



**National Statistics Office of Georgia
(Geostat)**

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Producer Price Index for Industrial Products

Technical Manual

The presented technical manual is prepared by the National Statistics Office of Georgia according to the international methods and practices and is based on the following handbooks:

1. ***“Producer Price Index Manual: Theory and Practice”, International Monetary Fund, 2004;***

Responsible organizations: the International Labor Organization (ILO), International Monetary Fund (IMF), Organization for Economic Co-operation and Development (OECD), United Nations Economic Commission for Europe (UNECE) and World Bank;

<https://www.imf.org/en/Publications/Manuals-Guides/Issues/2016/12/30/Producer-Price-Index-Manual-Theory-and-Practice-16966>

2. ***“Handbook on industrial producer price indices (PPI)”, Eurostat, 2012;***

Responsible organizations: European Statistical Office (Eurostat), European Commission.

<https://ec.europa.eu/eurostat/en/web/products-manuals-and-guidelines/-/KS-RA-12-020?inheritRedirect=true>

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1. Introduction

1.1 Producer Price Index for Industrial Products and its use

The Producer Price Index (PPI) for Industrial Products measures average price level of the goods produced by producers compared to the reference period.

The structure of PPI follows the Statistical Classification of Products by Activity (CPA) and covers: products from mining and quarrying (C-section); manufactured products, (D-section); electrical energy, gas, steam and hot water (E-section).

The Producer Price Index for Industrial Products is used for the following purposes:

- The PPI has an important role in deflating different economic indicators;
- The PPI is used for indexation of contracts in both public and private sectors;
- The index is an analytical instrument for researchers and representatives of business sector.

1.2 Structure of the PPI

The Producer Price Index comprises of two sub-indices: the Domestic Producer Price Index for Industrial Products and the Export Price Index. The former measures average price level of industrial goods produced in the country and sold on domestic market compared to the reference period. In turn, the Export Price Index measures average price level of industrial goods produced for export purposes compared to the reference period.

1.3 Coverage of the PPI and the observable prices

The prices are collected for the output of domestic enterprises across the country. The observable prices are the sale prices set by producers for the industrial products they produce in the specified period.

The prices used for calculation of the Domestic Producer Price Index are those at the factory gate and do not include VAT, excise and separately invoiced transport expenses.

Regarding the Export Price Index, the prices used for compilation of this index are free-on-board (f.o.b.) prices set by producers in the reporting period. The f.o.b. price is comprised of the basic price (producer price at the factory gate), plus taxes less subsidies on products levied by the general government of the supplying economic territory, plus distribution margins, transportation, and insurance services added to get the product from the point of manufacture to the point of departure from the supplying economic territory.

2. Sampling of products

For price registration for the industrial products produced for the domestic market, products are selected according to their shares in the volume of the whole domestic industrial production. Product sampling is conducted according to the Statistical Classification of Products by Activity (CPA). The statistical data of enterprises by the kind of industrial products in value terms are used for the sampling. In case of exported products, sampling is performed according to shares of the products in the total export value (re-export subtracted). External trade statistics data is used for this purpose.

Survey of enterprises is conducted based on the sampled products. On the following stage sampled enterprises are surveyed in order to define product specifications.

During the products selection process maximally detailed specifications are determined for them. To follow the specifications is the most important part of price registration, since the monthly recorded difference between prices should be caused by the pure price change of a product, rather than that caused by changes in characteristics, or a product itself. Relying on the obtained survey data the prices for sampled products are recorded across the year. Product selection is updated annually.

3. Price collection fieldworks

Prices for industrial production are collected by price enumerators. Price collection fieldworks are conducted from the 1st to the 8th of the month following the reporting period. Enterprises indicate in questionnaires the following information about the selected four products: measurement unit, prices in the reference, previous and current month and, in case of the Export Price Index, country of destination.

The information about the product prices provided by the enterprises is confidential and is protected by the “General Administrative Code of Georgia” and article 28 of the “Law of Georgia on Official Statistics”.

Unless otherwise provided for by the legislation of Georgia, legal entities registered in the Register of entrepreneurial and non-commercial legal entities are obliged to provide Geostat, upon Geostat’s written request, including such request in electronic form, with the available information (including confidential information) in paper or electronic form.

4. Validation procedures

PPI validation procedures are conducted in two stages:

On the first stage validation takes place simultaneously with the price registration fieldworks. In the case of price change, the person responsible for filling the questionnaire is required to define by the comment the reason of the change. After the data is sent to the central office, a responsible employee conducts analysis and logical control of the data.

On the second stage accuracy of the prices, which are extremely deviated from the previous month, is checked after calculating the indices.

5. Weights

Weights for individual products in the Producer Price Index are updated annually, based on the production structure defined by the National Accounts System and external trade statistics data and reflects the latest information on industrial production output across the country. The obtained weights represent the share of the product value in the overall value of products produced in the country. Weights for a reporting period t are calculated based on $t-2$ period information. The list of industrial products included in the index may also be changed while updating the weights.

6. Price imputation techniques

If a price for a product is not indicated by an enterprise in the reporting period, a price imputation method is applied.

For example, if there is no price recorded in April for one of the products, brand A, the imputed index for this product will be the index of the group, which includes this product. The group index is calculated using the actual price indices of products in this group (Table 1).

Table 1.

Product	Product weight, %	Base price	March Price	April price	Price Ratio (March/December)	Price Ratio (April/December)
Brand A	0.051	4.55	4.50	-	$4.50/4.55 \approx 0.99$	1.15*
Brand B	0.032	5.20	5.20	5.50	$5.20/5.20 = 1.00$	$5.50/5.20 \approx 1.06$
Brand C	0.067	5.00	4.50	5.50	$4.50/5.00 = 0.90$	$5.50/5.00 = 1.10$

*Imputed index

In April the imputed index for brand A is calculated in following steps:

1. Group long term index in April = $1.06 \times \frac{0.032}{0.032+0.067} + 1.10 \times \frac{0.067}{0.032+0.067} \approx 0.34 + 0.74 = 1.08$;
2. Long term index for the corresponding group in March = $1.00 \times \frac{0.032}{0.032+0.067} + 0.90 \times \frac{0.067}{0.032+0.067} \approx 0.32 + 0.61 = 0.93$;
3. Group short term index in April = $\frac{1.08}{0.93} \approx 1.16$;
4. Imputed long term index for brand A = $1.16 \times 0.99 \approx 1.15$.

If in the reporting month no price is recorded for products in a group, imputed index for them will be calculated using upper level group's index, according to the structure of Classification (CPA). Otherwise, if in the reporting month no price is recorded up to the third level of the structure of CPA (e.g. 15.1 "meat and meat products"), the imputed index will be calculated using the carry-forward method, rather than the upper level group's index.

7. Quality adjustment

In process of time an enterprise may not produce a product of the same quality any more, for which prices have been observed. In order to insure the comparability of prices for old and new products, a quality adjustment method should be used, for which conditional base price is calculated using the following methods:

1. If in the reporting month a replacement product is qualitatively different from the product in the previous month, and the value of the difference is evaluated, the base price for the replacement product is calculated using previous month's price and the qualitative difference defined by the person, responsible for filling the questionnaire (Table 2):

Table 2.

Product	Base price	Price in March	Price in April	Qualitative difference	Price Ratio (April/December)
Brand A	4.55	4.50	-		
Qualitatively different product - Brand B	5.86*	-	8.50	1.30	8.50/5.86≈1.45

*Imputed base price

Imputed price for brand B is calculated as follows:

$$\text{Base price} = (4.50+1.30)/(4.50/4.55) \approx 5.86$$

2. If in the reporting month it is possible to define previous month's price for the replacement product, base price for the replacement product is calculated using this price and the index of previous month (Table 3):

Table 3.

Product	Base price	Price in March	Price in April	Price Ratio (March/December)	Price Ratio (April/December)
Brand A	4.55	4.50	-	4.50/4.55≈0.99	
Replacement product - Brand B	5.26*	5.20	5.50		5.50/5.26≈1.05

*Imputed base price

Imputed base price for brand B is calculated as follows:

$$\text{Base price} = 5.20/(4.50/4.55) \approx 5.26$$

3. If in the reporting period a price enumerator discovers that the brand A will no longer be sold starting from the reporting month, and it is impossible to get information on previous month's price and the value of qualitative difference for the replacement brand B, the difference between current month's price of brand B and previous month's price for brand A will be totally treated as the qualitative difference.

Imputed base price of the replacement product is calculated based on current month's index and price of brand B (Table 4).

Table 4.

Product	Product's weight, %	Base price	Price in March	Price in April	Price Ratio (March/December)	Price Ratio (April/December)
Brand A	0.051	4,55	4,50	-	4,50/4,55≈0,99	
Replacement product - Brand B	0.051	6.09**	-	7,00		7,00/6.09≈1.15*
Brand C	0.032	5.20	5.20	5.50	5.20/5.20=1.00	5.50/5.20≈1.06
Brand D	0.067	5.00	4.50	5.50	4.50/5.00=0.90	5.50/5.00=1.10

*Imputed long term index

**Imputed base price

Imputed base price for brand B is calculated as follows:

1. Group long term index in April = $1.06 \times \frac{0.032}{0.032+0.067} + 1.10 \times \frac{0.067}{0.032+0.067} \approx 0.34 + 0.74 = 1.08$;
2. Group long term index in March = $1.00 \times \frac{0.032}{0.032+0.067} + 0.90 \times \frac{0.067}{0.032+0.067} \approx 0.32 + 0.61 = 0.93$;
3. Group short term index in April = $\frac{1.08}{0.93} \approx 1.16$;
4. Imputed long term index for brand A = $1.16 \times 0.99 \approx 1.15$;
5. Imputed base price for brand B = $7.00/1.15 \approx 6.09$.

8. Calculation of the PPI on different level

8.1 Calculation of the lowest level PPI

An index, calculated for each product produced by an enterprise, is the lowest level index for the PPI. Graph #1 shows the structure of industrial sector, where the price indices for product A, B and other individual products are the elementary indices. The lowest level index, compared to the price reference period, is obtained from the ratio of reporting (t) and reference period product prices:

$$I_i^{t/0} = \frac{p_i^t}{p_i^0}$$

where:

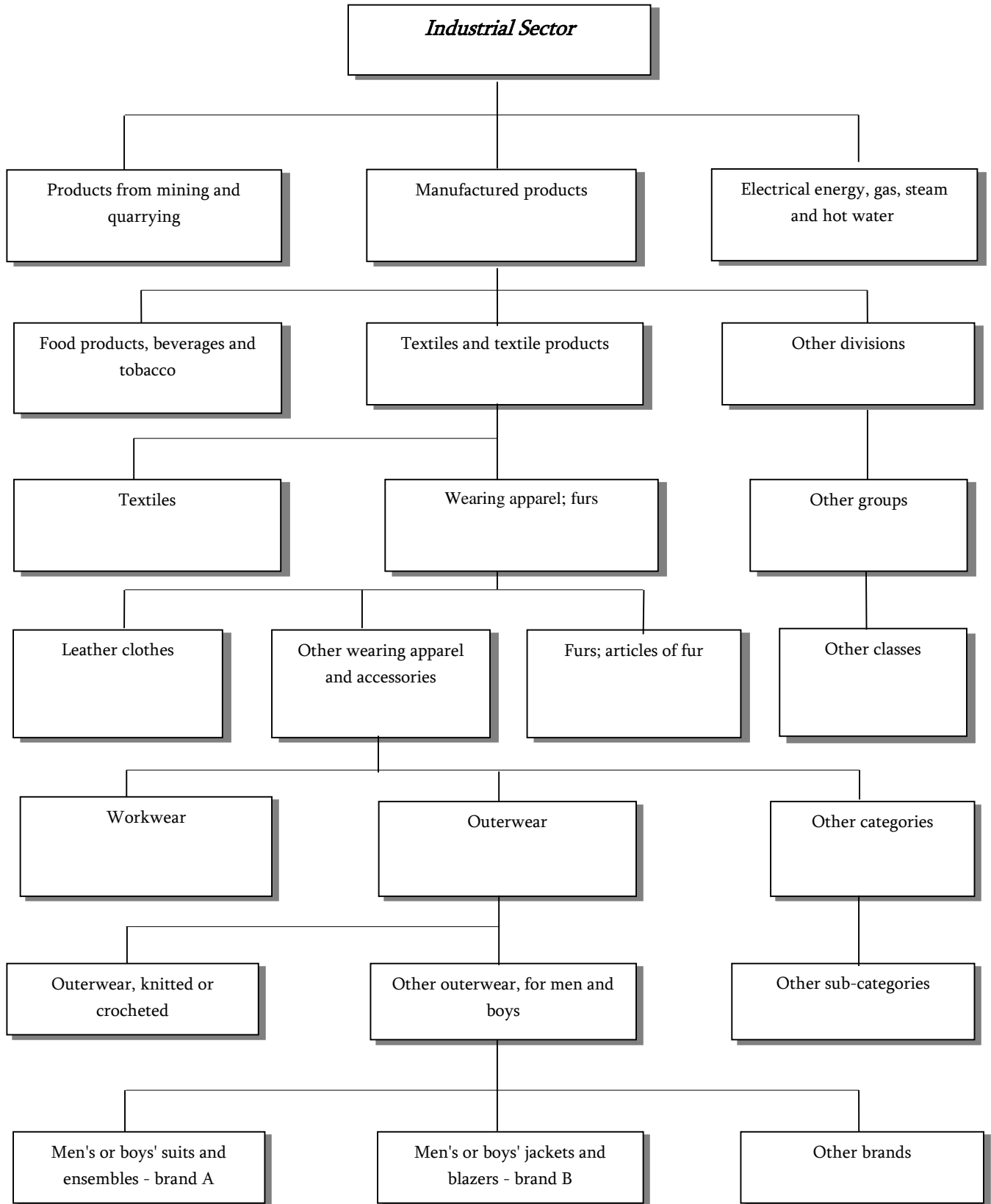
i – a product, produced by an enterprise, for which a comparable price is registered;

$I_i^{t/0}$ is a lowest level index for product i in the reporting period t , compared to the index reference period;

p_i^t – price of a product i in period t ;

p_i^0 – price of a product i in the price reference period.

Graph #1. Structure of the industrial sector



8.2 The PPI for Industrial Products for separate groups and the whole industry

Long term PPI for the whole industry compared to the price reference period is calculated by using the following Laspeyres-type formula:

$$I^{t/0} = \sum_{i=1}^n (I_i^{t/0}) \times s_i^b, \quad \text{where:}$$

$I_i^{t/0}$ is a lowest level long term index for product i compared to the price reference period;

$s_i^b = \frac{p_i^b q_i^b}{\sum p_i^b q_i^b}$ is the weight of product i in the weight reference period, which represents share of product i in the whole production, where $\sum_{i=1}^n s_i^b = 1$.

p_i^b - the price of product i produced by the sampled enterprise in the weight reference period (b);

q_i^b - quantity of product i produced in the weight reference period (b).

The same formula is used for calculation of all upper level indices. For example, a section index is calculated by weighting long-term indices of the products, which belong to the section, where sum of weights of the indices represented in the section is 100%.

Short term index compared to the previous month is obtained from the ratio of long term indices in the reporting and previous months, calculated comparing to the price reference period.

8.3 Chain index

During the annual update of samples of industrial products and enterprises or specifications of the products in the update period, December, prices are collected for products both in old and new samples. This enables chain-linking of indices, calculated for two different samples. Chaining enables to calculate indices with a long term reference period, notwithstanding the changes in weights.

For example, before December 2016, compared to December 2015, the overall (whole industry) index was calculated using w_i weights, whereas the 2017 index is calculated comparing to December 2016, using k_i weights (see table 5).

X_1 is the chain index for January 2017, which is calculated with the reference period of December 2015. Calculation of this index can be represented as follows:

Table 5.

12.2015=100	12.2016=100
12.2016: $I^{12.16/12.15} = \sum_i I_i^{12.16/12.15} \times w_i = 106$	12.2016: $I^{12.16/12.16} = \sum_i I_i^{12.16/12.16} \times k_i = 100$
X_1	01.2017: $I^{01.17/12.16} = \sum_i I_i^{01.17/12.16} \times k_i = 102$

$$\frac{106}{X_1} = \frac{100}{102}, \text{ resulting } X_1 = \frac{106 \times 102}{100} \approx 108$$

The same result can also be derived from the following chain-linking:

$$I^{12.2016/12.2015} \times I^{01.2017/12.2016} = 106 \times 102/100 \approx 108$$

9. Publication

9.1 Press release

Press releases for domestic PPI for industrial products, export price index and the total PPI for industrial products are published through the Geostat's website (www.geostat.ge) on a monthly basis. They contain information about monthly and annual index rates, as well as contributions of sections and divisions to the index formation. Press releases also include different time series graphs.

9.1.1 Contributions of product groups to the overall index percent change

Calculation of certain product groups' (section, division, etc.) contributions to changes in the overall index provides a powerful analytical tool for analyzing the PPI. The contribution of a group to the change in the overall PPI is defined as the percentage change of the overall index caused by the change of the given group index only, providing the permanence of the other group indices.

The contribution of a product, produced by an enterprise, to the change of the overall index is calculated using the following formula:

$$\text{Contribution of a product } i \text{ to the monthly index} = \left(\frac{I_t^i}{I_{t-1}^i} - 1 \right) \times 100 \times \frac{I_{t-1}^i}{I_{t-1}^a} \times w_t^i$$

where:

I_t^i is the index of product i in period t ;

I_{t-1}^i - the index for product i in period $t-1$;

I_{t-1}^a - the PPI for the whole industry in period $t-1$;

w_t^i - the weight of product i in period t .

Contribution of a group to the monthly index is a sum of contributions of products in the group.

In case of weights change, the contribution of the group i to annual index is calculated using the following formula:

$$\begin{aligned} & \text{Contribution of the group } i \text{ to the annual index} = \\ & = \left(\frac{I_L^i - I_{t-12}^i}{I_{t-12}^a} \right) \times w_{t-12}^i \times 100 + \left(\frac{I_t^i - 100}{I_{t-12}^a} \right) \times I_L^a \times w_t^i \end{aligned}$$

where:

I_L^i is the index for the group i in the weight change period;

I_{t-12}^i - the index of the group i in the period $t-12$ (previous reference period=100);

I_{t-12}^a - the PPI for the whole industry in period $t-12$;

w_{t-12}^i - the weight of the group i in the production volume of period $t-12$;

I_t^i - index for the group i in period t ;

I_L^a - the PPI for the whole industry in the weight change period;

w_t^i - the weight of the group i in the production volume of period t .

Example of calculation of section's contribution in the case of weight change

Using the above formula, the contribution of price change for the section of products from mining and quarrying to the annual PPI of October 2018, considering the weights of 2017 and 2018 (0.35 and 0.28, respectively), can be calculated as follows (see table 6):

Table 6.

Indices over December of the previous year				
	December 2016	October 2017	December 2017	October 2018
Products from mining and quarrying	100.0	101.2	101.7	102.2
Overall index	100.0	101.6	103.2	101.8

$$\text{Contribution} = \frac{(101.7-101.2)}{101.6} \times 0.35 \times 100 + \frac{(102.2-100)}{101.6} \times 0.28 \times 103.2 \approx 0.8\%$$

Thus, the contribution of the section of products from mining and quarrying to the annual index in October 2018 amounted to 0.8 percentage points.

9.2 PPI time series

Along with the press release, different time series of PPI are published on the website every month:

1. PPI to the previous month;
2. PPI to the long term base period (Average of 2010=100);
3. PPI to the same month of previous year;
4. PPI 12 month average over the previous 12 month average.

The published indices are rounded to four digits and are final data.

Time series data is published on the web-site along with corresponding graphs.

The data is also available by using PC-Axis - data dissemination software, created by Statistics Sweden. It is a complex system of data dissemination that gives an opportunity to a user to obtain different types of needed information in different format (text, tables, graphs, etc.) from Geostat's website (www.geostat.ge).

The PPI data is also disseminated through android application.

Graph # 2 represents stages of the PPI calculation and its periodicity.

Graph #2. Stages of the PPI calculation

