Approved by the board of

The National Statistics Office of Georgia

By resolution #1

February 24, 2020

Producer Price Index for Industrial Products and Import Price Index

Technical Manual

The presented technical manual is elaborated by the National Statistics Office of Georgia according to the internationally acclaimed methods and practice and is based on the following handbooks:

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

Responsible organizations: 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) and European Commission.

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

3. *"Export and Import Price Index Manual: Theory and Practice", International Monetary Fund, 2009;*

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/external/np/sta/xipim/pdf/xipim.pdf

Contents

1. Introduction

1.1 Producer Price Index for Industrial Products and Import Price Index and their use

Producer Price Index (PPI) for Industrial Products measures the average price level of the goods produced by producers compared to the reference period. As for Import Price Index (MPI), it measures the average price level of products produced abroad and imported to the country, compared to the reference period.

The structure of PPI follows the Statistical Classification of Products by Activity (CPA 2008) and covers the following parts: mining and quarrying (B-section); manufactured products (C-section); electricity, gas, steam and air conditioning (D-section); water supply, sewerage, waste management and remediation services (E-section).

Producer Price Index for Industrial Products and Import Price Index are used for the following purposes:

- The indices have an important role in deflating different economic indicators;
- The indices are used for indexation of contracts in both public and private sectors;
- The indices are analytical instruments for researchers and representatives of business sector.

1.2 Structure of Producer Price Index

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

Import Price Index measures the average price level of products produced abroad and imported to the country. Domestic Supply Producer Price Index (DSPPI) is obtained by combining MPI and DPPI for industrial products. It measures the average price level of industrial goods produced in the country and sold on domestic market, as well as price level of products produced abroad and imported to the country, compared to the reference period.

1.3 Coverage of PPI and MPI and the observable prices

The prices used for calculating Domestic Producer Price Index are those at the factory gate and do not include VAT, excise and transport expenses. The prices are collected for the output of domestic enterprises across the country.

Regarding Export Price Index, prices used for compiling this index are free-on-board (F.O.B) prices set by producers in the reporting period. The F.O.B price comprises of the price at the factory gate, net taxes on products (taxes – subsidies), transportation and other expenses that are incurred in bringing the product to the point of leaving the economic territory of the manufacturer country.

In case of Import Price Index, the observable price is the price (the so-called cost, insurance and freight (C.I.F.) price) of imported product. The imported product price includes: the transaction value of the product and the cost of delivering the product to the border of importer country. The use of C.I.F. price is recommended by the United Nations.

2. Sampling of products and organizations

DPPI: 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 2008). The statistical data of enterprises by the kind of industrial products in value terms are used for the sampling.

XPI: In case of exported products, sampling is performed according to the shares of the products in the total export value (re-export subtracted). External trade statistics data are used for this purpose.

MPI: The selection of observable import goods is also based on the external trade statistics data, presented in the class of the Statistical Classification of Products by Activity (CPA).

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

During the product selection process detailed specifications are determined for them. Following the specifications is the most important part of price registration, since the monthly recorded price difference should be caused by the pure price change of a product, rather than changes in characteristics, or the 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 domestic and imported 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 through the electronic questionnaires on the Geostat's website. In these questionnaires enterprises indicate the following information about selected four products: measurement unit, prices in the reference, previous and current months, in case of XPI - country of destination and in case of MPI - the importer country.

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, in case of a written or electronic request from the National Statistics Office of Georgia, persons registered in the Register of Entrepreneurial and

Non-entrepreneurial (Non-commercial) Legal Entities are obliged to present information available to them in material or electronic forms, including confidential information.

4. Validation procedures

PPI and MPI validation procedures are conducted in two stages:

At the first stage validation takes place simultaneously with the price registration fieldworks. In case of price change, the person responsible for filling in 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.

At 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 Producer Price Index and Import Price Index are updated annually based on the production structure defined by the National Accounts System and external trade statistics data and reflect the latest information on industrial production output and imported products across the country. The obtained weights represent the share of the product's value in the overall value of products produced/imported in the country. Weights for the 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 price for a product is not indicated by an enterprise in the reporting period, the price imputation method is applied.

For example, if there is no price recorded in April for one of the products, brand A, 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.

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≈0.99	1.15*
Brand B	0.032	5.20	5.20	5.50	5.20/5.20=1.00	5.50/5.20≈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 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 will be calculated using the upper level group's index, according to the structure of CPA 2008. Otherwise, if in the reporting month no price is recorded up to the third level of the structure of CPA (e.g. 10.1 "preserved meat and meat products"), imputed index will be calculated using the price repeating (carry-forward) method, rather than the upper level group index.

7. Quality adjustment

It is possible, that an enterprise may no longer produce/import 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 value of the difference is evaluated, the base price for the replacement product is calculated using the previous month 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:

$$Base\ Price = \frac{4.50 + 1.30}{4.50/4.55} \approx 5.86$$

2) If in the reporting month it is possible to define the previous month 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:

$$Base\ price = \frac{5.20}{4.50/4.55} \approx 5.26$$

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

Imputed base price of the replacement product is calculated based on current month 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 in April for service A = $1.16 \times 0.99 \approx 1.15$;
5. Imputed base price for service B = $7.00/1.15 \approx 6.09$

8. Calculation of PPI and MPI on different level

8.1 Calculation of the lowest level PPI and MPI

An index, calculated for each product produced/imported by an enterprise, is the lowest level index for the PPI and MPI. Graph #1 shows the structure of industrial sector, where the price indices for product A, B and other individual products are 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:

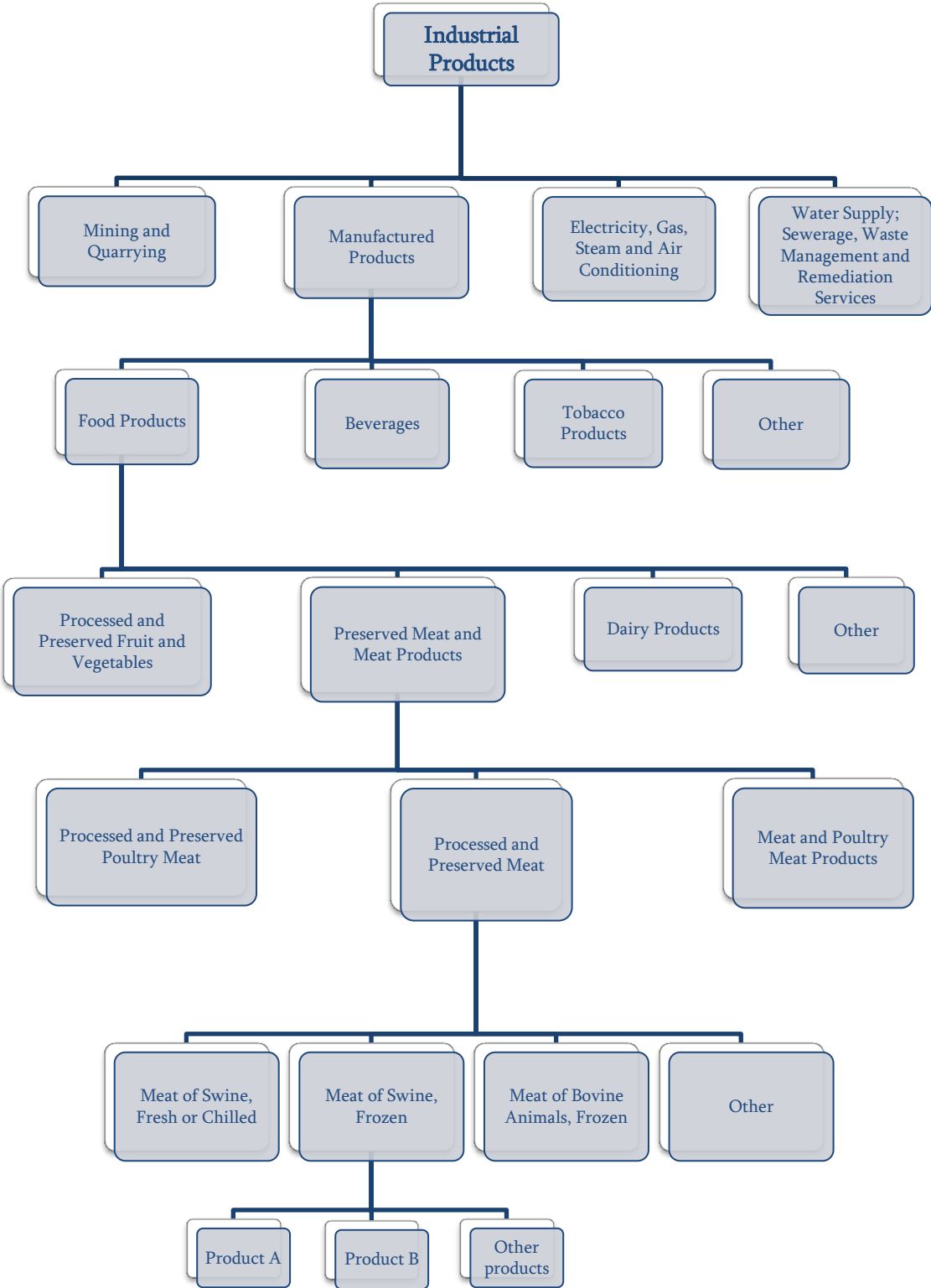$$I_i^{t/0} = \frac{p_i^t}{p_i^0}$$

where:

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

$I_i^{t/0}$ - the 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 PPI and MPI for the separate groups and the whole industry

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

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

$I_i^{t/0}$ - the 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 produced/imported product i in the whole production/import, where $\sum_{i=1}^{n} s_i^b = 1$.

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

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

The same formula is used for calculating 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 compared 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 calculating indices with a long term reference period, despite 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 compared 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: $I^{12.16/12.15} = \Sigma_i I_i^{12.16/12.15} \times w_i = 106$	12.2016: $I^{12.16/12.16} = \Sigma_i I_i^{12.16/12.16} \times k_i = 100$
X_1	01.2017: $I^{01.17/12.16} = \Sigma_i I_i^{01.17/12.16} \times k_i = 102$

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

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. Data dissemination

9.1 Press release

Press releases for the following indices are published through the Geostat's website (www.geostat.ge) on monthly basis: DPPI, XPI, PPI for Industrial Products, MPI and DSPPI. They contain information about monthly and annual index rates, as well as the contributions of groups to the index formation. Press releases also include different time series graphs.

Along with the press release, different time series are published on Geostat's website every month:
1. The indices to the previous month;
2. The indices to the long term basis (Average of 2010=100);
3. The indices to the same month of the previous year;
4. The indices 12 month average over the previous 12 month average.

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

Time series data are published on the website along with the corresponding graphs.

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

9.1.1 Contributions of product groups to the overall index percentage change

Calculation of certain product group contributions to changes in the overall index provides a powerful analytical tool for analyzing PPI and MPI. The contribution of a group to the change in the overall index

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 - the index for product i in period t;

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

I_{t-1}^a - PPI/MPI 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:

$$\text{Contribution of the group } i \text{ to the annual index} =$$

$$= \left(\frac{I_L^i - I_{t-12}^i}{I_{t-12}^a} \right) \times w_{t-12}^i \times 100 + \left(\frac{I_t^i - 100}{I_{t-12}^a} \right) \times I_L^a \times w_t^i$$

where:

I_L^i - 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 - PPI/MPI 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 - the index for the group i in period t;

I_L^a - PPI/MPI 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 case of weight change

Using the formula above, 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
Mining and quarrying	100.0	101.2	101.7	102.2
Overall index	100.0	101.6	103.2	101.8

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

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.

Graph # 2 represents stages of PPI and MPI calculation and their periodicity.

Graph #2.   Stages of PPI and MPI calculation

Annual activities

Sampling of industrial products

Sampling of producers/importer organizations

Survey of organizations and defining the product specifications

Calculation of weights

Monthly activities

Price Collection

Data Validation

Index Calculation

Index Analysis

Data Dissemination