

INDUSTRIAL PRODUCTION INDEX (IPI)

DETAILED METHOD OF INDEX CALCULATION

The industrial production index (IPI) measures the output of industrial economic activities and of the total industry, adjusted for price effects. It is a basic indicator of industrial short-term statistics. In a large part the calculation is based on sales of own goods and services at constant prices; in certain economic activities the production volumes of products-representatives are used. The index is primarily calculated as a monthly base index at the level of CZ-NACE divisions. For higher-level aggregations, weights derived from the structure of value added in the base year are used. The base indices provide the basis for year-on-year indices and cumulations over time, if any. In compliance with regulations of Eurostat the Industrial Production Index covers CZ-NACE sections B, C, D (except group 35.3).

Legal framework

The legal basis for the preparation of the short-term statistics of industry followed by the Czech Statistical Office (CZSO) is Council Regulation (EC) No 1165/98 concerning short-term statistics as amended by Regulation (EC) No 1158/2005 of the European Parliament and of the Council. Since January 1997, the set of short-term statistic data has been published in accordance with this Regulation. The Regulation establishes a common framework for the production of short-term statistics describing the economic development of European Communities, i.e. for the harmonised set of indicators for analysis of the short-term development of supply and demand, production factors and prices. This basic regulation is complemented by a range of relied pieces of legislation and legally non-binding methodological guidelines, in particular the handbook for short-term statistics (Methodology of short-term business statistics: Interpretation and guidelines, Eurostat, 2006).

In the Czech Republic, statistical surveys are conducted on the basis of the Act No 89/1995 Coll., on the State Statistical Service, as amended. Document detailing annually the statistical surveys carried out within the framework of the state statistical service, as well as a reporting duty of selected economical units, is the Decree on the Programme of Statistical Surveys. The Czech Statistical Office is responsible for short-term statistics in the industry sector; the monthly indicators are based on processing of the “Prům 1-12 Monthly Questionnaire in Industry”. The Decree on the Programme of Statistical Surveys indicates for each statistical survey its purpose, a group of reporting units that are subject to the reporting duty, a method of the statistical survey, its periodicity and deadlines for data providing. Processing of data is followed by making information public – in advance, the Catalogue of products for the current calendar year is published on the CZSO webpage. The Catalogue includes publications, as well as a whole set of time series, revisions, analysis, news releases and data sets.

Data sources

The compilation of Industry Production Index is based on the data collected via monthly questionnaire “Prům 1-12 Monthly Questionnaire in Industry” and its annex “PROD Manufacture of Industrial Products and Services”. The aim of Prům 1-12 questionnaire is to collect data reflecting the development of basic indicators by economic activity, to gather data on production volumes of selected industrial goods, sales from industrial activity and new industrial orders.

Reporting units subject to the reporting duty are active economic entities with industry as prevailing economic activity. The “*Prům 1-12*” is a sample survey. In population, all economic entities are included, both legal and natural persons with prevailing industrial activity (according to Statistical Business Register). The sample contains two parts: exhaustive part (large enterprises) and the sample part. Annex PROD is to be completed by economic units with prevailing industrial activity whether or not registered in a commercial register and having CZ-NACE 05, 06, 12 (since 2015), 19 and 35 as the principal or secondary activity, with 20 or more employees.

Modified list of products CZ-PRODCOM that is used for detailed information on production for the purpose of annex CZ PRODCOM “PROD Manufacture of Industrial Goods and Services” is a subset of the “CZ-PRODCOM List of Industrial Goods and Services”. The CZ-PRODCOM List is Czech national version of the European list PRODCOM. It contains 10-digit codes of industrial products and services that are closely aligned with CPA classification of products, as well as with CZ-CPA; they are also linked to Combined Nomenclature (HS/CN). The scope of monthly modification of the List includes only sections of mining and quarrying, manufacture of coke and refined petroleum product and electricity and gas production.

For conversion to constant prices, two price indices have been used. Industrial Producer Price Index, (in Czech *ICPV*), monthly outcome of price statistical survey, is used for conversion of revenues from own goods and services sold in the domestic market; ICPV measures the trend in prices agreed upon between the supplier and the customer inland. For revenues from sales of own exported products and services (sold abroad), the Export Price Index is used; it measures the trends in invoiced prices of significant export trade transactions converted into CZK by average monthly exchange rates.

The weights for aggregation of product representatives (“1st stage weights”) are derived from outputs of annual statistical survey via “*Prům 2-01 Annual Questionnaire in Industry*” used for collection of information on structure of production, sales and stocks of enterprises or businesses having significant share of industrial activity at the level of product codes by CZ-PRODCOM (its full version) or CZ-CPA in case of non-industrial activities of the enterprise. Weights reflect a products-representative’s share within a CZ-CPA 2-digit level aggregate in the base year.

Aggregation of individual sector indices up to the higher level of sales is based on weights (“2nd stage weights”) derived from the structure of the value added in the base year. Source for the weights is structural statistics on businesses, namely “*P 5-01*” survey (the Annually Questionnaire on Businesses Operating in selected production branches).

IPI calculation

Since 2006 the calculation method used by CZSO is based on combination of two possible approaches. Internationally accepted IPI concept enables to use a rather large scale of methods as well as input data used. In 2006, in accordance with experience from abroad, such alternative of calculation was now chosen, in which input calculation of individual indices starts at a higher level of aggregation. However, on that level, it is not possible to combine different physical units of measure and thus it is necessary to rely on monetary indicators adjusted for inflation. As a suitable basic indicator the following usually surveyed indicator was chosen: sales of own goods and industrial services in constant prices, which can be used as approximation of the volume of production. It was used in most of industrial branches; only in the case of several branches, characteristic for homogeneous production,

the calculation included data on the volume of production in physical units of measure (CZ-NACE 05 Mining of coal and lignite, 06 Extraction of crude petroleum and natural gas, 12 Manufacture of tobacco products, 19 Manufacture of coke and refined petroleum products and 35 Electricity, gas, steam and air conditioning supply).

The following text provides a description of the whole process of data processing done by the CZSO, from the preparation of the survey to the information release. The description is divided into individual phases and within two branches - branch A describes a part of the calculation of the Industrial Production Index based on sales, branch B then the part of the calculation based on product representatives. A scheme of the whole procedure is presented at the end of this document.

Survey preparation (step 0)

Information from the Statistical Business Register are used to generate the population and on the basis of given selection criteria is then generated reporting duty for “Prům 1-12 Monthly Questionnaire in Industry” and its Annex “PROD Manufacture of Industrial Products and Services”. This statistical questionnaire is delivered to the selected sample of reporting units together with the information on options of filling it out and deadlines for completing individual monthly questionnaire.

Data collection, imputation of non-response (step 1)

Data collected from respondents are checked in order to identify potential errors and correct them. When unit fails to fulfil its reporting duty on time, imputation of non-response is carried out followed by imputation to a whole population (i.e. population of business with industry as prevailing activity).

Micro-data aggregation (step 2)

In case of sectors that use sales of own goods and services of industrial character as data sources (*branch A*) so called lowest level of aggregation is processed, combining two-digit CZ-NACE divisions with the Main Industrial Groupings (MIG); this approach allows to disseminate aggregates of both NACE and MIG.

For sectors using production volume as a source of data (*branch B*), individual indices based on PROD are aggregated to so called product-representatives – one products-representative is composed of one or more (summable) products. Processing technic allows to change products-representatives and products they include overtime, in case when significant changes in observed reality are registered.

Adjustment for price effects (step 3)

Aggregated data expressed in monetary value are converted from current prices to constant prices, so that the resulting index reflects the real change in volume of production isolated from price effects. At present, this conversion to constant prices is based on Industrial Producers Price Index and Export Price Index.

Constant prices are prices of the base period, which is currently the year 2015. In line with the European Statistical System rules, the base period changes every 5 years (recalculation to 2015 base was carried out in 2018).

Calculation of individual production indices by sectors (step 4)

The Industrial Production Index is primarily calculated as a base index – the reference month is compared with the average month of the base year, which is currently a year 2015.

When calculating individual indices for specific basic aggregates - for those sectors that are using sales from industrial activity as a source indicator (*branch A*) -, domestic sales are calculated first (as the difference between sales of own industrial goods and services, and sales of exported ones that are explicitly indicated in the questionnaire) – for conversion of sales into constant prices, two separated data groups are needed: export sales and domestic sales.

Individual index for specific basic aggregates is then calculated according to the following formula:

$${}_d I_o(t) = \frac{T_o(t)}{T_o(0)} \cdot 100 = \frac{T_o(t-1)}{T_o(0)} \cdot \frac{T_o(t)}{T_o(t-1)} \cdot 100$$

where ${}_d I$ is individual base index of basic aggregate o and T are sales (domestic or export) expressed in constant prices for the reference period (t), the same period of the last year ($t-1$) and for the average period of the base year (0). For the practical reasons, technically, year-on-year indices are calculated first and base indices are derived from those afterwards.

Index of domestic sales and index of export sales constitute index of sales of own goods and services of industrial character in a total for given aggregate, using the fix ratio of domestic and export sales to total sales (in the base year):

$$I_o = {}_{tuz} I_o \cdot {}_{tuz} W_o + {}_{zah} I_o \cdot {}_{zah} W_o$$

where ${}_{tuz} I$ is partial index of domestic sales of the sector o , ${}_{zah} I$ is partial index of export sales of the sector o and ${}_{tuz} W$ and ${}_{zah} W$ are fixed ratios of domestic and export sales of the sector o .

In case calculation of individual indices of product representatives, it is also proceeded in two steps (*branch B*). Base indices of individual representatives are calculated similarly as sales indices, I being *base* index of the representative r and P being physical production volume:

$$I_r(t) = \frac{P_r(t)}{P_r(0)} \cdot 100 = \frac{P_r(t-1)}{P_r(0)} \cdot \frac{P_r(t)}{P_r(t-1)} \cdot 100$$

Then, composed index of the sector can be calculated. It is calculated as the arithmetic mean of *base indices* of those representatives that represent selected sector. For the practical reasons, technically, year-on-year indices are calculated first, base indices are derived from

those afterwards. Indeed, individual indices of the sector from the calculation branch using product-representatives are calculated by the following formula:

$$I_o(t) = \sum_{r \in o} {}_1w_r \cdot I_r(t)$$

where I is the base index of the sector o or of the product-representative r in the reference period (t) and ${}_1w$ is the weight of the product-representative r – weights are deduced from the outputs of annually survey “Prům 2-01” in the base year (currently year 2015).

Compilation of overall IPI for industry as a total (step 5)

After the individual base indices have been determined, the Industrial Production Index can be aggregated to higher levels of CZ-NACE classification (divisions), to Main Industrial Grouping and to the overall index for industry. It is calculated as the weighted arithmetic mean of indices I_o , where the value added in the base year (currently year 2015) is used for the weighting of individual industrial sectors. Industrial Production Index for total industry is then calculated following the formula:

$$IPP(t) = \sum_{k=1}^K {}_2w_o \cdot I_o(t)$$

where IPP is the overall Industrial Production Index in the reference period (t), ${}_2w$ is the weight of the sector o and I_o is the base index of the sector o .

Seasonal adjustment (step 6)

Seasonal adjustment is used for Industrial Production Index applying the TRAMO / SEATS method implemented in the JDEMETRA+ programme. Since January 2019, so-called indirect seasonal and calendar adjustment method is applied that replaced direct method used before. Indirect method is based on weighted average of the adjusted source data, applying the adjustment on aggregates of industrial production index of the lowest level only. The TRAMO / SEATS method as well as the method of indirect adjustment belongs nowadays to those preferred also by the Eurostat methodological guidelines on seasonal adjustment of economic indicators time series.

Outputs release (step 7)

A principal tool for the Industrial Production index publication, and so for all outputs of monthly industrial statistics, is so-called News Release. It is published at 9:00 AM according to the fixed pre-determined schedule (about 37th day after the end of the reference month – slight shifts are due to weekends, holidays, etc.).

IPI long time series (starting from 2000) are published on the CZSO web page, in section of “Industry – Time series” and via Public Database.

Afterwards, data are transmitted to the Eurostat database and made available via publication tool News Release – Euro Indicators – Industrial Production approximately one week later, together with data of other countries belonging to the European Statistical System.

Data revisions and retroactive corrections are governed by the revision calendar, which results from the CZSO revision policy. In the case of short-term monthly statistics, revisions are made as a standard together with the data processing for the first month after the calendar quarter is finished. Should serious input data corrections be made, which have a significant impact on the results published, extraordinary revisions outside the revision calendar are permissible.

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