of surveys delegated to OPAs has dropped significantly since 2014. Surveys have been standardised in terms of methodology and questionnaire content. The standardisation process undertaken by INSEE was driven by the need to revise the IPI processing chain and to apply the framework provided by the European Statistics Code of Practice. The aim was to refocus the content of delegated surveys on products and variables relevant to the IPI and thereby to minimise the burden on businesses and bring them into line with the principles established for the design of direct surveys.

In 2018, 6 OPAs were appointed by INSEE to conduct EMBs, representing 11 surveys in total.

Between 4,500 and 5,000 enterprises are surveyed each month, including 500 to 600 by means of "delegated" surveys. In the case of surveys conducted by OPAs, INSEE selects the sample and retrieves the detailed results or the individual data directly.

2.4- The Questionnaire

The EMB questionnaire is structured as follows:

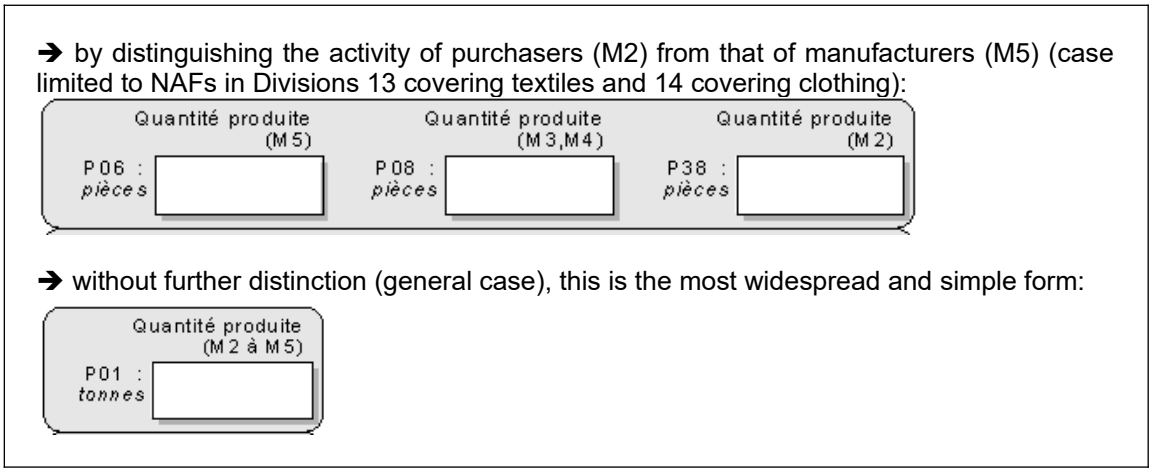
- the first page is reserved for management and contains the statutory legal notices (including those implied by the delegation for standardised surveys managed by OPAs), the identification data relating to the legal unit and the survey correspondent;

18Model 1, corresponding to a purely commercial function, is excluded.

- the body of the questionnaire contains the survey by products classified according to the classification in use. Each product is associated with one or more collection variables (e.g. quantities produced or invoicing excluding purchases for resale[19], see Chapter 4).

In a small number of sectors, quantities or invoicing may be requested based on an additional breakdown criterion linked to the economic model (see Figure 2).

Figure 2: EMB Questionnaire - Survey of Quantities Produced in Two Possible Forms



Direct EMB questionnaires are customised, meaning that each enterprise is only requested to respond on the control products included in the sample and not on its entire output. Each enterprise receives just one questionnaire, which may relate, however, to several branches of activity.

The questionnaires of delegated surveys are now almost all standardised. The products and variables and their design follow the same principles as direct survey questionnaires, with some differences:

- page 1 contains the legal notices related to delegation and the union logo instead of the INSEE logo;

- the questionnaires are not generally customised but have a fixed structure and enterprises may be required to respond on products for which they were included in the IPI sample and others that are not relevant to the calculation of the IPI. Only products of use to the IPI are handed over to INSEE by the OPAs.

The questionnaires may be revised each year to take into account changes in EU product classifications (PRODCOM), enterprise production or IPI methodological changes. In particular, some questions may be removed if they become less useful for the accuracy of the IPI or, conversely, new products may be added. However, the vast majority of products and variables are maintained from year to year.

19This ensures that any trading activities which by their very nature do not constitute a manufacturing activity are excluded from the index. In the questionnaires, the exclusion of purchases for resale is indicated by a reference to the economic models to be reported (see the reference to “M2 to M5”). Enterprises surveyed as part of the EAP are already familiar with the concept of economic model.

Chapter 3 - Choice of Elementary Series

1- What is an Elementary Series?

Since it is impossible to monitor the production of all the products in a branch on a monthly basis, product groupings are defined in advance. These groupings are known as elementary series (or control series) and form the basis upon which the industrial production index is calculated and analysed.

Elementary series correspond to the aggregation of EMB products ("ProdEMB"; see Chapter 2). ProdEMBs are product codes corresponding to groups of detailed products tracked as part of the annual structural surveys ("ProdEAP" code from the EAP).

Ideally, the elementary series should consist of relatively homogeneous products and be representative of the branches covered. By design, unless an activity is not monitored, there will be at least one elementary series per NAF Rev. 2 subclass (5-digit level of the classification).

2- Distribution and Main Characteristics of the Elementary Series with Base Year 2015

2.1- A Little Over 500 Elementary Series

Currently, 530 elementary series are used to monitor 232 items of the NAF 700 (58 industry items are not tracked by a series; see below). The number of elementary series is identical to that of the 2010 base[20] although marginal changes are expected from 2019 with the introduction of the annual re-basing process, which will result in the boundaries of series being revised at a rate of up to a fifth each year (see below).

The number of elementary series per NAF subclass varies widely. In cases where the range of products is very broad, a subclass is generally represented by several elementary series (the chemical industry being one example). Conversely, some items in the NAF 700 can be more easily monitored using a single series.

The number of elementary series per NAF also depends on the choice of monitoring variables; within a series, all products (ProdEMB) must be monitored based on a single variable (e. g. quantity in kg) so that the individual data collected for the series can be summed up. By opting for monitoring based on invoicing, the number of elementary series can be reduced since it is then easy to sum them up.

20The transition to the 2015 base in March 2018 was accompanied by a number of methodological improvements (such as the shift to chained indices with annually updated weights) but did not initially lead to changes in the boundaries of series. This is the purpose of the annual re-basing process launched in conjunction with the 2015 base year, the first wave of which will end in January 2019.

Table 1: Number of Elementary Series by Major NAF Item

	Number of Elementary Series
C1 Manufacture of food products, beverages and tobacco	103
C2 Manufacture of coke and refined petroleum products	1
C3 Electrical and electronic equipment	75
C4 Transport equipment	21
C5 Other manufactured goods	306
DE Mining and quarrying, energy, water	21
FZ Construction	3
Total	**530**

2.2- Branches Not Monitored in the IPI

Some branches are not monitored with the 2015 base year either because of specific difficulties or because of their limited significance (or non-significance in the case of some NAF items). For example, the mining of coal and lignite, the mining of metal ores and mining support service activities are not monitored since they account for a very small proportion of French industrial activity (see Table 2).

Other branches within the craft sector (most businesses of which have fewer than 20 employees; see Chapter 2 for details of the inclusion criteria), such as “bakery and bakery confectionery” and “confectionery”, are not covered.

Neither the nuclear industry nor the manufacture of military fighting vehicles are included in the IPI. In other manufacturing industries, jewellery, the manufacture of musical instruments, sporting goods and toys are not covered, although their status will be reviewed in the coming years.

In the electricity, gas, steam and air conditioning supply branch, there is no series on the manufacture of gas on account of its small size. Steam and air conditioning supply is not monitored, there being no requirement to do so under the European regulation. The same applies to some branches falling under Section E (“water, sewerage”).

In total, non-monitored branches represent less than 10% of the value added of industry as a whole (sections B to E; see Table 2). Some of the activities that are not currently monitored are due to be introduced in the coming years as part of the annual re-basing process (see below), particularly if they are significant or if survey data have already been collected (in anticipation of future inclusion) since the last base change. Thus, three branches that were not previously monitored were already incorporated into the IPI in the March 2019 publication. These are: “10.71A - Manufacture of bread; manufacture of fresh pastry goods and cakes”, “18.13Z - Pre-press and pre-media services” and “17.29Z - Manufacture of other articles of paper and paperboard”. Other branches may be introduced in 2020, such as the “manufacture of jewellery and related articles” and the “manufacture of other products of wood”.

Table 2: List of Industry Subclasses Not Tracked in the IPI with Base 2015 (Following the Implementation of the First Wave of Annual Re-Basing in March 2019)

NAF Codes	Branch Name	Estimated weight in Industrial VA in 2016 (in %)
05.10Z	Mining of coal	0.00
05.20Z	Mining of lignite	0.00
07.10Z	Mining of iron ores	0.00
07.21Z	Mining of uranium and thorium ores	0.00
07.29Z	Mining of other non-ferrous metal ores	0.01
08.91Z	Mining of chemical and fertiliser minerals	0.01
08.92Z	Extraction of peat	0.00
09.10Z	Support activities for petroleum and natural gas extraction	0.02
09.90Z	Support activities for other mining and quarrying	0.00
10.13B	Meat products	0.13
10.71B	Baking of bakery products	0.39
10.71C	Bakery and bakery confectionery	1.64
10.71D	Confectionery	0.26
10.84Z	Manufacture of condiments and seasonings	0.12
11.02B	Wine-making	0.37
11.03Z	Manufacture of cider and other fruit wines	0.01
11.04Z	Manufacture of other non-distilled fermented beverages	0.00
13.94Z	Manufacture of cordage, rope, twine and netting	0.01
14.11Z	Manufacture of leather clothes	0.01
14.20Z	Manufacture of articles of fur	0.01
16.10A	Sawmilling and planing of wood, excluding impregnation	0.32
16.10B	Impregnation of wood	0.04
16.22Z	Manufacture of assembled parquet floors	0.01
16.29Z	Manufacture of other products of wood	0.07
18.11Z	Printing of newspapers	0.03
18.14Z	Binding and related services	0.05
18.20Z	Reproduction of recorded media	0.01
19.10Z	Manufacture of coke oven products	0.00
20.13A	Enrichment and reprocessing of nuclear fuel	0.18
23.43Z	Manufacture of ceramic insulators and insulating fittings	0.00
23.44Z	Manufacture of other technical ceramic products	0.02
23.49Z	Manufacture of other ceramic products	0.00
23.52Z	Manufacture of lime and plaster	0.05
23.64Z	Manufacture of mortars	0.07
23.65Z	Manufacture of fibre cement	0.01
23.69Z	Manufacture of other articles of concrete, plaster and cement	0.03
23.70Z	Cutting, shaping and finishing of stone	0.11
24.41Z	Precious metals production	0.01
24.46Z	Processing of nuclear fuel	0.03
26.80Z	Manufacture of magnetic and optical media	0.00
28.24Z	Manufacture of power-driven hand tools	0.01
28.49Z	Manufacture of other machine tools	0.03
30.40Z	Manufacture of military fighting vehicles	0.00
30.99Z	Manufacture of other transport equipment n.e.c.	0.01
32.11Z	Striking of coins	0.00
32.12Z	Manufacture of jewellery and related articles	0.20
32.13Z	Manufacture of imitation jewellery and related articles	0.05

32.20Z	Manufacture of musical instruments	0.03
32.30Z	Manufacture of sports goods	0.10
32.40Z	Manufacture of games and toys	0.05
32.91Z	Manufacture of brooms and brushes	0.02
33.17Z	Repair and maintenance of other transport equipment	0.07
33.19Z	Repair of other equipment	0.05
35.21Z	Manufacture of gas	0.00
35.30Z	Steam and air conditioning supply	0.46
37.00Z	Water collection, treatment and supply	1.71
38.11Z	Collection of non-hazardous waste	0.41
38.12Z	Collection of hazardous waste	0.08
38.21Z	Treatment and disposal of non-hazardous waste	0.38
38.22Z	Treatment and disposal of hazardous waste	0.16
38.31Z	Dismantling of wrecks	0.03
38.32Z	Recovery of sorted materials	0.94
39.00Z	Remediation activities and other waste management services	0.19

2.3- The Quality of Subclass Monitoring per NAF Subclass

Even if some activities are not monitored, the scope of the elementary series tracked ensures that most of the subclasses of the activity classification are covered. Within the subclasses monitored, however, not all the products manufactured (and identified using the list of ProdEAPs included in the subclass) are surveyed. Reasons may include a low cost/benefit ratio (i.e. cost of monitoring versus gain in accuracy) for the IPI, difficulties in retrieving information on the manufacture of a product on a monthly basis or if the product accounts for a limited volume of output in the subclass.

It is then possible to calculate coverage rates for each branch tracked by the IPI to reflect the representativeness of the index branch by branch based on data from the annual production survey, which, by design, covers all products manufactured within a branch. Coverage rates vary according to the branch considered. However, more than 80% of the branches monitored in industry have a coverage rate of more than 75% (see Table 3a), allowing for accurate estimates of changes in activity. The coverage rate increased significantly with the implementation of the first wave of the annual index review process in March 2019 (see below), as illustrated by the difference with the situation that had prevailed until then (see Table 3b for the coverage rates before the implementation of these changes). Finally, construction activities are well covered.

These coverage rates play no role in the calculation of aggregated indices[21]. Within a given branch, the process of selecting products is intended to identify products that are representative of other activities in this branch. The underlying assumption is to consider that the uncovered portion of the products is negligible or changes in a similar manner.

21They have sometimes played a role in the past. To calculate the aggregated indices, VA adjusted by the coverage rate rather than the total VA of the branches monitored was used.

Table 3a: Distribution of Branches (NAF Subclass Level) Based on Current Coverage Level (Excluding Construction)

Coverage Rate	Number of Branches (Subclasses)	Weight of Branches in Industrial VA (%)
> 90%	149	56.8
75% to 90%	38	21.0
50 to 75%	27	8.5
25 to 50%	10	4.1
Less than 25%	4	0.5
NAFs not monitored or with no output in France	63	9.0
Total	**291**	**100.0**

Table 3b: Distribution of Branches (NAF Subclass Level) based on Coverage Level Before the Introduction of the First Wave of Annual Re-Basing in March 2019 (Excluding Construction)

Coverage rate	Number of Branches (Subclasses)	Weight of Branches in Industrial VA (%)
> 90%	139	53.8
75% to 90%	36	17.8
50% to 75%	34	12.2
25% to 50%	11	4.8
Less than 25%	5	0.9
NAFs not monitored or with no output in France	66	10.5
Total	**291**	**100.0**

3- Updating the Products Surveyed and the Monitoring Method

As explained above, because of structural changes in industry, the list of activities tracked needs to be updated at regular intervals to ensure the IPI accurately represents French industrial output. Other factors may result in revisions being made to the tracked series and the method of collection. Examples include a retrospective statistical analysis showing responses of medium quality and new recommendations issued by international bodies. Previously, a review of the relevance of the series monitored was carried out every 5 years at the time of the base change (base years 2005, 2010, etc.). No such review took place at the time of the transition to base year 2015 but will now be conducted on an ongoing basis as part of the annual re-basing process.

3.1- Major Guidelines

The UN's recommendations relating to indices of industrial production focus on elementary series and the choice of production indicators to be used. It is on the basis of these recommendations that work on the re-basing of the IPI using 2010 as the base year was undertaken. In particular, the UN often recommends (for a well-identified list of products) monitoring in invoicing terms to better incorporate changes in product quality into the measurement of production. One of the first issues in examining series therefore relates to the choice of monitoring variable.

A second issue is the choice of products to be monitored (within a branch in order to provide a satisfactory estimate of the output of that branch) and the revision of the boundaries of the elementary series, i.e. the list of products forming it (ProdEMB). Given current developments in French industrial activity, products may disappear, their economic significance may decrease considerably or they may no longer be manufactured in France. In such cases, it may be appropriate to remove certain monitored products (for example, if the cost seems too high in relation to the expected gain in accuracy of the IPI) or to group series together. These changes generally lead to a decrease in the branch's coverage rate. To offset the drop in coverage, it is often necessary to introduce new products that have become more important. By way of anticipating these developments, some

products may be surveyed even if they are not yet included in the IPI (the term used is “future IPIs”), waiting for the time series to be long enough.

A third issue concerns the correction of any existing distortions in the boundaries of the elementary series, which may result from changes in classifications or, more rarely, from changes to product classifications. For example, these appear when a product tracked in a given IPI series is classified in a new branch. Though initially intended to track a set of products belonging to the same branch, the IPI series in question continues to be made up of the same products, but after the nomenclature is revised (such as the revision that took place in 2008), they correspond to different NAF codes. At the time of re-basing, any series subject to distortion are corrected to restore the overall consistency between the branch that the series represents and the classification of the products that make it up.

3.2- Example of Product Review at the Time of the 2010 Re-Basing

Apart from the reasons already mentioned, the 2010 base change was an opportunity to optimise the sample of elementary series and to rebalance the number of series by NAF code. Ideally, the number of elementary series in each branch should be roughly proportional to its weight, unless the branch has a particularly homogeneous production (in which case a single product may be sufficient) or a particularly heterogeneous production (i.e. many sub-branches with very specific production or price trends).

To meet the recommendation to develop indicators in terms of deflated values, it is necessary to have series of industrial producer price indices (PPI) defined along the same lines as the IPI series. To ensure convergence between the IPI and PPI series, it was sometimes necessary to change the boundaries of the IPI series.

In the 2005 base, 592 elementary series were used to monitor production in industry, construction and waste treatment. In the 2010 base, the number of series was reduced to 520 (see Table 4) while representing, as in the 2005 base, around 80% of total value added.

In food and agriculture, new series were introduced to improve the coverage of the IPI. A new branch was added: Processing and preserving of fish, crustaceans and molluscs (1020Z). The processing and preserving of potatoes (1031Z) and the distilling, rectifying and blending of spirits are better monitored in the 2010 base as a result of the addition of 3 new series in each of the two branches.

Table 4: Breakdown of the Decrease in the Number of Elementary Series between the 2005 and 2010 Bases

Number of series with base year 2005	592
+ Series newly introduced in 2010	+ 21
– Series discontinued in 2010	– 44
– Series from a grouping (87 series in 2005 grouped into 34 series in 2010)	– 53
+ Series arising from a splitting (4 series in 2005 split into 8 series in 2010)	+ 4
= Number of series with base year 2010 (including construction)	520

Since the French textile and clothing industry has decreased significantly in terms of output, the number of elementary series within the branch has been adjusted and reduced. The number of series in the chemical industry has decreased significantly (from 60 to 37) as a result of the removal of many series relating to the manufacture of basic chemicals, fertilisers and nitrogen compounds, basic plastics and synthetic rubber in primary forms, many of which accounted for very little of the branch’s value added. The number of series was also reduced in the other branches relating to the manufacture of chemicals, the manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations and the manufacture of other chemical products.

In the electricity, gas, steam and air conditioning supply branch, a series on the transport of electricity was introduced in the 2010 base with the use of data on high voltage. Data on medium and low voltage feed into the trade and supply series.

Lastly, the 2010 re-basing was an opportunity to reduce the distortions that had become apparent with the previous base, particularly following the revision of the classification of activities in 2008[22]. In total, not all elementary series were reviewed in depth as part of the 2010 five-year re-basing. A number of lower priority branches were not assessed. Similarly, the series relating to branches surveyed by approved professional bodies (OPAs) generally underwent no changes. The introduction of annual re-basing is intended to improve this process over the long term.

3.3- Introduction of an Annual Series Review Process

3.3.1-Principle

Under base year 2015, the industrial branches monitored by the IPI are reviewed at a rate of one fifth of the series each year. The annual update process helps to improve responsiveness and to better adapt the monitoring of the branches to economic or technical developments. It also ensures that all industrial activities are reviewed over a 5-year period, something that was not always possible under the five-year re-basing approach since examining all branches at once would have represented too great a burden. The rate at which series are revised may be adjusted, as the case may be, to take better account of differentiated changes in the production processes of different branches: while the gap between two reviews for the same series will be 5 years on average, it may be shortened in some cases.

Given the different processes involved in review operations, work on each review wave begins approximately 20 months before the actual implementation: for example, for the implementation in March 2019 of the first wave (dissemination of the January 2019 indices), the initial exploratory work (choice of field in particular) began in June 2017. The main objectives pursued, allowing a selection of the branches to be re-based, and the operations to be carried out are as follows:

- to maximise the coverage of the IPI (value-added share of monitored products in relation to the total value added of the branch);
- to improve the relevance of the set of elementary series used to calculate the IPI: the point is to redefine, within each re-based branch, a set of series adapted to the monitoring of the economic situation of that branch; it may also be desirable to modify the method used to measure production by taking into account, as far as possible, the United Nations recommendations applicable to the branch in question;
- to introduce new industrial products into the monthly surveys (or products not previously monitored on a monthly basis) that can be incorporated in a subsequent re-basing into the calculation of the IPI (once there is sufficient perspective on the data);
- to remove any distortions.

3.3.2-The First Wave (2019) of Annual Re-Basing

The first wave conducted between mid-2017 and the end of 2018 involved a revision of 44 NAF subclasses (see Table 5 for the exhaustive list), corresponding to approximately 19% of the 2015 value added of industry. Overall, these branches were covered by the IPI up to a rate of initially 55%, compared to 75% at

22The corrections of distortions made as part of the 2010 re-basing concerned the following branches:
- manufacture of arms and ammunition;
- manufacture of air and spacecraft and related machinery, manufacture of electronic components;
- manufacture of loaded electronic boards;
- manufacture of other electronic and electric wires and cables;
- manufacture of electrical installations, manufacture of scientific and technical instruments;
- manufacture of other general-purpose machinery;
- printing machinery, manufacture of electric lighting equipment;
- manufacture of electrical and electronic equipment for motor vehicles;
- manufacture of other parts and accessories for motor vehicles, manufacture of non-domestic cooling and ventilation equipment;
- manufacture of other general-purpose machinery, manufacture of medical, surgical and dental equipment.

the end of the review process. During this first wave, nearly 38% of the portion of industry not covered by the IPI was addressed. The overall coverage of industry by the IPI thus rose from 77% of the 2015 VA to more than 80%.

As part of this first wave, 3 branches were included in the IPI monitoring: 1071A - "Manufacture of bread; manufacture of fresh pastry goods and cakes"; 1813Z - "Pre-press and pre-media services"; and 1729Z - "Manufacture of other articles of paper and paperboard". These branches were backcast to provide sufficient perspective and are available since 2015 in the data published on the INSEE website. Two other branches were included within the field of the monthly branch surveys (EMBs) from 2019, without being included in the IPI. These are: branch 2364Z - "Manufacture of mortars" and branch 3317Z - "Repair and maintenance of other transport equipment". They will be taken into account in the calculation of the IPI at the time of a subsequent review wave after several years of surveys providing sufficient perspective on the quality of the data.

In total, this first stage resulted in nearly 100 elementary series being reviewed. The total number of elementary series has changed little despite significant developments, in particular as a result of the incorporation of activities that were monitored without, however, being taken into account in IPI calculations, with a view to future incorporation in order to improve the coverage of the indices (see Table 5).

Table 5: Breakdown of Changes in the Number of Elementary Series with the Implementation of the First Wave of the Annual Re-Basing Process (Implemented in March 2019)

Number of series with base year 2010	520
+ Series newly introduced in 2016	+ 20
- Series discontinued in 2016	– 2
- Series from a grouping (25 series grouped into 16 series)	– 13
- Series from a splitting (13 series split into 18 series)	+ 5
Total (including construction)	530

Beyond the changes made to the scope applied and method used to monitor the series, the implementation of re-basing requires a major backcasting of the series, the link-up between the old and the new boundaries being a sensitive operation for obtaining series of the highest possible quality. In particular, where possible, it can be useful to introduce the new boundaries over a sufficient temporal depth (in cases where the redefined products were already being monitored in parallel)[23]. However, this may lead to significant revisions to the revised years. These revisions may be deemed acceptable if the revision of the series allows a significant improvement in the quality of monitoring of the branch.

The implementation of chained indices since the 2015 base (see following chapters) makes it easier to link old and new product boundaries: the switch from the old to the new monitoring method can be managed directly using the weights applied to these series (the weight of the old boundary changing to zero at the time of the switchover).

Table 5: List of NAF Subclasses Reviewed as Part of the First Wave of the New Annual Re-Basing Process (Implemented in March 2019)

NAF Code	Name of Branch
1020Z	Processing and preserving of fish, crustaceans and molluscs
1031Z	Processing and preserving of potatoes
1032Z	Manufacture of fruit and vegetable juice

23A number of products have been surveyed since the 2010 base year but are not yet included in the IPI (sufficient perspective being required). Therefore, when incorporating these products into a review wave, it is possible to produce long series since the year of their creation.

1039A	Other processing and preserving of fruit and vegetables
1071A	Industrial manufacture of bread; manufacture of fresh pastry goods and cakes
1071B	Baking of bakery products
1071C	Bakery and bakery confectionery
1071D	Confectionery
1072Z	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
1073Z	Manufacture of macaroni, noodles, couscous and similar farinaceous products
1085Z	Manufacture of prepared meals and dishes
1101Z	Distilling, rectifying and blending of spirits
1102A	Manufacture of sparkling wines
1102B	Wine-making
1103Z	Manufacture of cider and other fruit wines
1104Z	Manufacture of other non-distilled fermented beverages
1105Z	Manufacture of beer
1106Z	Manufacture of malt
1107A	Production of mineral water
1107B	Production of soft drinks
1623Z	Manufacture of other builders' carpentry and joinery
1729Z	Manufacture of other articles of paper and paperboard
1813Z	Pre-press and pre-media services
2013A	Enrichment and reprocessing of nuclear fuel
2059Z	Manufacture of other chemical products n.e.c.
2110Z	Manufacture of basic pharmaceutical products
2229A	Manufacture of plastic-based technical parts
2319Z	Manufacture and processing of other glass, including technical glassware
2364Z	Manufacture of mortars
2399Z	Manufacture of other non-metallic mineral products n.e.c.
2410Z	Manufacture of basic iron and steel and of ferro-alloys
2432Z	Cold rolling of narrow strip
2752Z	Manufacture of non-electric domestic appliances
2841Z	Manufacture of machine-tools for metal work
2849Z	Manufacture of other machine tools
2899B	Manufacture of other special purpose machinery
2920Z	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
2932Z	Manufacture of other parts and accessories for motor vehicles
3311Z	Repair of fabricated metal products
3312Z	Repair of machinery
3316Z	Repair and maintenance of aircraft and spacecraft
3317Z	Repair and maintenance of other transport equipment
3320A	Installation of metallic, boiler structures and pipes
3320D	Installation of electrical equipment, electronic and optical equipment or other equipment

3.3.3-The Second Wave (2020) of Annual Re-Basing

Work associated with the second wave of the annual product review began in the summer of 2018 with the definition of the branches to be examined (see Table 6). As in the previous wave, this should result in the coverage of the IPI being significantly improved, even if work is still ongoing. Implementation is scheduled for March 2020. In particular, new branches may be introduced, such as the "Manufacture of other products of wood" (1629Z) and the "Manufacture of jewellery and related articles" (3212Z).

Table 6: List of NAF Subclasses Reviewed as part of the Second Wave of the New Annual Re-Basing Process (Implemented in March 2020)

NAF Code	Name of Branch
1012Z	Processing and preserving of poultry meat
1013A	Industrial production of meat products
1013B	Cooked meats production and trade
1051A	Manufacture of liquid milk and of fresh dairy products
1051B	Manufacture of butter
1051C	Manufacture of cheese
1051D	Manufacture of other dairy products
1061A	Flour milling
1061B	Other manufacture of grain mill products
1081Z	Manufacture of sugar
1082Z	Manufacture of cocoa, chocolate and sugar confectionery
1083Z	Processing of tea and coffee
1086Z	Manufacture of homogenised food preparations and dietetic food
1089Z	Manufacture of other food products n.e.c.
1512Z	Manufacture of luggage, handbags and the like, saddlery and harness
1629Z	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
2014Z	Manufacture of other organic basic chemicals
2016Z	Manufacture of plastics in primary forms
2030Z	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
2120Z	Manufacture of pharmaceutical preparations
2211Z	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
2223Z	Manufacture of builders' ware of plastic
2361Z	Manufacture of concrete products for construction purposes
2442Z	Aluminium production
2443Z	Lead, zinc and tin production
2444Z	Copper production
2445Z	Other non-ferrous metal production
2562B	Industrial mechanical engineering
2599B	Manufacture of other fabricated metal articles
2651B	Manufacture of scientific and technical instruments
2652Z	Manufacture of watches and clocks
2670Z	Manufacture of optical instruments and photographic equipment
2740Z	Manufacture of electric lighting equipment
2813Z	Manufacture of other pumps and compressors
2822Z	Manufacture of lifting and handling equipment
2825Z	Manufacture of non-domestic cooling and ventilation equipment
2830Z	Manufacture of agricultural and forestry machinery
3109B	Manufacture of other furniture and industry closely related to furnishing
3212Z	Manufacture of jewellery and related articles
3213Z	Manufacture of imitation jewellery and related articles
3299Z	Other manufacturing n.e.c.
3313Z	Repair of electronic and optical equipment
3314Z	Repair of electrical equipment
3320B	Installation of machinery and mechanical equipment
3700Z	Sewerage

Chapter 4 - Production Monitoring Indicators

A range of different indicators are used to measure industrial production in the monthly branch surveys. Historically, production was measured based on quantities alone. To better reflect the specific characteristics of certain sectors, other indicators have been introduced over time, such as production in value terms and hours worked.

At the time of the 2010 re-basing, the UN's recommendations on the methods to be used in monitoring economic activities were incorporated as far as possible. For many branches, production in value terms is recommended. Production in value terms is measured by invoicing. This provides a good approximation of production in value terms in cases where there is no gap between production and sales. On the other hand, if there is a time lag (for example in the event of large stocks or when the production process is very long without intermediate invoicing), quantity indicators are generally recommended.

In the case of very long production cycles, such as shipbuilding, production can be measured based on hours worked, which are then corrected for a productivity trend.

1- The Different Production Indicators

Several types of indicators can be used depending on the products monitored:

- quantity produced;
- quantity delivered;
- invoicing;
- hours worked;
- consumption of raw materials.

1.1- Quantities Produced

This indicator is often used for relatively homogeneous productions. It can vary widely. The indicator covers all production (as defined in economic models M2 to M5; see Chapter 2). In some cases, for statistical reasons, production excludes purchasers (model M2).

Summary: Quantities Produced

- What is being observed?
  - number of parts, tons, litres... produced.
- Where? When?
  - at the end of the production chain;
  - between production and storage or delivery.
- Measurement imperfections:
  - the increasing variety of production;
  - "quality" effects;
  - unrecorded work in progress in the case of long processes.

1.2- Quantities Delivered or Invoiced

In some branches, it is impossible to collect data on the quantities produced[24], with the only available data being the quantities delivered. 53 series in the 2010 base are monitored in terms of quantities delivered.

The "quantities delivered" indicator provides a satisfactory approximation of changes in production provided the stock of finished products remains relatively stable over time. As with quantities produced, quantities delivered correspond to diverse economic models, sometimes including the purchasers. Reporting manufacturers may indicate, at the same time as deliveries of products leaving their own workshops, deliveries of similar products

24For example, due to difficulties related to the information systems of the enterprises surveyed.

that they have purchased from other manufacturers without having manufactured them. In addition, the delivery declaration may be delayed in relation to the factory exit since it is linked to the transfer of ownership to the customer or to embarkation on a ship.

Summary: Delivered Quantities

- What is being observed?
  - number of parts, tons, litres... delivered.
- Where? When?
  - on delivery.
- Measurement imperfections:
  - in the event of significant variations in product stocks;
  - of variable delivery times;
  - the increasing variety of production;
  - "quality" effects;
  - variation of work-in-progress.

1.3- Deflated Invoicing

At the time of the transition to the 2010 base year, the number of series followed in deflated invoicing increased significantly compared to the 2005 base year, in line with UN recommendations. Invoicing (excluding taxes) is one of the easiest variables to use with companies through branch surveys. A summary of monthly invoicing is generally carried out by type of product by accounting departments within companies.

Deflated invoicing of production prices is an approximation of the quantities delivered. However, there may still be discrepancies with the delivered quantities on account of discrepancies in accounting entries. Invoicing can peak at the end of the year while deliveries are carried out at a more consistent rate throughout the year. In order for deflated invoicing to be used as a production indicator, stocks must remain stable over time.

Invoices may, like quantities, concern all economic models, including products resold in the same condition as they are, excluding or not purchasers depending on the sector.

Invoices are, unlike quantity indices, value indicators that can be applied to a set of heterogeneous products. In addition, they incorporate "range effects" and "quality effects". The range effect can play a role in the case of products of the same generation in production at the same time. This occurs, for example, in cases where the share in the production of high-end products increases at the expense of the share of low-end products. The "quality" effect corresponds to the replacement over time of products of one generation by products of the next generation, with generally increased performance (technological products being one example).

<u>The choice of deflators for the series monitored in invoicing</u>

Deflated invoicing indicators require the use of producer price indices consistent with the boundaries of the series in value terms. Industrial producer prices for the French and foreign markets are the indicators usually used to deflate invoicing for industrial products. The price measure is established at base prices, excluding VAT, product taxes and subsidies on non-deducted products.

At a level below CPF4, IPI series and producer price index series may not always be linked in a simple way. In addition, some products are not covered by industrial producer price indices.

Summary: Invoicing

- What is being observed?
  - Invoices in euros from legal units.
- Where? When?
  - In the accounting department, at the same rate as entry into the accounts.
- Measurement imperfections:
  - in the event of significant variations in product stocks;
  - more generally, the discrepancies between production and invoicing;
  - risks around the consistency between the value index and the price index.

1.4- Productive Hours Worked

21 series in manufacturing series and three in construction are monitored in terms of hours worked. These series represent just under 10% of the manufacturing IPI with 2010 as the base year (in value added) and the entire construction index. The series monitored in terms of hours worked mainly concern the production of capital goods (such as shipbuilding) and the repair and installation of machinery and equipment.

The number of productive hours worked is used to track products with a long production cycle. For products with a long production cycle, the number of hours worked generally reflects actual activity more accurately than other indicators. It is important to ensure that the hourly data collected as part of the monthly branch surveys correspond to productive hours actually incorporated into the production process, excluding ancillary and overhead costs and also excluding paid hours not worked (leave). Productive hours must include the hours of any interim production staff employed.

Summary: Hours Worked

- What is being observed?
  - hours worked.
- Where? When?
  - during the production process.
- What is missed:
  - productivity cycle;
  - difficulty in accurately measuring productivity trends over the recent period.

Correcting the number of hours according to the productivity trend

Measuring production by productive hours worked presupposes that productivity remains stable. If this is not the case, the hours worked indicator must be associated with labour productivity indicator based on the following equation:

$$Production = Productive\ hours\ worked \times productivity$$

The trend observed for productivity over the past years is extrapolated to the period under review.

2- Changes in Production Indicators between the 2005 and 2010 Bases

For many branches, the UN recommends using value production indicators. For these sectors, the transition to invoicing monitoring was considered, if producer price indices in industry were available and if there were no problems related to volatile stock variations. For example, the UN advises monitoring the automotive industry in value terms; the invoicing indicator is not used in this industry because of the significant variations in stock. The change in the distribution of monitoring methods between the 2005 and 2010 base years is detailed in Table 1. Before the implementation of the first wave of the new annual re-basing in March 2019, the distribution of monitoring methods with base year 2015 was identical to the 2010 base year. It has since changed slightly (see Table 1) with a slight increase in the proportion of series monitored in invoicing terms. This distribution should change again with the implementation of the second wave of annual re-basing in March 2020.

Table 1: Monitoring Indicators for the Current IPI and in Comparison with the 2005 and 2010 Base Years (Excluding Construction)

	Base Year 2015 (After Implementation of the 1st Wave of Annual Re-Basing in March 2019)			**Base year 2010**			**Base year 2005**		
Monitoring Indicator	Number of series	Distribution of the number of series (%)	Distribution of VA (%)	Number of series	Distribution of the number of series (%)	Distribution of VA (%)	Number of series	Distribution of the number of series (%)	Distribution of VA (%)
Quantities	314	59.6	54.8	319	61.7	52.9	436	74	62.5
Invoicing	190	36.1	38.3	177	34.2	39.8	129	21.9	30
Hours	23	4.4	6.9	21	4.1	7.4	24	4.1	7.5
Total	**527**	**100.0**	**100.0**	**517**	**100**	**100**	**589**	**100**	**100**

Chapter 5 -Calculation of Indices: the Elementary Level

As seen above, the IPI is based on a survey conducted at a detailed level with the aim of obtaining relatively homogeneous elementary sets. The (unpublished) elementary level is the building block of the IPI. This chapter presents the computation method of the elementary indices that will then be used to calculate the upper levels (see Chapter 6).

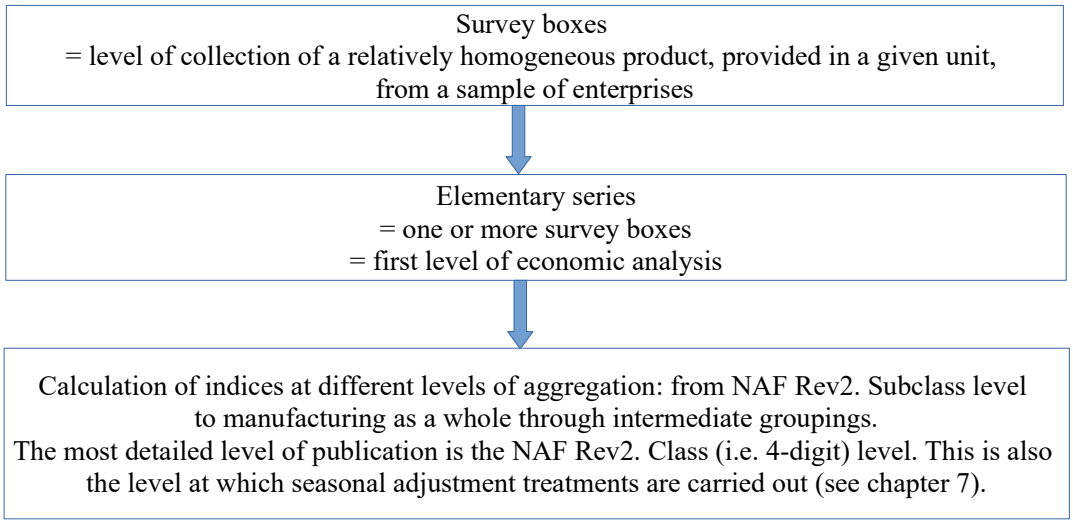
1- Collection of Individual Data: The Principle of the Survey Box

As set out in previous chapters, individual data on enterprises are collected using well-defined boundaries termed "cases-enquêtes" in French (survey box hereafter), corresponding exactly to the intersection of a product (ProdEMB), an observation variable (quantities, invoicing, hours worked) and a unit (tonnes, kilos, euros, etc.). The term survey box refers directly to the box of the questionnaire where, for a given product, the enterprise (in the sense of legal unit) fills in its production for the month in question. The IPI collection process is based on a large number of survey boxes. For example, within NAF 2932Z ("Manufacture of other parts and accessories for motor vehicles"), there is a survey box relating to the "manufacture of motor vehicle seats" with invoicing used as an observation variable, but also a survey box on steering and braking devices, one on parts and accessories made of thermoplastic materials, and so on.

This collection nomenclature (all survey boxes) may be revised in line with changes made to the European "ProdCom" classification of products. The nomenclature is managed in a reference system grouping all the products surveyed as part of the EAP[25] (and serves as a reference for the EMBs). As a reminder, the products surveyed in EMBs (referred to as ProdEMB) are generally groupings of several products surveyed under the EAP (or ProdEAP).

The construction of the sample of enterprises surveyed (approximately 4,500 and 5,000 enterprises in total) is conducted on a case-by-case basis. Data are collected through INSEE's COLTRANE portal used for responses to business surveys. They are then being checked and integrated into the calculation of the indices.

Figure 1: General Outline of the Index Computation Process



25See Chapter 2 for a presentation of this source.

2- Method of Calculation of Elementary Indices

2.1- Different types of elementary series

Different Monitoring Methods
The construction of the IPI begins with the calculation of elementary series. Depending on the importance and complexity of the sectors in question, elementary series may reflect different levels of detail and use different measurement variables. They are composed of one or more homogeneous survey boxes (see above) (invoicing and hours worked are not combined, for example). The indices of primary series are set to an annual average of 100 in the reference year.

Since the IPI is an indicator of production volume, series monitored in invoicing terms must be deflated (by a price index) while series monitored in terms of hours worked need to be adjusted by a technical coefficient taking into account the change in productivity in the activity studied.

Internal and External Series
The bulk of the monitoring and data collection work involved in compiling the industrial production index is conducted by INSEE (internal series). However, in some cases, the calculation is conducted directly by an external partner (external series): these include the food and agriculture activity series and the energy series.

2.2- Definition of an Elementary Index

An elementary index corresponds to a development indicator (or indicator of change) calculated as the ratio between a numerator and a denominator. In the case of internal series, the denominator is equal to the average of the base year (the reference). Therefore, the difficulty is to estimate a numerator representing the change in activity relative to this reference point. In other words, an elementary index is written:

$$Ind_i^{m,A} = \frac{Num_i^{m,A}}{\left(\sum_{k \in Aref} \frac{Num_i^{k,Aref}}{12} \right)} * 100$$

where:
- i denotes the branch monitored
- m and A denote the month and year of calculation of the index, respectively
- Aref is the reference year (or base year), which is currently 2015

As noted above, in the case of series monitored in terms of invoicing or hours worked, this index must also be adjusted by a technical coefficient taking into account changes in prices or productivity.

2.3- Calculation of the Numerators of the Internal Elementary Series

Chaining of elementary series by month: based on a reference month, the numerators are constructed from one month or period to the next (chaining) by applying the monthly changes calculated from the data provided by enterprises present in two consecutive months[26] (referred to below as "present-present")[27].

Let:

Num_S^m = the numerator of elementary series '*S*' for month m of year A;

26Here, "consecutive" does not always mean two consecutive months in the calendar. For certain special cases or if a change between two consecutive months cannot be calculated, it is chain-linked to the first appropriate month.
27The methodology presented here is the methodology implemented since 2015. The methodology used previously was slightly different and was based on the calculation of a denominator common to every month of a year, so the numerators were not directly chain-linked from one month or period to the next.

$EvolPP_S^{m/m-1}$ = the change calculated on all products included in series "*S*" for enterprises present-present in m-1 and m (enterprises in the sample for dates m and m-1 and for which either a response or an imputation is available for both dates);

$M_{j\times box}^m$ = amount of legal unit "*j*" for a product corresponding to survey box "box" of series "*S*" (being accepted that a given enterprise may be surveyed for different products within series S) and $p_{j\times box}^m$ its sampling weight;

$(j, box)\in\{S\times[m;m-1]\}$ all present-present *entreprise x survey-box* pairs surveyed in both m and m-1 for the survey boxes of series *S*.

Then, by calculating the weighted change between m and m-1

$$EvolPP_s^{m/m-1}=\frac{\sum_{(j,case)\in\{S\,x\,[m;m-1]\}} p_{j\times case}^m M_{j\times case}^m}{\sum_{(j,case)\in\{S\,x\,[m;m-1]\}} p_{j\times case}^m M_{j\times case}^{m-1}},$$

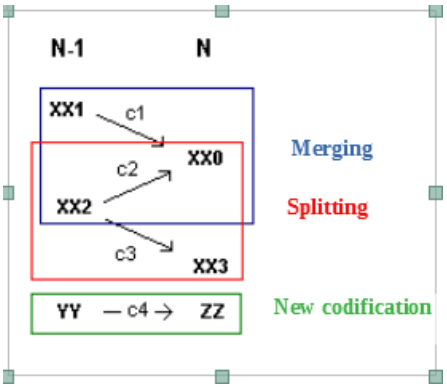
We can calculate the numerators by chain-linking from one period to the next:

$$Num_s^m = Num_s^{m-1}\times EvolPP_s^{m/m-1}$$

Beyond this general formula, a number of special cases need to be considered.

Special case 1: calculation of the change between December and January and management of the survey boxes
Each year, the survey boxes can be modified (groupings, recoding, splitting).

Figure 2: Possible Changes to Survey Boxes



The chaining of the amounts reported by enterprises from one month to the next can cause difficulties when changing years since declarations are not comparable on different survey boxes. In such cases, correspondence coefficients must be estimated to move (in cases where there has been a change) from survey boxes in one year to those in the following year.

Special case 2: Chaining Relative to the Atypical Months of July and August
July and August being atypical months, it is not desirable to chain-link changes by taking them as a reference. Therefore, for the methods used for the IPI, when calculating the August and September months, the comparison is generally made with the month of June (in the above calculation formulas, it is then sufficient to replace "m-1" by June).

Special Cases 3: Management of "0" Cases

When calculating $EvolPP_S^{m/m-1}$, it is possible that the denominator equals zero. In this case, chaining will be relative to the first non-zero month observed (m-2, m-3, etc.). The same applies if the numerator in relation to which the chaining is applied is zero.

2.4- Imputation of Non-Responses

The method of imputation of an individual datum *j (*undertaken in box survey *C)* is based on the combination of the following quantities:

- ratio m/m-1 of the total of the survey box (all responding enterprises for this particular survey box in m and present in m-1 (respondent or imputed)): $EvolR_C^{m/m-1}$;
- $EvolSerie_S^{m-12/m-13}$ the m-12/m-13 ratio of the elementary series *S* in which the survey box is located: ;
- weighted by a response rate in the survey box that allows the "quality" of the change to be taken into account: TxR_C^m .

$$M_j^m = M_j^{m-1} \times \left[\left(EvolR_C^{m/m-1} \right)^{TxR_C^m} . \left(EvolSerie_S^{m-12/m-13} \right)^{\left(1-TxR_C^m\right)} \right]$$

Special Case 1: Management of "0" cases
If in the above formula one of the two ratios is zero (or if no enterprise responds): the formula becomes**:**
$M_{i,ce(an_m)}^m = M_{i,ce(an_m)}^{m-1} \times Evol$ with $Evol$ being the non-zero or calculable ratio (in the case of a zero response rate). If both changes equal zero, the amount imputed is 0.

Special Case 2: Incoming and Non-Responding Enterprises:
Enterprises that are new to the sample and do not respond cannot be imputed. Therefore, they are not used for the calculation in the first month.

2.5- Management of Infra-Annual Movements in the Sample (Chaining Corrections)

Drawn once a year, the sample of enterprises may undergo changes every month, in particular because of restructuring (takeover of one company by another, separation, etc.). Thus, new companies may be created that incorporate one or more enterprises surveyed in previous months. Enterprises may also cease their activity or operate in a completely different field of activity.

Changes in samples (taken into account through the application used to manage the monthly branch surveys) affect the calculation of the elementary series. Since the calculation of the indices is chained between months m1 and m, several boundary changes can affect it:

- for restructured companies retaining the same identifier but which see changes in scope or response behaviour, comparable amounts between m and m-1 are desirable;
- for new restructured companies incorporating one or more enterprises in the sample, comparable amounts between m and m-1 are also desirable, even if not all companies within the new boundaries of the restructured company were surveyed in m-1;

- removals, on the other hand, are not involved in the chaining and, therefore, in the calculation of the index[28].

In all these cases, it is necessary to implement chain corrections allowing for relevant changes to be maintained. Where possible, corrections are implemented in tandem with companies.

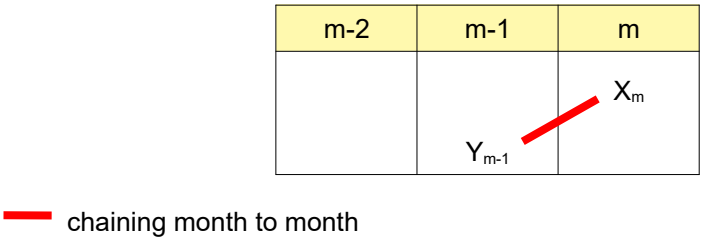
Let:

Y_{m-1}: chaining correction amount for the intersection (enterprise (SIREN) x survey box) for month m-1 and comparable in field terms to a declaration in m, written $X_{m;}$

X_m: amount reported for an intersection (enterprise (SIREN) x survey box) in m (enterprise response or imputation).

Figure 1: Enterprise Birth

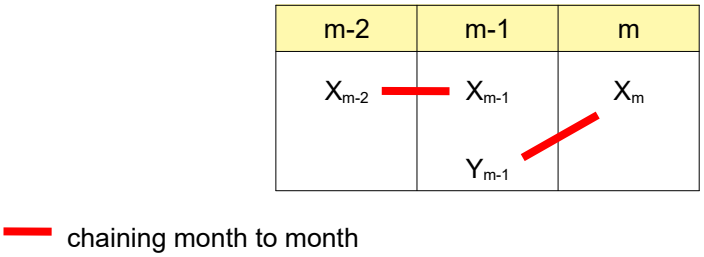
In the case of an enterprise birth, an adjustment is made in m-1 to calculate the change based on a comparable field: the chaining adjustment amount is used to calculate the numerator of month m (chaining between m and m-1). However, it should not be used in the calculation of m-1 (there is no response in m-2).



If a new company is created but no chaining correction amount,Y_{m-1} has been inputed (for example because no reliable estimate of the amount is available), the company is not taken into account in calculation for month m. It will then be incorporated for the first time in the calculation carried out the following month.

Case 2: Restructuring or Change in Response Behaviour

In the case of a change in a company (restructuring or change in response behaviour), the chaining correction amount is used to calculate the numerator of month m. By contrast, in the calculation of m-1, the amount used is always that of the previous month, entered by the company (or modified by the Insee clerk, or imputed).



If a company is restructured or changes its response behaviour but no chaining correction amount has been entered, the amount used is X_{m-1}.

28Generally, if this is not already the case, the product concerned is set to 0 before the actual removal of the calculation sample to take the removal into account.

2.6- Prioritising the Analysis of Individual Responses Within an Elementary Series

The elementary series are assessed by clerks at the Insee Normandy regional directorate with a view to detecting possible erroneous responses or atypical changes. Because of the very tight production deadlines, it is not possible to check all data. Priorities for the analysis of series are therefore determined based on two main criteria:

- individual contributions to the year-over-year change (between m/m–12) of the elementary series;
- individual contributions to the revision of changes between m–1 and m of the elementary series.

Re-using the notations already used and if $\{j \in [S \times (m-12)]\}$, the contribution of enterprise *i* (present in m and m-12) to the "m/m-12" year-on-year change in an elementary series is written:

$$Contribution_{i \to S}^{m/m-12} = \frac{p_i^m * M_i^m - p_i^m * M_i^{m-12}}{\sum_{j \in [S \times (m-12)]} p_j^m * M_j^{m-12}}$$

In addition, let:

- "dca" be the current campaign date and "dca-1" the previous campaign date, i.e. for the indices calculated the previous month;
- $M_i^{m;dca}$ be the amount declared by enterprise i for month m during calculation campaign "dca";
- $\{j \in [S \times (m;m-1);\ dca]\}$ all (enterprises x survey boxes) present-present in m and m-1 for the S series during the "dca" monthly campaign;
- $\{j \in [S \times (m;m-1);\ dca-1]\}$ all (enterprises x survey boxes) present-present in m and m-1 for the S series during the previous monthly campaign.

The contribution of enterprise *i* to the revision of the monthly change "m/m-1" of an elementary series is written:

$$Contribution_{i \to S}^{Révision\ m/m-1,\ campagne\ dca} = \frac{p_i^m * M_i^{m;dca}}{\sum_{j \in [S\ x\ [m,m-1];dca]} p_j^m * M_j^{m-1;dca}} - \frac{p_i^m * M_i^{m;dca}}{\sum_{j \in [S\ x\ [m,m-1];dca-1]} p_j^m * M_j^{m-1;dca}}$$

Chapter 6 - Calculation of Indices: Aggregation

Chapter 5 aimed to set out how individual data are combined to form elementary indices, the first true level of computation and analysis of IPI indices. These indices provide an estimate, for each of the families of industrial products monitored, of the quantities produced on a monthly basis by enterprises located in France. They are then aggregated based on different levels of classification to facilitate the analysis and use of the indicators.

1- General Principles of the Aggregation of Indices with Base Year 2015

1.1- From Constant Weights to Chained Indices with Annually Updated Weights

The transition of industrial production indices to the 2015 base year, first published in March 2018, was accompanied by the introduction of annual chain linking, using a set of annual weights for aggregating the indices at higher levels. In previous bases, fixed weights were used to aggregate IPI series over the entire 5-year calculation period (2005 weights for the 2005 base, 2010 weights for the 2010 base, etc.).

The new methodology improves the long-term robustness of the index by:

- taking better account of structural changes in the economy (in practical terms, if, at the most detailed level – i.e. elementary series – changes depend only on the specific data collected for the IPI, "regular calibration" on structural statistics limits any long-term drifts);

- taking into account the distortion of relative prices (similar to what is done in the national accounts in calculating volumes based on the previous year's chained prices, such as GDP, which helps to improve the consistency between the IPI and output calculated by national accounts on the basis of structural statistics);

- lastly, it significantly reduces revision problems during base changes[29].

While this change appears to provide increased quality for the IPI, it is important not to overestimate the impact of the change in weights each year: in particular, since changes in the productive structure and in relative prices are relatively slow, aggregating indices from weights associated with one year or those of the previous year would, in most cases, only marginally affect the changes in the indices.

Conversely, using chained indices has some disadvantages related in particular to the increased complexity (see below).

1.2- Annual Overlap Chaining

There is no single method for chaining indices or, more generally, quantities based on the quantities available at the lower levels. The method used for the IPI is known as the "annual overlap" method. The construction of the index for a given month depends directly on the average annual index for the previous year and on a trend calculated based on carefully selected sub-indices and weights. The definition and specific construction of the weights is the subject of the following section.

Let:
- m be the month in which the index is to be calculated and A be the year;
- $Aref$ be the reference year (=2015 currently);

29In systems using constant weights, the change in reference year for the calculation of weights implied updating the entire series based on the new weights, which could lead to significant and sometimes incomprehensible revisions.

- $J_{Agg}^{m,A}$ = Index of aggregated series Agg for reference month m of year A;
- J_{Agg}^{A} = Annual average of the indices of the aggregate series for year A;
- $J_{i}^{m,A}$ = Index of subseries i (lower level), such that $i \in Agg$, for reference month m of year A and J_{i}^{A} be the annual average of the index for series i for year A;
- p_i^A be the weighting associated with series i ($i \in Agg$), used for the calculation of year A (typically a variable depending on the value added of the previous year, see next chapter).

The general formula for calculating the indices is then written[30] : $J_{Agg}^{m,A} = J_{Agg}^{A-1} * \frac{\sum_i p_i^A J_i^{m,A}}{\sum_i p_i^A J_i^{A-1}}$

We can then easily understand the construction method: we start from the level of the index of the previous year and construct the monthly aggregated indices of year A with reference to this annual index. To achieve this, a change index is applied based on the weighted averages of the sub-indices (monthly in the numerator and annual in the denominator). The index is:

- chained[31] since the index is deduced from the value of the previous period and so on;
- with annual overlap, since the chaining is based on the annual average of the previous year, thereby ensuring the quality of the annual change and providing a basis for moving directly to a chained annual index by summing the monthly indices.

Indeed, if the indices of the different months of year A are summed up, we easily obtain $\frac{J_{Agg}^{A}}{J_{Agg}^{A-1}} = \frac{\sum_i p_i^A J_i^A}{\sum_i p_i^A J_i^{A-1}}$. In other words, the annual change of the aggregate index is obtained as the ratio of the averages of the sub-indices weighted by the same system (the weights $p_i^A, i \in A$; see Chapter 7 for a presentation of the calculation of these weights): the index obtained is a (chained) Laspeyres index.

30The formula should be adjusted slightly to calculate the indices over the period prior to the base year (calculations are made on the basis of the indices of that base year, before and after) and for the base year serving as a reference.
31The IPI is therefore ultimately a double-chained index:
- it will be derived from a calculation of elementary indices by chaining the series month to month;
- the aggregated indices are also calculated by chaining from the previous year's indices and the lower level indices.

Comments:

- The aggregation formula for indices with constant weights was written: $J_{Agg}^{m,A} = \frac{\sum_i p_i^{Aref} J_i^{m,A}}{\sum_i p_i^{Aref}}$

- The implementation of the new methodology is accompanied by backcasting of the weights over a long period (see below);

- Using chaining methods for the IPI has some disadvantages related in part to the greater complexity of the calculations involved:
  - the exact calculation of the contributions of subseries to changes in an aggregate is more complex;
  - the change in the first month of the year relative to the last month of the previous year is affected by the change in weight (see Section 3).

2- The Principle Governing the Calculation of Weights

2.1- Type of Weights Used

The European Regulation on short-term statistics[32] specifies, for each short-term indicator, the preferred weighting variable to be used for the aggregation of elementary indices. In the case of the IPI, the weighting variable is value added (VA). It is important to note that the choice of VA is based on practical and theoretical considerations as well as on conventions (see box). As noted in Chapter 1, at the elementary level, the changes measured by the IPI are not exactly similar to changes in value added.

Eurostat recommends using the VA data drawn from structural business surveys. However, in France, structural business statistics do not allow for a direct calculation of VA per branch. The calculation of the weights is first based on the VA data by branch contained in the national accounts (aggregate classification, level A129). However, this level is not detailed enough for the IPI. A breakdown to the most detailed level is then carried out based on annual structural data on turnover by branch (see diagram).

Box 1: Why Use Value Added Weights?

The use of valued added as a weight unit for aggregating indices is consistent with a Eurostat recommendation. This recommendation implies a particular measure of changes in activity.
The first option is to construct Laspeyres indices of quantities produced using price weights. These are the simplest indices and appear to be consistent with the standard representation in terms of the value of "baskets" of quantities produced. However, they have the disadvantage of valuing the production of intermediate goods several times over.
Industrial production as a whole consists of products, some of which – i.e. consumer goods and capital goods – have reached the final stage of development and are therefore no longer processed until they reach their final destination, while others – i.e. intermediate goods – must be processed several times before reaching the final stage of development. Gross production indices are relevant for monitoring the production of consumer goods or capital goods: the system of weighting using base year unit prices is clear and fairly appropriate for valuing a basket of products, all of which have reached the final stage of development. On the other hand, gross production indices are not suitable for monitoring the production of intermediate goods or for monitoring the production of manufacturing as a whole since they overweigh the production of goods downstream of the production process. For example, the use of a gross production index values the production of the "automotive" series at a price that includes the value of the steel sheets, glass, tyres, etc. used to manufacture it, despite the fact that the production of these goods has already been included in the "steel sheets", "flat glass" and "tyre" series. In doing so, the value of intermediate goods is counted several times. The weighting system does not give each product family a weight proportional to the economic importance of the production of these products: it is biased insofar as it systematically assigns a greater weight to products that are located downstream of the production chains.

32*See Methodology of short term business statistics - Interpretation and Guidelines, Eurostat, 2006*

The concept of VA can be used to overcome this difficulty. Value added is the balancing item of the production account. It is calculated as the value of production less intermediate consumption.
This index is called the net production index to underline the choice of a weighting system that distinguishes it from the simpler gross production index. In practice, however, the term "net" is generally omitted.

2.2- Data Used and Calculation of the Distribution of VA

2.2.1-National Accounts Data

To strike a balance between data availability and data robustness, under the current system the calculation of weights is based on the semi-definitive version of the national accounts (available in May N+2 for year N). However, the weights used for backcasting (chained indices with annually updated weights) over a long period are based on the final version of the accounts.

The variable used is **value added at base prices of industrial branches across all institutional sectors**[33]. VA at base prices is defined as value added at producer prices minus any tax payable, and plus any subsidy receivable:

VA at base prices = gross VA[34] + Subsidies– taxes on products

2.2.2-ESANE Data

Individual Data or Composite Aggregates

The breakdown at the subclass level of national accounts data is carried out based on the turnover data[35] provided by the structural business statistics obtained from ESANE. ESANE data are available as individual data files, as well as in aggregate form at the subclass level. Known as composite aggregates, these aggregates are obtained after a complex adjustment process. In both cases, there are "sector" data (data collected at the "enterprise" level) and "branch" data (breakdown by branch based on turnover).

The calculation of the weights is now based on aggregated files. This seems to be more appropriate given that ESANE macro controls are applied to the aggregates, thereby ensuring greater reliability. The implementation process is also quicker.

We therefore have:

$$Weight_{subclass\ i} = Value\,added^{national\ accounts}_{A129\ level \ni i} \times \frac{Turnover^{Esane}_{sous\text{-}classe\ i}}{Turnover^{Esane}_{A129\ level \ni i}}$$

33In manufacturing, there are only a small number of branches where the value added of non-financial corporations and sole proprietorships differs from the value added of institutional sectors as a whole. These are primarily branches E36Z (Water collection, treatment and supply) and E37Z (Sewerage), where communal bodies and public companies are common. For the sake of simplicity and consistency with what is published, and as was the case for the previous bases, a decision was made to retain the added value on all institutional sectors.

34VA = Sales of goods - Purchases of goods - Changes in stocks of goods
+ Output of goods sold
+ Output of sold services
+ Output sold as inventory
+ Capitalised output
+ Other production
- Purchases of raw materials
+ Changes in stocks of raw materials
+ Other purchases and external charges
+ Other costs.

35VA data by branch being unavailable.

2.2.3-EAP Data

Annual Production Survey (EAP) data are used to break down VA at the elementary series level (see Figure 1).

The process of collecting data on industrial products is conducted at a very detailed level of classification. As such, this tool is particularly suitable for calculating weights at the most detailed level of the elementary series, which are moreover derived from the EAP product classification.

The variable used corresponds to "invoicing" in the EAP. Since the definition of industry used in the IPI is based on the UN definition, model M1 (see Chapter 2) was excluded for all products for which a breakdown by economic model is available in the survey. For other products or activities, total invoicing was used.

The EAP is used for all branches of industry except for food and agriculture, where the breakdown is based on the annual branch surveys of the SSP (Statistical Service of the Ministry of Agriculture), or in cases where the boundaries of the elementary series coincide with the boundaries of the subclass (e.g. aeronautics).

We therefore have:

$$Weight_{elementary\ series\ i} = Weight_{sous\text{-}classe \ni i} \times \frac{Invoicing^{EAP}_{elementary\ series\ i}}{Invoicing^{EAP}_{subclass \ni i}}$$

Comment 1:

At the level of the elementary series, until 2016 the IPI weights did not use the total VA of a branch but the proportion of the VA covered by the IPI series (for a definition of the coverage rate, see Chapter 3). The choice to be made depends on the intended message or meaning to be given to the IPI dissemination.

- **Case 1: The VA of the Branch is Adjusted by the Coverage Rate**
For example 2, consider two branches A and B with the same VA (100). In Branch A, the IPI covers 70% while in Branch B the IPI covers 50%. If the index of A increases by 1 point while the index of B decreases by 1 point, the change in the aggregate (A+B) will be positive. Implicitly, the message to users is that branch A is more represented.

- **Case 2: The VA of the Branch is not Adjusted by the Coverage Rate**
In this case, the message is different, with the published IPI representing changes in the branch's output regardless of coverage. In other words, it is assumed that changes in the IPI over an elementary series reflect changes in the entire associated branch, despite the coverage of manufactured products being below 100%. Using the example above, the change in the aggregation (A + B) would be zero.

INSEE has opted for the second solution, which seems more relevant and more in line with the IPI's publication objectives.

Comment 2:

For the "construction" sector, Eurostat has developed a specific classification, the Classification of types of construction (abbreviated as CC), which is not directly related to NACE-4. A correspondence table[36] between the NAF Rev.2 subclass codes and the aggregates of this classification, namely "buildings" and "civil engineering works", was therefore developed.

Within the scope of the forthcoming European Regulation on short-term statistics, the production index for construction will be based on NACE and will distinguish between NACE Divisions 41, 42 and 43.

36It should be noted that a direct relationship existed between NAF Rev. 1 and CC.

2.2.4-Importance of Adjusting the VA Weights and Recalibration

Since the weights are applied to indices and not to changes (see the formula presented in 1.2), the weights in VA must be adjusted by the changes in the indices since the base year. It is important not to double count changes in volume between the reference year and the base year, i.e. once in the weights and a second time in the indices.

Consider the example of two indices A and B aggregated to level C, the two branches being equally distributed (each representing 50% of series C series in value-added terms). By definition, the two indices A and B equal 100 on average in 2015. We now position ourselves in 2017 and assume that branch A has doubled in volume in the meantime while branch B has remained at the same level. The fact that branch A has doubled in size should appear in the VA data from the national accounts and used to calculate the weights. Excluding price effects, the VA of branch A now represents 67% of the total (branch C) while branch B accounts for 33%. At the same time, index A doubled, increasing to 200, while index B remained constant at 100. We can see that if we aggregate indices A and B in 2017 based on the weights in 2017 VA, the change observed in branch A will be counted twice: once because the index has doubled (normal) and a second time through the update of its weighting. It is therefore necessary to adjust the 2017 weight based on the change in value added between 2015 and 2017.

Using the notations of Section 1.2 and using va_i^{A-1} to denote the weight in VA terms of branch i in the next highest aggregate (*"Agg"*), the adjusted weights are then written as follows (regardless of classification level):

$$p_i^A = va_i^{A-1} * \frac{J_i^{Aref}}{J_i^{A-1}} = va_i^{A-1} * \frac{100}{J_i^{A-1}}$$

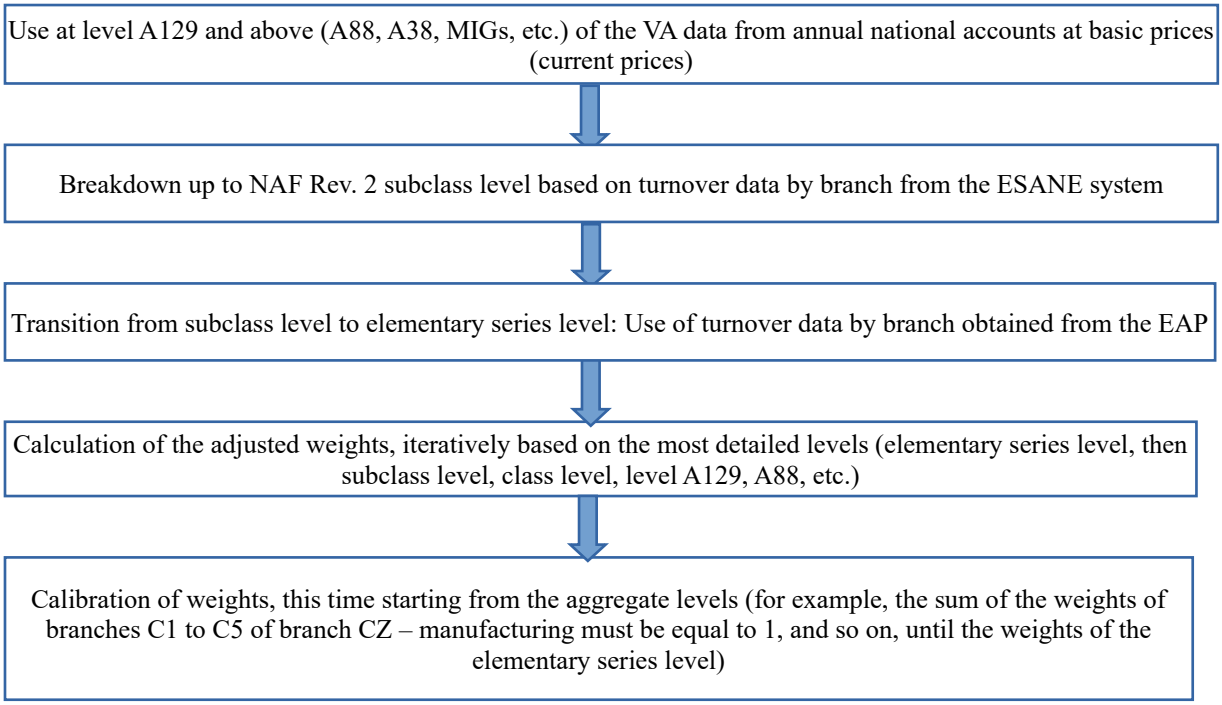
Since the annual average aggregate index of the previous year must be known for the calculation, it is necessary to progress iteratively from the most detailed levels (as part of a bottom-up approach):

- we start from the known elementary indices (see previous chapter) and calculate the annual average indices at the elementary level, allowing for the weights at this level to be calculated;
- using the elementary indices and weights, the indices can be calculated at the higher level;
- again, the weights can be calculated using known VA data and the average annual indices;
- and so on, up to the most aggregated levels.

Finally, to adhere to the additivity properties, we proceed in the opposite direction to adjust the weights (top-down approach) so that the sum of the weights of the sub-branches of an aggregate is equal to 1. All the operations involved in calculating the weights are summarised in Figure 1.

Figure 1: Main Stages in the Calculation of Weights

2.2.5-Backcasting of Weights over the Long Term



Given the many sources required to calculate the weights, it was possible to calculate them in a standard way from 2010 onwards. Previously, changes in classifications or sources (e. g. the transition from the EAB to the EAP) did not allow for a systematic calculation in this way.

In order to be able to chain the indices over a long period (since 1990), it was necessary to backcast the information available: national accounts by branch available over a long period (level A129 since 1999 and level A88 before that), and at the more detailed levels, use of the weights of the old IPI bases and interpolation between two reference years. Before 2000, the "*infra* NAF A88" structure was thus constant.

2.2.6-Updating Weights and Revisions

Given the delays in the availability of data used to construct the weights (for example, the "semi-final" annual accounts for 2017 are published in May 2019), the recent indices (year N) rely, at least initially, on weights calculated on previous data, until the N-1 data (reference year used to calculate the weights) are published. These operations can of course lead to revisions on recent years.

3- Going Further: Interpretation of Chaining Formulas for Monthly and Annual Changes

By showing the value added data in the chaining formula, after simplification we obtain:

$$J_{Agg}^{m,A} = J_{Agg}^{A-1} \times \sum_i \left(\frac{VA_i^{A-1}}{\sum_k VA_k^{A-1}} \right) \frac{J_i^{m,A}}{J_i^{A-1}}$$

with VA_i^{A-1} as the value added of branch i for year A-1.

The change in the aggregate index between months (m) and (m+1) of the same year (m cannot be December) is then written:

$$\frac{J_{Agg}^{m+1,A}}{J_{Agg}^{m,A}} = \sum_i \frac{VA_j^{A-1}}{\sum_k VA_k^{A-1}} \times \frac{J_i^{m+1,A}}{J_i^{m,A}}$$

Therefore, the change simply corresponds to the average of the elementary changes, weighted by the share of sub-branches in the aggregate. Similarly, the annual change between (A-1) and (A) is written

$$\frac{J_{Agg}^{A}}{J_{Agg}^{A-1}} = \sum_i \frac{VA_j^{A-1}}{\sum_k VA_k^{A-1}} \times \frac{J_i^{A}}{J_i^{A-1}}$$

.

In other words, to calculate the annual change, we start from the value-added structure of the previous year and apply the changes in the indices as an annual average.

The relationship between January of year A and December of year A-1 is more complex since it implicitly incorporates the shock associated with the weight change (change from weights based on VA A-2 to weights based on VA A-1 with the year change).

Chapter 7 - Seasonal and Calendar Adjustment

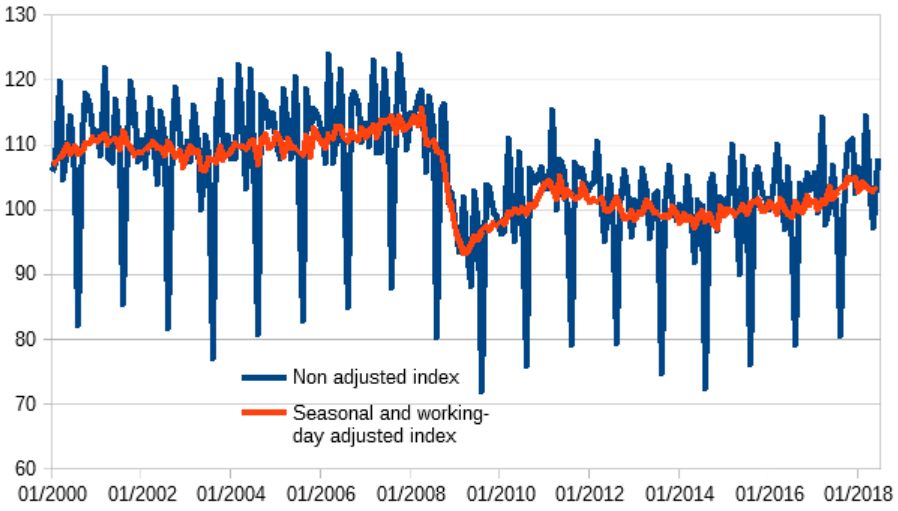
1- The Difficulty of Interpreting Gross Indices

The purpose of the IPI is to track the dynamics of production in France on a monthly basis. However, the month-to-month variations of the "gross" index are difficult to interpret because of the presence, as in most economic series, of seasonal and calendar (specifically, working-day) effects (in other words, the specific and changing calendar from one month to the next).

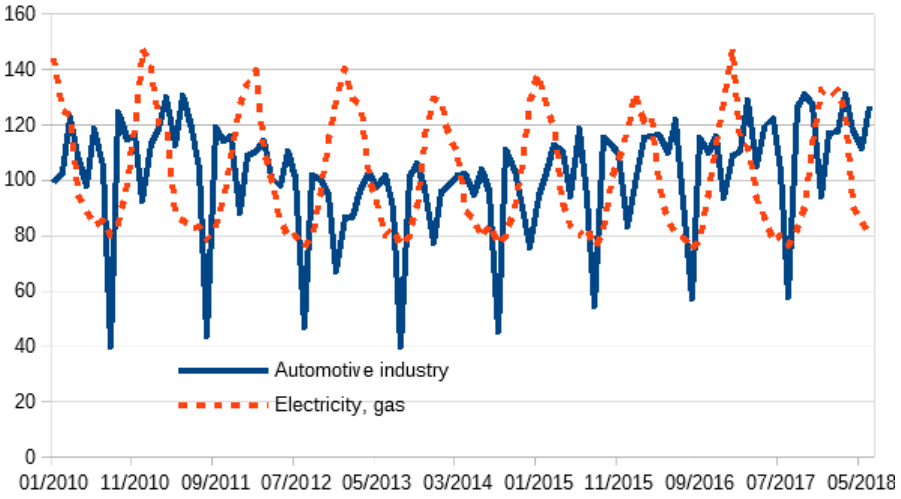
Industrial output follows a marked seasonal pattern (see Graph 1). Each year, it is characterised by a particularly low point in August, with many businesses reducing their activity during the summer holidays, making it difficult to interpret monthly trends. Seasonality can also vary considerably from one branch to another (e. g. automotive industry or electricity production with a high level in winter and a low level in summer), thus further complicating the comparison, with some series having even more pronounced profiles than industry as a whole (see Figure 2).

To analyse cyclical changes in industrial production, it is therefore necessary to adjust the series for seasonal and working-day effects, in the same way as many other economic series produced by INSEE. The methods used are updated regularly.

Graph 1: Industrial Production Index (Base and Reference 100 in 2015)



Graph 2: Two Types of Characteristic Seasonality (Gross Indices, Base and Reference 100 in 2015)



2- Principle of Seasonal and Working Day Adjustments

Seasonal and working-day adjustment generally aims to break down the raw series, written X_t , into several components:

- the trend cycle: on the one hand, it includes the trend, which reflects the background variations in the series observed over a long period of time, and the cycle, which is the smooth and almost periodic movement around the trend component (this is characterised by an alternation of periods of expansion and recession, the length of which generally varies between three and ten years); it is written TC_t ;

- the seasonal component: this corresponds to the seasonal variations in the series occurring from one year to the next and requiring neutralisation. It is written S_t ;

- the component corresponding to calendar effects: this is used to take into account the different compositions of months or quarters in terms of working days; as with seasonality, the aim is to neutralise the calendar component since it generally provides no cyclical information; it is written WD_t ;

- the irregular component: this component is made up of residual and erratic fluctuations that cannot be attributed to one of the components described above. It is written I_t .

Two decomposition models are used to manage the seasonal/working-day adjustment of IPI series:

- the additive model: $X_t = TC_t + S_t + WD_t + I_t$;

- the multiplicative model: $X_t = TC_t \times S_t \times WD_t \times I_t$; this model can be converted into an additive model by applying the logarithm function to each member of the equality.

To seasonally adjust the series and correct it for calendar effects, it is therefore necessary to identify the two associated components S_t and WD_t and to remove them from the series studied. The seasonally and calendar-adjusted series is thus $X_t - S_t - WD_t$ in the case of the additive model and $X_t / (S_t \times WD_t)$ in the case of the multiplicative model.

The two main seasonal adjustment methods used in the European Statistical System are the TRAMO-SEATS method, a parametric method used for the IPI up to the 2005 base, and the non-parametric X13-ARIMA method.

3- Method Used for the Seasonal and Calendar Adjustment of the IPI

Since the shift to the 2010 base year, the seasonal adjustment of the IPI[37] has been based on the X13-ARIMA method, a method implemented using the JDemetra+ software provided by Eurostat[38] with the use of specific working-day regressors (see below). The X13-ARIMA method is based around two main modules[39].

A first module ("RegARIMA") allows for a pre-adjustment of the series: detection of outliers in the series, adjustment for "working days" effects, extension of the series to the edges and provision of diagnostics. Estimating seasonal coefficients is improved if the gross series is not overly disrupted by cyclical fluctuations.

Four types of disturbances can be detected and are then taken into account by adding regressors in a RegARIMA model:

- additive outliers are disruptions that occur in a given month and that cannot be attributed to seasonality. An example is a strike that can be assumed not to have any impact on production in the following months;

- transitory changes: an incident was significant enough to affect the level of production in the following months (e.g. a flood);

- level shifts: for example, the opening of a new plant or a major economic development such as the 2008 crisis;

- seasonal outliers: these allow for a sudden change in seasonality with a lasting impact to be taken into account, such as a change in the method of accounting for production.

For working-day adjustments (assuming such adjustment is necessary), the module uses regressors that reproduce the structure of the calendar (through the structure of months in terms of non-holiday trading days). To take into account the specificities of the national calendar (national holidays, public holidays), INSEE creates its own variables and then incorporates them into JDemetra+. The regressors are centred by removing the long-term averages for each month, allowing the seasonal component of the calendar to be removed. Finally, an automatic choice procedure is applied between different combinations of possible regressors (see below).

After detecting any effects, the RegARIMA module estimates them using a RegARIMA model to "linearise" the series and extend it to the edges for seasonal adjustment purposes.

In a second step, a second module (X11) performs the actual seasonal adjustment by iterative smoothing of moving averages and breaks down the linearised series in the first part into orthogonal components: the trend cycle, seasonality and the irregular component.

Seasonal adjustment is of an indirect type: it is conducted at a detailed level (at class level, i.e. NACE-4 level), and the seasonal and working-day aggregates are then calculated directly from these series[40] using the methods presented in Chapter 6.

Lastly, a change made effective since the March 2019 campaign was implemented by estimating and applying the seasonal adjustment and working-day models over a reduced sub-period for recent data[41], the aim being to

37 Readers are referred to Eurostat's *'ESS guidelines on seasonal adjustment'* (2015) for a review of good practice in the area of seasonal adjustment.
38 The software can be used to apply the two main seasonal adjustment methods used within the European Statistical System: the TRAMO/SEATS method, a parametric method used previously in the 2005 IPI base, and the non-parametric method X-13-ARIMA.
39 For a complete presentation of the programme, see *'X-13ARIMA-SEATS Reference Manual'* (2017), U.S. Census Bureau. For a user-friendly presentation of how the X11 module works, the reader is referred to the following document: *'Comprendre la méthode X11'* (1999), D. Ladiray, B. Quenneville.
40 Another method, known as the "direct" method, involves making seasonal adjustments at each level of aggregation.
41 A decision was made to estimate models since 2005 and to fix the data before 2012.

adhere more closely to Eurostat's recommendations on the matter. The application of seasonal adjustment methods over 30 years (i.e. the time depth of the IPI series) can pose robustness problems on account of economic or behavioural changes. This approach also allows for changes in the past to be frozen, whereas seasonal adjustment methods by nature imply revisions over the entire series each time a new point is added (even if these revisions are very small beyond a few years in the past).

4- Monthly and Annual Campaigns

The seasonal and working-day adjustment process for IPI indices consists of applying the models identified series by series each month. These models are built and/or revised during annual campaigns (see below), which generally take place during the January-February period before the first campaign of the year (publication of the January indices in early March). The general form of the models (excluding parameter updates) is then determined at the end of the annual update for the entire coming year.

The monthly seasonal and working-day adjustment campaigns take into account the new data available each month, re-estimate the model coefficients, identify outliers over the recent period (last 12 months) and update the seasonal and working-day coefficients (thereby involving revisions to the past as new data become available).

This method of re-estimating models with the latest monthly data available but with an unchanged model, set of regressors and filters (known as the "partial concurrent/last outliers") is recommended by Eurostat.

Conduct of Annual Campaigns Conducted to Completely Update the Models

The overall approach of an annual campaign involves comparing the current modelling (i.e. the models currently used in production, considered as the reference) with an automatic model. If the automatic model is found to be of better quality (in terms of the quality assessment developed using the statistics and results provided by the programme) than the current modelling, the series is then examined in greater detail to determine whether the modelling needs to be changed. More specifically:

- For each series, automatic modelling is initiated by resetting all the parameters (working-day regressors, selected ARIMA model, additive outliers, etc.); the combinations tested for the working-day models are presented in Table 1;
- Current models (in production during monthly campaigns) are updated with the latest data by re-identifying outliers over the last year (refresh option used during monthly campaigns);

- For each series examined, a quality assessment[42] is published. The assessment is used to compare the quality of current and automatic modelling. A score is thus calculated for each series and only those series for which the score shows a better quality of automatic modelling than the current (reference) modelling are studied in depth; by way of illustration, there were 58 series in this case during the campaign implemented at the beginning of 2018 (out of a total of just over 200);

- To prioritise the processing of the series to be studied, the score also takes into account the weight (and therefore the economic weight) of the series. Thus, in the event that it is not possible to study all problematic series, the "weighted" score is used to detect as a priority those series whose poor quality is most likely to degrade the quality of the aggregate series;

- Once the model has been selected, the new seasonal and working-day adjusted series obtained are compared with the old series.

42The quality assessment uses diagnoses from JDemetra+ and creates synthetic indicators in the form of scores. The main diagnostic categories available in this file are as follows:
- *Overall quality of processing;*
- *Quality of the Reg-ARIMA model;*
- *Quality of the decomposition;*
- *Quality of the revisions* (covering the last two years available).

An overall quality score out of 20 is given, corresponding to the weighted average of the scores of each diagnostic family. This score can be used to compare the models (automatic processing/old model) and to identify "problematic" series, while giving priority to the series with the greatest weights.

Table 1: Different Specifications for Working-Day Adjustment

Set of Regressors	Characteristics
Not applicable	No working-day (WDA) effects (= no WDA regressors)
Lpyear	Only a "leap year" effect and no effects according to the type of days (only one regressor)
Regwda 1 (+lpy), differentiated days (including Saturday)	6 regressors (Mondays, Tuesdays,..., working Saturdays) in contrast to Sundays and public holidays (+ possibly a "leap year" effect)
Regwda 2 (+lpy), week/weekend effect	1 regressor (week days, Monday to Friday, working days) in contrast to Sundays and public holidays (+ possibly a "leap year" effect)
Regwda 3 (+lpy), days differentiated relative to the weekend	5 regressors (Mondays, Tuesdays,..., working Fridays) in contrast to Sundays and public holidays (+ possibly a "leap year" effect)

Sequence of a Monthly Campaign

The monthly campaigns re-estimate the models by taking into account the new data made available:

- Update of the data file/launch of processing operations in JDemetra+;
- Verification of the quality of processing in JDemetra+;
- Interactive change of specifications if necessary (outliers in particular);
- Export and archiving of monthly processing.

5- Main Changes in the Treatment of Seasonal Adjustment since the 2010 Base

As noted above, since the move to the 2010 base year, the seasonal adjustment of IPI is now based on the X13-ARIMA method or later versions. Previously, seasonal and working-day adjustment was based on the TRAMO-SEATS method, another method recommended by Eurostat, particularly in the case of short-term statistics.

The change in the seasonal adjustment method[43] for the 2010 base was designed to improve consistency with the method used to compile the quarterly national accounts, which are partly based on the IPI series. The quarterly accounts have historically tended to use the X13-ARIMA method. Using different methods to compile the IPI and quarterly accounts could have led to discrepancies that were sometimes difficult to interpret. This change in method has led to revisions in the past.

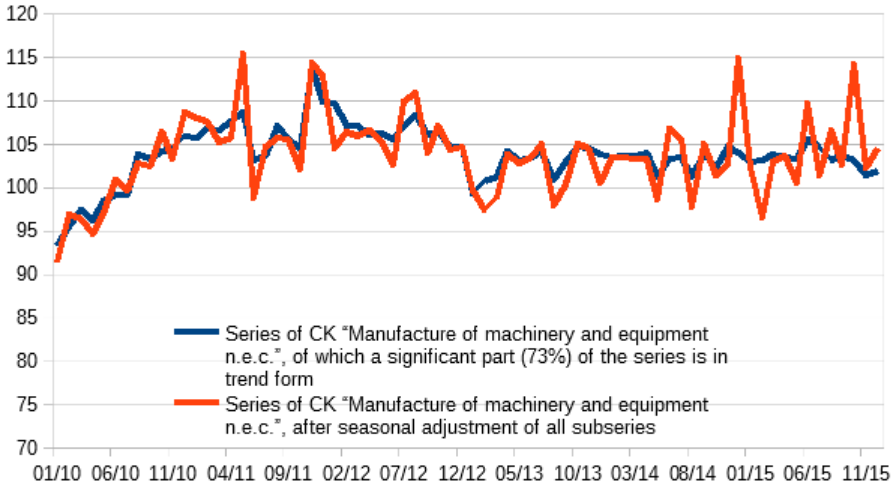
In 2015, it was also decided to carry out the seasonal adjustment process and the adjustment of "working day" effects on the series at NACE-4 level (class level) and no longer on the series at NACE-3 level for practical reasons and to ensure consistency with the series published on the Eurostat website. New models for the class level therefore had to be developed. Although relevant for the reasons mentioned, this change may make it more difficult to identify robust models at a detailed NACE-4 level because of relatively significant fluctuations at this level of detail, whereas these fluctuations tend to be neutralised at a more aggregated level.

43In practice, there has been little impact on the main IPI aggregates, although significant discrepancies were sometimes found on more detailed series. For around a quarter of the series, the seasonal and working-day adjusted series from X13-ARIMA practically overlapped with the series produced using TRAMO-SEATS. By contrast, for around a third of the series, the results differed relatively significantly. These differences are not surprising since TRAMO-SEATS and X13-ARIMA are based on very different principles governing series decomposition. However, some discrepancies were found in the "pre-adjustment" phase: ARIMA modelling, the detection and correction of outliers and breaks, and possible transformation using the logarithm function. As for the adjustment for "working day" effects, it did not appear to be a cause of divergence since the working-day adjusted series obtained with the two methods were very similar when using the same working-day regressors.

Lastly, in early 2016, trend series were discontinued. Until December 2015, the calculation of the seasonally and working-day adjusted index of industrial production was based, in some industries, on trend series, and not on seasonally and working day-adjusted series. These series, numbering 18 in total (out of 203), accounted for around 12.5% of industrial output and were mainly found in the "Manufacture of machinery and equipment n.e.c. (CK)" (representing 73% of the branch) and in the "Manufacture of basic pharmaceutical products and pharmaceutical preparations (CF)" (representing the entire branch).

The purpose of changing methods was to ensure compliance with Eurostat guidelines (see above). The volatility of these series has increased but remains in the order of that of the automotive industry series (CL1) and other transport equipment (CL2), which have comparable weights. Graph 3 illustrates the impact of this change in 2010 on the indices for the CK branch.

Graph 3: CK Branch Indices - "Manufacture of machinery and equipment n.e.c." Before and After the Discontinuation of Trend Series (Base and Reference 100 in 2010)



Chapter 8 - Conduct of a Production Campaign

Each month, INSEE collects all the data needed to compile the index, verifies the data, builds the elementary series based on the collected data, analyses them and applies adjustments and corrections where necessary, calculates the indices based on several classifications, seasonally adjusts them and, finally, publishes and disseminates them to a wide range of users. These complex operations are based on well-established processes and applications.

1- Operations Management and Data Collection

Historically, the industrial production index has been the responsibility of INSEE. The decree governing the organisation of INSEE dated 4 August 2016 specifies that the "Short-term statistics" department of the Directorate of Business Statistics is responsible for compiling activity indices (IPI, turnover indices, etc.) in industry, trade and services and the various price indices (purchase and sale) collected from enterprises in industry and services.

The IPI – and, more generally, all related processes, methods and applications – is managed by the "Short-term business indicators" (in French, *Indicateurs conjoncturels d'activité*, or ICA) division within this department.

The task of collecting individual production data (dispatch of campaign opening letters, receipt of results, reminders to late responders, imputation of non-responses…) and of producing the elementary series is handled at the Normandy Regional Directorate within the National Business Statistics Service (in French, *Service des statistiques nationales d'entreprises*, or SSNE) located in Caen for "industry excluding food and agriculture"[44]. Surveys of industrial food and agriculture businesses are managed by the Statistics and Forecasting Service (SSP) of the Ministry of Agriculture located in Toulouse[45], while the collection of energy data is the responsibility of the Statistical Data and Studies Service (SDES) of the Ministry for the Ecological and Inclusive Transition, as is the collection of construction data, with collection delegated in this case to the French Building Federation (FFB) and the French Federation of Public Works (FNTP).

Because of the sheer range of collection bodies and production indicators and the fact that a large number of product groups are tracked, the process of managing the indicator is a highly complex process.

A customised questionnaire is developed for each enterprise included in the sample. The questionnaire focuses on the products for which the enterprise was included in the sample. A letter is sent each month to the enterprises included in the sample to inform them that the questionnaires are available. The vast majority of enterprises respond online (98% of responses), using the COLTRANE portal dedicated to official business statistics surveys. If they wish to respond by post, they must make an explicit request. Mail responses mainly come from small businesses with no Internet access.

2- Legal Basis and Litigation Management

The EMB[46] is compulsory. It has been issued with a general interest and statistical quality label. It is included in the programme of official statistics surveys to which companies must respond under the 1951 Act, which provides for a dispute resolution procedure in the event of non-response. Companies' responses are essential for the quality of the index, and therefore, for short-term diagnostic purposes.

A litigation procedure is set up by the various bodies responsible for overseeing the conduct of surveys to guarantee a high response rate and thereby ensure that the IPI is of good quality. Thus, for example, for the EMBs managed by INSEE, the response rate is over 87% (although the rate varies slightly from one month to the next). In the event of repeated non-responses, the litigation procedure involves serving non-respondents with a formal notice followed by a notification of non-response with acknowledgement of receipt. The

44Except for certain branches, such as the manufacture of basic iron and steel and of ferro-alloys, where collection is conducted by partner professional bodies (see Chapter 2).
45As with the "non-food and agriculture" part, data on some branches are collected by partner professional bodies.
46Or, more precisely, the monthly branch surveys since they cover all collection bodies.

acknowledgements of receipt are sent to the Litigation Committee at the National Council for Statistical Information (CNIS), which then sends a letter of referral to the enterprises concerned. A final decision is taken at a meeting of the Litigation Committee depending on the response provided by the enterprises and their position with regard to the dispute (repeat offender or not). The decision may result in a fine being imposed on non-responding enterprises.

3- Data Processing

The role of the unit responsible for calculating the IPI is to collect all the data required to calculate the index, to produce the aggregated indices (based on different classification levels) using the data collected, to assess them, to seasonally adjust the indices and, finally, to publish and disseminate them in several formats. It also responds to internal and external requests for information on the indices.

The integration of the data and the calculation of the indices are mainly based on two integrated applications for calculation and analysis. These integrated applications enhance the security of the index production process. The gross indices are recalculated each month from January of the previous year based on current production and revisions to historical data may be incorporated over a longer period if necessary.

As noted above, the National Business Statistics Service is responsible for the first part of the processing as part of a monthly campaign to calculate the IPI indices. Sector clerks are responsible for a set of branches within the scope of the index. Their first duty is to check that enterprises have submitted their responses to the monthly surveys, which are received either directly (if the survey is managed by INSEE) or indirectly through OPAs. They are required to ensure that all the results are sent to INSEE within the deadlines set for the production of the IPI and to follow up with correspondents if necessary.

All declarations of production received are processed and assessed by clerks and heads of units. Raw responses from enterprises to the monthly branch surveys may be altered without appeal from the enterprise if the error is obvious (unit error) or after appeal by the enterprise, if necessary. Once the individual data have been verified and validated, the industrial production indices are calculated (taking into account imputations in the event of non-response), accompanied by an analysis of the indices at all classification levels to identify possible atypical changes and to account for (or correct) them as part of a top-down approach from the most aggregated indices down to individual data.

4- Sequence of a Monthly Campaign

For publication on D-Day (no later than the 10th day) of month M and relating to production in month M-2:

At (D-45), the campaign is launched. Thus, for example, in the case of the publication of the January index on 10 March, the campaign is launched around 25 January. The questionnaires are published online on the collection site and a letter (letter of notification) is also sent out to businesses informing them that the questionnaire for the month under review is available and requesting them to respond.

From (D-45) to (D-15), the SSNE collects the data: receipt and verification of the responses submitted by participating enterprises. In the event of very significant changes, the enterprise in question is requested to check the accuracy of the data and to identify any reporting errors. Non-responding enterprises are sent reminders, particularly the largest entities. The collection process continues throughout the month.

From (D-14) to (D-6), the SSNE calculates the elementary series based on the responses provided by enterprises and non-response imputations and analyses changes and revisions. It may also be required to correct automatic imputations. It sends reminders to enterprises that have reported atypical changes and, if necessary, corrects their responses. It takes note of comments provided to explain changes and revisions. It also continues to send reminders to non-responding enterprises.

From around (D-20) onwards, the unit responsible for calculating the IPI begins the initial index calculations, analyses the series and identifies any problems. Following the initial calculations, the indices are then updated as new data become available for advance estimates (see below). The unit also uploads external series: SSP data (food and agriculture), SDES data (manufacture of coke, energy), SDES data collected by the FFB and FNTP (construction) and DARES data on temporary work in construction. It then incorporates the price series for the

series monitored in invoicing terms and the productivity coefficients for the series tracked in hourly terms. The IPI section also calculates the gross aggregate and seasonally and working-day adjusted indices. Finally, contributions to changes and revisions are calculated.

Between (D-5) and (D-2), the IPI section conducts the final analysis of the gross aggregate and seasonally and working-day adjusted indices. To do so, it draws on the changes that contributed the most to the change in the overall index, i.e. the most significant changes or those affecting branches with a high weight. The aim is to understand and explain them. In other words, are the observed changes the result of atypical production by a business? Are they due to the treatment of seasonality and working days? This work can result in the SSNE sending a reminder to the enterprise and, if necessary, in correcting the declaration. Similarly, the section focuses on understanding the most significant revisions: can they be explained by late declarations by enterprises, corrections to past declarations or updates to seasonal adjustment models? (see below)

From (D-2) to (D-1), the dissemination is validated and prepared. After a final calculation of the IPI, the IPI section drafts the "Informations rapides" by way of commentary on developments in the IPI and any relevant revisions before submitting the publication to the formal approval process. It then uploads the data (long series) to the relevant database at insee.fr ("Indices and time series"), with INSEE then sending the series to Eurostat on D-day. The section ensures that operations run smoothly until publication.

The whole thing remains under embargo until D-Day at 8:45!

The media or external or internal users may then request further details on developments in the IPI, which happens relatively frequently.

5- Implementation of Early Estimates for the IPI

Since 2013, INSEE has been producing early estimates of the IPI for internal purposes. These indices are calculated at month end (30 days) to update the cyclical diagnosis established in the context of business cycle scores and points. These early estimates also help to secure the process by providing initial estimates well in advance of publication.

In addition, since 2016, in the first month of each quarter (January, April, July, October), the IPI section also calculates an early estimate at 23 or 25 days (indices for December, March, June, September). The indices for the third month of the quarter enable INSEE's quarterly accounts division to calculate an initial estimate of GDP using as much information as possible. The estimate is published 30 days after the end of the quarter (a system in place since the end of 2016) as opposed to 45 days previously.

6- Analysis

The analysis conducted by the IPI section aims first of all to understand changes in total industrial output compared to the previous month, adjusted for seasonal and working-day variations.

The seasonally adjusted change in the index of total industrial production results from the changes to its components, in particular within the classes forming it, these being the most detailed seasonally adjusted series[47]. The IPI section focuses its analysis primarily on the classes making the biggest contributions and conducts detailed examinations of the changes applicable to them.

The analysis of class changes begins with the determination of the elementary series that contributes (or contribute) the most. For example, if the seasonally and wording-day adjusted index for "Manufacture of machinery for food, beverage and tobacco processing" decreases between two consecutive months, it is necessary to determine which subseries within it account for the decrease.

The elementary series contributing to the seasonally adjusted change cannot be determined immediately, notably because a link must be established between a series at the "class" level whose seasonally adjusted change is to be

47As a reminder, below the class level, there is the NAF subclass level and the elementary series level (see Chapters 3 and 5). These last two levels are only available in "gross" form, i. e. before seasonal and working-day adjustment.

explained and elementary series that are not adjusted (the minimum level of seasonal adjustment being NACE-4).

To facilitate the work involved, several analytical tools are available. The key tool is the contribution to year-on-year change and the year-on-year change rate, which are calculated for each elementary series, the idea being that an atypical monthly change will be reflected in the year-on-year change or the year-on-year change rate, even if the relationship is not perfect. Various other graphical and display tools are provided to facilitate the analysis, in particular the annual superposition of the indices of the elementary series, thereby highlighting additive outliers in relation to the usual seasonal profile.

Once the elementary series explaining changes in the series at the "class" level has (or have) been determined, it is then necessary to understand which enterprise (or enterprises) accounts (account) for this change and why. Here too, the key tool is the year-on-year analysis of business output. If necessary, the enterprise may be contacted by the SSNE to explain or correct the atypical individual change.

With regard to revisions, the IPI section focuses on the series that contributed the most. The aim is to establish the reason for the revision based on the information provided by the SSNE. The process of analysing revisions can lead to the detection of anomalies, which are then corrected.

A significant part of the analytical work carried out by the IPI section consists in examining the treatment of seasonal and working-day adjustments, whether in terms of changes in the last month or revisions to previous months. The aim is to ensure that the models carry out appropriate and relevant operations. Adjustments may be carried out if necessary, including by adding or removing an outlier. For example, a significant change in the index over the past can be excluded from the calculation of seasonality if it relates to a clearly identified exceptional event (temporary closure of a plant leading to a fall in the index, which therefore does not relate to a seasonal phenomenon, etc.).

7- Revisions

The Purpose of Revisions

Indices are generally revised, albeit within a limited range (see below), several times after their initial release, for several reasons:

- the declarations of certain enterprises are received late by the body conducting the survey;
- errors in the interpretation of questionnaires by respondents or data entry errors (whether by the responding enterprise or the collecting body) may not be detected during the initial calculations;
- seasonal and working-day adjustments naturally lead to revisions to the seasonally and working-day adjusted indices as new monthly data become available to refine the estimates;
- INSEE conducts the annual production survey, which provides 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.

The amount and scale of revisions decreases as one moves further away from the month in question. Successive revisions lead to a gradual convergence towards a more accurate estimate of production (with the receipt, in particular, of late responses). In line with the European Statistics Code of Practice, and for the sake of transparency, revisions made to recent months are reported in the monthly publication (see Chapter 9).

Late Declarations

For some products tracked among a large population of enterprises, non-responding enterprises may, at the time of the first release, account for between 10% and 20% of the month's total production.

The tools available provide a means of estimating the output of non-responding enterprises in addition to that of responding enterprises and of calculating the production statistics for month (m). The initial statistic for month (m) is termed “provisional”.

The following month, late respondents submit their production declaration for month m. The imputations are then replaced by the responses received. This then becomes a “corrected” statistic for month (m).

Some enterprises may not respond to surveys for a relatively long period of time: in such cases, the estimate applied over several months will be weaker, and when the enterprises in question do respond, the corrections made may have a significant retroactive effect, particularly in cases where the enterprise carries significant weight in terms of production on national soil.

Correction of Response Errors

Inevitably, some enterprises make mistakes in their declarations, whether material errors, errors in the interpretation of the explanatory notes to the questionnaires or errors related to staff changes or changes in internal information systems.

When these errors are detected (either by the responding enterprise or by INSEE following checks carried out on the data), amended declarations are drawn up, resulting in revisions to the indices.

In this context, the availability (the following year) of detailed annual data from the EAP can also lead to reporting errors being detected and in values from past series being reviewed.

Corrections Related to the Updating of Seasonal Adjustment Models

Seasonal adjustment models and seasonal coefficients are re-estimated each month since knowledge of the index for month m+1 enables models and estimates to be further refined. Even without any change in the raw data, knowledge of the index for an additional month has an (admittedly limited) impact on the estimation of the trend, on the estimation of seasonality coefficients and, more generally, on all stages of the seasonal adjustment process (see Chapter 7). In particular, the detection of additive outliers (outliers, level changes, etc.) is updated over the last few months, with potentially significant effects on the estimation of model parameters.

Taken together, all of these factors result in moderate revisions: on average over the period 2015-2018[48], changes in the industrial index of the previous month was revised by 0.16 percentage points (see Table 1), either upwards or downwards, pointing to a limited range compared to the standard deviation of the series (1.4 points over the period). The bias (average of revisions) is close to 0 and not significant.

Of course, revisions made to industrial production indices may offset each other: in other words, an upward revision to changes in one series may be offset by a downward revision to changes in another series. Similarly, revisions to the raw data of one series may be mitigated by a revision arising from updates to the seasonal adjustment models in the same or another series. Thus, we see that the revision of the development in the seasonally and working-day adjusted manufacturing index is lower on average than the revision of the change due to the raw data (0.16 compared to 0.22 points), with the updating of the seasonal adjustment models generally mitigating the revision of the raw data.

48More specifically, January 2015-June 2018, and excluding months associated with a major change in methodology (January 2018: base change; March 2016: update of weights). Average of the revisions in absolute terms applied to the change in the manufacturing index published the previous month. As an example, when the March 2018 IPI was published, the change in the manufacturing index between January and February 2018 was revised by +0.09 points. Having initially been estimated at -0,6%, it was increased to -0,5 % in the April publication. The +0.09 point revision breaks down as follows: + 0.05 points related to the revision of raw data and + 0.04 points related to the updating of the seasonal and working-day adjustment coefficients.

Table 1: Revisions Affecting the Manufacturing Index for the Last Published Month (Absolute Revisions, in Points)

	Average of revisions in absolute value	1st quartile	Median	3rd quartile
Revisions – manufacturing – Total	0.16	0.08	0.14	0.20
Including revision due to updating of raw data	*0.17*	*0.06*	*0.12*	*0.27*
Including revision due to updating of seasonal adjustment models	*0.10*	*0.04*	*0.07*	*0.13*

Reading note: the average of the revisions in absolute value (in other words, without taking into account the direction, i.e. upwards or downwards, but only the range) of the change in the manufacturing index in the previous month (for example, the change in the manufacturing index between August and September, during the October index calculation campaign) is 0.16 points. 25% of the revisions are lower than +0.08 points and 75% are below +0.20 points. These statistics were calculated over the period January 2015-June 2018, excluding months corresponding to a major change in methodology.

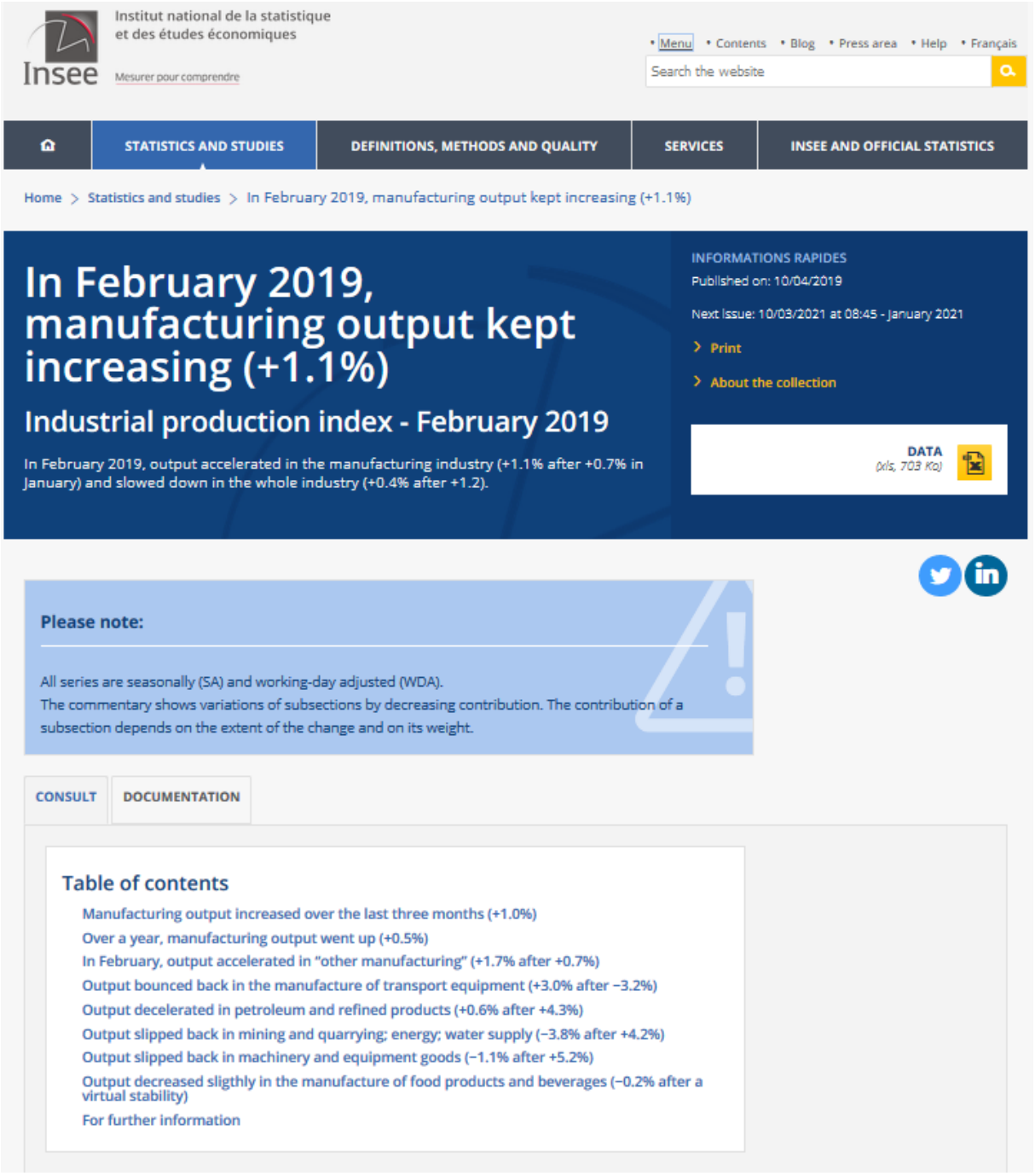
Chapter 9 - Publication and Dissemination

1- Publication of the Industrial Production Index: *Informations Rapides*

The IPI is published monthly by INSEE no later than 40 days after the end of month m in the *Informations Rapides* series. However, if m+40 falls on a Saturday, a Sunday or a public holiday, publications are announced and scheduled for the previous Friday at 8:45 am. This document presents the main results by major branches and refers to the revisions made to the previous month.

The INSEE press office is responsible for communicating it to the media. As for the other main economic indicators, monthly and four-monthly schedules are also drawn up: https://www.insee.fr/en/information/2107811?debut=0

The IPI results are made available on the INSEE website (www.insee.fr) on the Home page under the heading "Key indicators" as soon as the embargo is lifted (at 8:45 am on the day the index is published). Users can then access the main information of the monthly campaign in both French and English, download the relevant *'Informations Rapides'* in the form of a printable file and access the long series (see following pages).



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In February 2019, manufacturing output kept increasing (+1.1%)

Industrial production index - February 2019

In February 2019, output accelerated in the manufacturing industry (+1.1% after +0.7% in January) and slowed down in the whole industry (+0.4% after +1.2).

INFORMATIONS RAPIDES

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Print

About the collection

DATA (xls, 703 Ko)

Please note:

All series are seasonally (SA) and working-day adjusted (WDA).
The commentary shows variations of subsections by decreasing contribution. The contribution of a subsection depends on the extent of the change and on its weight.

CONSULT | DOCUMENTATION

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2- Dissemination of Industrial Production Indices

Under the "*Informations Rapides*" section, the indices are disseminated at levels A10, A17, A38 and (exceptionally) A64 of the aggregate nomenclature (in French, *nomenclature agrégée*, or NA) associated with NAF Rev. 2. They are also disseminated based on the MIGs (Main Industrial Groupings) as defined by Eurostat.

More detailed levels (NAF Rev. 2 divisions, groups and classes) are available on INSEE's website in the "time series (BDM)" database. In this section if the website, the monthly industrial production indices are disseminated both as raw data and seasonally and working-day adjusted data up to the class level of the NAF Rev.2 classification, that may go back to 1990. Lastly, series from older bases – 1970 to 2010 – are also available at different levels of aggregation.

3- Transmission to Eurostat

The IPI is one of the main European economic indicators (see Chapter 1). The index is transmitted to Eurostat, which then calculates and disseminates an aggregate for the euro area. Eurostat also disseminates the indices of individual Member States (and also handles the collection process for some non-member States).

Indices are provided in "raw" form (i.e. excluding seasonal and working-day adjustments) and in working-day adjusted and seasonally and working-day adjusted form.

Chapter 10 - Methodological and Base Changes

The industrial production index has existed in France in various forms since 1924 and its scope and methodology have evolved considerably to meet quality requirements and changes in the recommendations and/or regulations issued by international bodies. Most changes are generally carried out at the occasion of base changes. For several decades now, base changes have taken place every five years.

1- The Purpose of Re-Basing

The industrial sector evolves over time, with new products appearing on the market while others disappear. Likewise, production processes change. In recent decades, there has been a significant rise in offshoring and outsourcing. The specific content of the products tracked as part of the industrial production index therefore needs to be regularly adapted and updated (see Chapter 3). The industrial production index is calculated relative to a base year based on a list of specific products. As the reference period moves further away, structural deformations gradually cause the calculated index to decline in relevance if they are not taken into account. It is also common practice to locate the reference year of an index (i.e. the year when the index is equal to 100 on average) in a not too distant year.

At the same time, changes in recommendations and concepts, including in adjacent areas (national accounts, including base changes in national accounts, structural statistics, index theory) and improvements in technical resources allowing for quality improvements mean that the methodology and method of calculation of the IPI need to be adapted.

For all these reasons, the base year requires regular review, as do the elementary series making up the index, the production indicators and the methodology used to aggregate indices. Since 1980, re-basing has been carried out every five years and includes an update of the weights, a redefinition of the boundaries of the series and the use of 100 as reference for a given year. Re-basing is also an opportunity to introduce a change in classification (as illustrated by the 2005 base change). Of course, these changes can result in revisions to the indices, which generally have no impact on the major developments of the index.

Since 2015, two major changes have resulted in profound changes in the processes used to update the IPI (see below). These changes do not affect the need for a base change every five years by way of updating the base year and taking into account any additional conceptual or methodological changes.

2- Main Characteristics of the Two Most Recent Base Changes

2.1- The 2010 Base Year

The move to the 2010 base year for the industrial production index (IPI) has met the basic objectives of 5-year re-basing process, i.e.:

- the updating of the weights used to calculate the index;
- the change in reference date;
- the updating of the control series.

The move to the 2010 base year was also an opportunity to meet other objectives, including:

- limiting the loss of IPI coverage since the 2005 base; as the base year moves further away, the coverage of the index decreases; activities in decline whose weight had become too small have been grouped together, while other activities on the rise have been broken down into more detailed series. Thus, the

2010 base index included fewer elementary series than the 2005 base, but coverage was maintained by extending the series to new products and creating new series (see Chapter 3);

- improving the boundaries of the series and the monitoring of products, with, in particular, the elimination of distortions and the addition of non-monitored products;

- improving the relevance of the set of series by removing problematic series, adding series of use to economic analysis, merging small series and splitting the most dynamic branches;

- increasing the number of series monitored in invoicing terms to comply with UN recommendations: to bring the French IPI closer to international standards, INSEE has increased the number of series observed in invoicing terms and deflated and reduced the number of series observed in quantity terms (see Chapters 1 and 4);

- in the case of monthly campaigns, improving the division of labour among index managers;

- creating new series boundaries ahead of the next re-basing ("future IPIs"). These series will gradually be included in the calculation of the IPI as part of the new annual re-basing (see below).

2.2- The 2015 Base Year

2.2.1-Innovations

Since March 2018 (for the January 2018 indices), the IPI is being published using 2015=100 as base and reference year. At the time of this implementation, in addition to the change in reference year, two major changes were put in place or initiated, resulting in profound changes to the processes involved in updating the IPI:

- the implementation of a chained index with annually updated weights improves the robustness of the index over a long period and replaces the system of updating weights every five years;

- an annual process of (partial) product renewal is put in place (for a first publication with the new boundaries in 2019 (see Chapter 3) to take into account economic changes more responsively.

As part of the annual revision process, approximately one fifth of the NAF subclasses are reviewed each year. This will help to spread the burden of re-basing over several years and to take into account changes in products affecting specific branches more rapidly.

A provisional timetable has been defined for this first five-year cycle. The timetable may be amended as the cycle progresses (for example, if priority branches are identified because of lower quality). This ensures an exhaustive review of all NAF manufacturing branches, which was not always the case when a review was carried out at the time of a five-year base change due to time constraints.

The annual review can result in a wide range of operations, the most important of which are listed here (see Chapters 2 to 4 for terminology):

- change in the monitoring and tracking method (transition to monitoring in invoicing terms for certain products, or vice versa if invoicing does not appear to be appropriate);

- removal of products whose production is no longer significant;

- conversely, the creation of new series to improve the coverage of the IPI or take into account new products; in such cases, integration into the indices will only be effective after a few years to assess the main characteristics and quality of the series;

- incorporation of series created during a previous re-basing ("future IPIs");
- redefinition of the boundaries of series (groupings of ProdEMB products; see Chapter 2,), product mergers, etc.;

- Of course, many series will remain unchanged if their quality is deemed satisfactory.

2.2.2-Timetable of Annual Product Review Process

Given the different production processes involved in this operation, the work required for each wave takes place over a period of approximately eighteen months (as is the case with the five-year re-basing), on a continuous basis. Apart from the first year of initialisation of this process, the various actors will also be required to complete the re-basing of the branches started the previous year and to begin the process of reviewing the next group of NAF subclasses. Table 1 shows the main steps involved in a renovation wave.

Table 1: Main Steps of a Renovation Wave

July N-2 to September N-2	Selection of NAF subclasses to be re-based according to specific priorities (quality, need to improve coverage of the branch, existence of series in the survey to be included in the indices - "future IPIs", etc.)
September N-2 to January N-1	Process of reviewing and redefining the boundaries of the series; possible introduction of new products, review of deflators for the series monitored in invoicing terms. This stage is based in particular on the latest production data from the annual production survey (allowing for comparison between the output monitored as part of the IPI and the branch's total output).
February N-1 to August N-1	Once the changes in the series are recorded and become effective, it is then necessary to proceed with the necessary preparations prior to effective integration into the indices: calculation of productivity coefficients for the series monitored in hourly terms, backcasting of the series based on new boundaries over a long period if necessary, calculation of weights based on the new boundaries, study of the impact on seasonality, review of the seasonal adjustment models, etc.
September N-1 to January N	Taking into account the various changes made to the dedicated applications, new sample of enterprises to be drawn and adjustments to be made to the questionnaires relating to products that have changed.
March N	Dissemination of the first IPI index with the changes in the boundaries of the series taken into account in January N.

The time required to implement a renovation wave is therefore 20 months from the start of operations to the publication of the first index. This does not correspond to the period between the introduction of a new product into the IPI and the dissemination of the IPI with the inclusion of that new product. This is because the new product must be tracked as part of the monthly branch surveys 1 to 2 years before the start of re-basing operations, thereby delaying the effective inclusion in the index (see Table 2).

Between the time a decision is made to integrate a new product into the production process and its actual introduction into the calculation of the IPI, a period of at least 3.5 years must be factored in. The timetable below details the corresponding sequence.

This time lag may be too long for products whose economic weight is changing rapidly (emerging product or relocation activity). In this case, non-standard creations may be considered. However, the introduction of a new product into the EMB does not only mean creating an additional question in the questionnaire; it is also important to ensure that the product fits properly into all EMB collection and index calculation processes. A new product can only be introduced into the EMB if a representative sample can be drawn for it and if it is identifiable within the EAP. Finally, it is necessary to have sufficient perspective before the actual introduction into the indices (for example, for the estimation of the seasonal and working-day adjustment models).

Table 2: Stages of the Process Leading to the Inclusion of a New Product in the Index (Standard Cycle)

Launch of renovation operations with NAFs including new products to be created, generally innovative products)	Early September N-4
Proposals and validation: introduction of new products	October N-4 to January N-3
Incorporation of the changes approved in January N-3 in the applications dedicated to the management of classification and collection operations	October N-3
Start of collection of the new product(s) as part of the EMB	January N-2
Launch of operations for wave N *(re-registration in N-2 of NAF in relation to which the new products created in the summer wave N-4 are intended to be used in the IPI)*	Early September N-2
Proposals and validation: decision to use the new product(s) in the new base (depending in particular on the observed quality)	October N-2 to January N-1
Additional operations related to renovation taking into account new product(s) (calculation of weights, backcasting, etc.)	February N-1 to February N
Inclusion of the new product in an IPI series for the January N campaign	October N-1
Dissemination of the indices including the new product(s)	March N

2.3- Backcasting of Series

To ensure comparable data are available over an extended period, indices must be backcast in the event of base year changes. This is a vital but generally costly operation because of changes that may lead to inconsistencies between the old and new base in some branches .

At the time of the 2010 re-basing for the dissemination of the indices from January 2013, backcasting resulted in new series being created from January 1990 to December 2012 based on the new data and the data from the previous base[49]. This long period has been maintained because the IPI is also used as a production indicator at INSEE to compile the quarterly accounts.

As part of the transition to the 2015 base (March 2018), a major backcasting was also carried out on the weights to build annually weighted series since 1990 (see Chapter 6). On the other hand, since the boundaries of the series were not revised at that time, the backcasting of the indices to the elementary levels (before aggregation) was a simple process since it was based directly on the changes in the elementary indices with base year 2010.

With the implementation of the annual product review process, the challenges around backcasting could have been even greater, with, potentially, changes in the monitoring of series each year. As such, the use of chaining with annually updated weights helps to deal with the matter satisfactorily by adjusting the weights in order to switch from series based on the old boundaries to those based on the new boundaries. Changes in the past over a long period of time are thus stabilised.

49Excluding exceptions and new series, backcasting required dealing with four major cases:

- re-use of the series without change (the series with base year 2005 is then reused by setting the 2010 average of the old series at 100);
- modification of the boundaries of the series with removal or addition of products (the opposite year-on-year change of the 2005 base series is applied to known data from the 2010 base series);
- splitting of the series (the opposite year-on-year change of the 2005 base series is then applied to each of the split series);
- merger of series (the 2005 base year series are summed up and the average is set at 100 in 2010).

3- Other Developments

3.1- The COLTRANE Platform for Collecting Business Surveys

To enable businesses to respond to surveys as easily as possible, INSEE is extending the possibility of responding online on a single website. Since the first online surveys introduced in the early 2000s, several systems have been developed. Drawing on past experience, INSEE designed the COLTRANE project (standing, in French, for *Collecte Transversale d'Enquêtes*, or Cross-Cutting Survey Data Collection), designed to bring together all business surveys under a single portal, with two main challenges:

- to generalise and standardise online collection across all surveys;
- to provide a single point of access for businesses to facilitate the response process and enable them to better identify surveys falling within the scope of official statistics.

Respondents are able to access the portal and view all the questionnaires sent to them from a single login account. COLTRANE is also designed to minimise the burden for the bodies responsible for conducting surveys. It automatically generates all collection instruments and ensures their standardisation. The online questionnaires accessible from COLTRANE are thus generated based on their formal description, i.e. from the metadata describing the questionnaire. COLTRANE also provides a range of services, including, for example, the generation of different types of letters announcing the survey, those used for reminders and requests for paper and downloadable questionnaires. Monthly branch surveys were incorporated into the COLTRANE system in May 2017.

3.2- Publication Deadlines

For flash GDP production purposes at +30 days after the end of the quarter, an "early" IPI is now calculated between +23 and +25 days after the last month of each quarter. Quality tests are underway and may lead to shorter IPI release times, provided this can be done without a significant loss of quality (balance to be struck between speed of release and index quality).

3.3- Integration with European Projects

In 2012, Eurostat launched a plan to integrate all existing business statistics regulations by developing a cross-cutting legal framework for the systematic collection, compilation, transmission and dissemination of European statistics related to the structure of the economic activity and competitiveness of the European business sector, a plan known as the FRIBS (Framework Regulation Integrating Business Statistics) draft regulation.

FRIBS (adopted in 2019 by the European Council and Parliament) provides for two major developments in the area of short-term indicators:

- the use of the Kind-of-Activity Unit (KAU) as the only statistical unit for short-term indicators. In the current STS Regulation, depending on the sector of activity, the statistical unit is either the KAU (as in the case of the IPI) or the enterprise. The KAU is the legal unit in almost all cases whereas the enterprise is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources;
- the introduction of new activity indicators: a production index in services and a sales volume index for all trade and no longer just for retail trade.

The current IPI is in line with the provisions of the new framework regulation. Other indicators have undergone changes to ensure compliance with the new Framework Regulation (FRIBS). This is particularly the case with the publication since March 2017 of the new monthly quantitative volume indicators on services (services production index) and trade (volume index of sales in trade). Other developments are still ongoing as part of the "INSEE 2025" project and aim to improve the quality, relevance and speed of availability of monthly production indicators[50].

50For example, by clarifying or enriching the supply of indicators, shortening production and publication deadlines, optimising methods for the imputation of missing values or the sampling design used to select the surveyed enterprises, etc.

Glossary

Reference year: year for which the annual average value of a given index is set equal to 100. Eurostat requires that the reference year be published no later than three years later (e. g. in January 2013, 2010 being the reference year of the indices).

Base year: year characterised by the age of the weights used to compile the IPI.

Branch: a branch (or branch of activity) groups together homogeneous production units, that is, units that manufacture products (or produce services) belonging to the same item of the classification of economic activities considered, while a sector groups together companies according to their principal activity.

Class: 4-digit level of the French Classification of Activities (NAF). The NAF is fully consistent with the NACE up to class-level.

French Classification of Products (in French, *Classification de produits française*, or CPF): the product classification (associated with the classification of economic activities) in force in France since 1 January 2008 is the French Classification of Products (CPF Rev 2). The CPF is identical to the classification of products at the level of the European Union (EU), known as the Statistical classification of products by activity, abbreviated as CPA. CPF Rev. 2 contains seven levels: 21 sections, 88 divisions, 261 groups, 575 classes, 1,342 categories and 3,142 subcategories. CPF Rev. 2 replaces CPF Rev. 1, which had been in force since 1 January 2003.

Technical coefficient: generic term for productivity coefficients and deflators.

- Productivity coefficient: an elementary series monitored in hours worked is associated with a series of productivity coefficients used to obtain volume indices.

- Deflator: series of producer price indices. An elementary series monitored in invoicing terms is associated with a series of producer prices used to obtain volume indices.

Deflator: in general, an implicit deflator measures price changes in an area of the economy by dividing the magnitude in value terms by the same magnitude in volume terms. Implicit deflators are named after the aggregate used. Deflators of GDP, final consumption expenditure, gross capital formation, exports and imports measure price changes in their respective areas of the economy. They are used to adjust the aggregates of the effects of inflation. The GDP deflator deviates from the consumer price index, depending in particular on changes in import, export and GFCF prices.

Denominator: denominator used to calculate an elementary index. It is equal to the annual average of the numerators for the current campaign dates of the reference year (year for which the annual average of the indices is equal to 100) for most series (except those relating to food and agriculture).

Annual Business Statistics Programme/ESANE: the ESANE system combines administrative data (obtained from annual returns on profits provided by businesses to the revenue authorities and from annual employment data providing information on staff) and survey data collected from a sample of enterprises surveyed using a specific questionnaire for the purpose of producing structural business statistics (Annual Sectoral Survey/ESA).

Monthly Branch Surveys (in French, *Enquêtes mensuelles de branche*, or EMB): these mandatory surveys collect data used to monitor monthly changes in industrial output. INSEE uses these data to calculate the industrial production index, which it publishes each month.

Annual Production Survey (in French, *Enquête annuelle de production*, or EAP): first conducted in 2009, the annual production survey aims to identify and analyse the industrial goods and services sold in value and quantity terms. The survey takes into account sales, installation, fitting and maintenance of industrial products. The survey concerns around 40,000 businesses operating in the industrial sectors of the economy (not including food and agriculture) located in metropolitan France.

Laspeyres index: a Laspeyres index is a fixed-weight, or base-weighted, index with a variable set at its value at the initial date. Thus, prices changes in the index between period 1 and period 2 are calculated as follows: $Lq_{2/1} = \sum p_1 q_2 / p_1 q_1$. Conversely, with a Paasche index, the variable to be neutralised is fixed at its value at the final date: $Lq_{2/1} = \sum p_2 q_2 / p_2 q_1$.

Chained index: index chaining means constructing a long-term index, for example a long-term volume index, by aggregating the elementary movements of different basic short-term indices. For example, an index between 0 and t can be calculated as follows: $\mathrm{Ich}_{t/0} = \mathrm{I}_{1/0} \times I_{2/1} \times \ldots \times I_{t/t-1}$, where I may be a Laspeyres index, a Paasche index, etc.

Producer price index (PPI): industrial producer price indices for the French market measure changes in the trading prices (exclusive of VAT) of industrial goods sold on the home market. Industrial producer price indices for external markets reflect changes in the trading prices (converted into euros, i. e. including currency effects), FOB, of French industrial goods sold on foreign markets. The combination of the two indices determines the industrial producer price indices (home and external markets). These indices are calculated from monthly price surveys of some 24,000 products collected from a representative sample of 4,200 businesses as part of the Survey on observation of prices in industry and services.

Classifications (activities, products): classifications of activities and products have primarily been developed to facilitate the organisation of economic and social information. In other words, their purpose is primarily statistical. When using them for administrative management purposes, this original purpose should be kept in mind: the type of units taken into account, the method of determining the main activity, the aggregation methods and the construction principles are closely linked to the statistical data objectives.

The classifications currently in use are for:

1. classifications of activities:
   - at the international level, ISIC;
   - at the European level, NACE;
   - at the French level, NAF.

2. classifications of products:
   - at the international level, the CPC;
   - at the European level, the CPA:
   - at the French level, the CPF.

3. production surveys:
   - at the European level, PRODCOM;
   - at the French level, PROFRA.

4. external trade:
   - at the international level, the HS;
   - at the European level, the CN;
   - at the French level, the NGP.

Aggregate classification/NA 2008: with the adoption of NAF Rev.2 (the revised French classification of activities in force since 1st January 2008), the composite economic classification (NES) associated with NAF Rev.1 disappeared as such. In practice, this strictly French classification scheme did not allow for international comparisons since it did not fit into the general framework provided by the ISIC and NACE systems

NAF Rev. 2 includes two aggregate “standard” levels: sections and divisions, containing 21 and 88 items respectively. These levels are common to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4), the Statistical classification of economic activities in the European Community (NACE Rev. 2) and NAF Rev.2.

However, it was necessary to create additional groupings to meet requirements relating to economic analysis and the publication of composite data. Seven aggregation levels are thus associated with NAF Rev. 2, labelled

“Axx”, where xx represents the number of items within the level. Together they form the aggregate classification (NA):

- A 10: international level, grouping of sections;
- A 17: French level, intermediate between levels A10 and A38.

At the section level (A 21), the manufacturing industry covers 5 items while certain service activities are grouped together.

- A 21: sections, standard level of the NAF Rev.2 system;
- A 38: international level, intermediate between sections and divisions;
- A 64: European level, intermediate between levels A 38 and A 88 (divisions), provisional;
- A 88: divisions, standard level of the NAF Rev.2 system;
- A 129: French intermediate level between divisions (level A 88) and groups.

French Classification of Activities (NAF): the classification of economic activities in force in France since 1 January 2008 is the French Classification of Activities (NAF Rev. 2). NAF has the same structure as the Statistical classification of economic activities in the European Community (NACE Rev. 2) but includes an additional level specific to France: subclasses. NAF Rev. 2 has five levels comprising respectively: 21, 88, 272, 615 and 732 items. NAF Rev. 2 replaced NAF Rev. 1 dating from 2003 (entry into force on 1 January 2003). NAF Rev. 1 has five levels comprising 17, 31, 62, 224 and 712 items respectively. NAF Rev. 1 replaced NAF, in force since 1 January 1993.

Statistical classification of economic activities in the European Community/NACE: the Statistical classification of economic activities in the European Community (NACE) was adopted in 1970 to establish a common statistical classification of economic activities in the European Community designed to ensure comparability between national and Community classifications and, consequently, between national and Community statistics, but is not governed by a European regulation.

Numerator: numerator used to calculate an elementary-series level index (also called an elementary index).

Weighting: aggregation weight of a series (elementary or aggregated) into a higher level series (e.g. weighting of series E2021Z1 in subclass E2021Z).

Base price: amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable. It excludes any transport charges invoiced separately by the producer.

PRODCOM (survey): the PRODCOM regulation is a European Union statistical survey on the volume of industrial output sold by product. Output is defined by a list of product headings comprising items or groups of items in the Combined Nomenclature (CN) and linked to other product nomenclatures.

ProdFra (the ProdFra nomenclature): ProdFra is the acronym for “Production Française’’ (“French Production”). The ProdFra nomenclature is a French classification of products, consistent with both the “French Classification of Products” (CPF) and the Prodcom list. It covers all subcategories of the industrial CPF.

Productivity: in economics, productivity is defined as the ratio, in volume, between production and the resources used to obtain that production. Production means goods and/or services produced. The resources used, also called production factors, mean labour, technical means (installations, machines, tooling, etc.), the capital invested, intermediate consumption (raw materials, power, transport, etc.) as well as factors that are less easy to grasp but nonetheless extremely important, such as the accumulation of know-how.

Production (national accounts): activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services, and the result of that activity. A purely natural process without any human involvement or direction is not production in an economic sense.

Re-basing: products and industrial production change over time: new products appear on the market while others disappear. Likewise, production processes change. These structural distortions require the content of the products monitored by the industrial production index to be adapted. The process of adapting indices to the industrial system lies at the heart of re-basing.

Elementary series or control series: an elementary series is the finest level of calculation and observation of the indices. It is obtained directly by aggregating the individual production data of businesses. If necessary, an elementary series is deflated or adjusted for the increase in production and is necessarily given in “volume” terms.

Subclass: 5-digit level of the French Classification of Activities (NAF).

Legal unit/Enterprise-legal unit:

A legal unit is a legal entity under public or private law. This legal entity may be:

- a legal entity whose existence is recognised by law independently of the individuals or institutions which may own it or are members of it;
- a human person engaged in an economic activity in his or her own right.

Its existence must be reported to the relevant authorities (court registries, social security, revenue authorities, etc.). The existence of such a unit depends on the choice of the owners or its creators (for organisational, legal or tax reasons). The legal unit is the main unit registered in the SIRENE business register.

This definition of the concept of legal unit should not be confused with the definition of enterprise in the statistical sense, which may include several legal units

Value added: balancing item of the production account. It is calculated as the value of output minus intermediate consumption.