National Statistics Office of Georgia
(Geostat)

Import Price Index
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. *"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), European Statistical Office (Eurostat), United Nations Economic Commission for Europe (UNECE) and World Bank;

   https://www.imf.org/external/np/sta/xipim/pdf/xipim.pdf

2. *"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

Contents

1. Introduction

1.1 Import Price Index and its use

The Import Price Index (MPI) measures the average price level of products produced abroad and imported to the country, compared to the reference period.

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

The MPI is used for the following purposes:
- The index has an important role in deflating different economic indicators;
- The index is an analytical instrument for researchers and representatives of business sector.

1.2 Coverage of the MPI and the observable prices

The prices are collected on products imported in the country. The observable price is the import price (the so-called cost, insurance and freight (C.I.F) price) of the product imported by an organization in the specified period. The import price includes the transaction value of the product and the cost of delivery of the product to the border of Georgia. The use of C.I.F price is recommended by the United Nations.

2. The selection of observable goods and products

The selection of observable importer organizations across the country is based on the external trade statistics data. Organizations that import products presented in the class of the Statistical Classification of Products by Activity (CPA) are sampled selectively.

After the organization sampling they are surveyed in order to determine the products in the CPA class. For this purpose, organizations are provided by additional electronic questionnaires and are required to indicate the following information: the name of the top four products in the class of the CPA with the largest import share, that are imported in the reporting period, corresponding measurement unit, importer country and the percentage share of each imported product in the selected CPA class.

During the products selection process their detailed specifications are determined. 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 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 sample is updated annually.

3. Price collection fieldworks

Prices for imported products are collected by price enumerators. Price collection fieldworks are conducted from the 1ˢᵗ to the 8ᵗʰ of the month following the reporting period. In the electronic questionnaire provided on the Geostat website importer organizations indicate the prices for the four selected products in the reference, previous and current months. Besides, the reason(s) of a price change or any other relevant information is indicated in the comment field.

The information about the prices of the products provided by the organizations 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

The validation procedure for the import price index is conducted in two stages:

On the first stage validation takes place simultaneously with the price registration fieldworks. In case of a 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 overall index.

If the index passes the above-mentioned validation procedures it is considered to be reliable.

5. Weights

Weights for individual products in the import price index are updated annually based on the external trade statistics data and reflects the latest information on imported products. The obtained weights represent the share of the imported product value in the overall value of the imported products. Weights for a reporting period *t* are calculated based on *t-2* period

information. The list of imported 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 organization in the reporting period, one of the following two methods of price imputation is applied:

1. 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)

Table 1.

Product	Product 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	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 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 the group, imputed index for them will be calculated using the upper level group index, according to the structure of the Classification (CPA).

2. If in the reporting month no price is recorded up to the third level of the structure of the CPA (e.g. 15.1 "Meat and meat products"), the imputed index will be calculated using carry-forward method, rather than the upper level group index.

7. Quality adjustment

In process of time, an organization may not import a product of the same quality anymore, for which prices have been observed. In order to ensure the comparability of prices for old and new products, a quality adjustment method should be used, for which an imputed 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:

Base price = (4.50+1.30)/(4.50/4.55) ≈ 5.86

2. If in the reporting month it is possible to define previous month's price for the replacement product, the 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 = 5.20/(4.50/4.55) ≈ 5.26

3. If in the reporting period it is revealed that the brand A will no longer be imported starting from the reporting month, and it is impossible to get information on previous month's price and 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 qualitative difference.

Imputed base price of the replacement product is calculated based on current month's index and the 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 MPI on different levels

8.1 Calculation of the lowest level MPI

During the MPI calculation, an elementary price index is the index calculated for each individual product imported by an organization. Graph #1 shows the import structure, where indices for the product A, product B and other individual products are the elementary indices. The elementary index compared to the price reference period is obtained from the ratio of reporting (t) and reference period product prices:

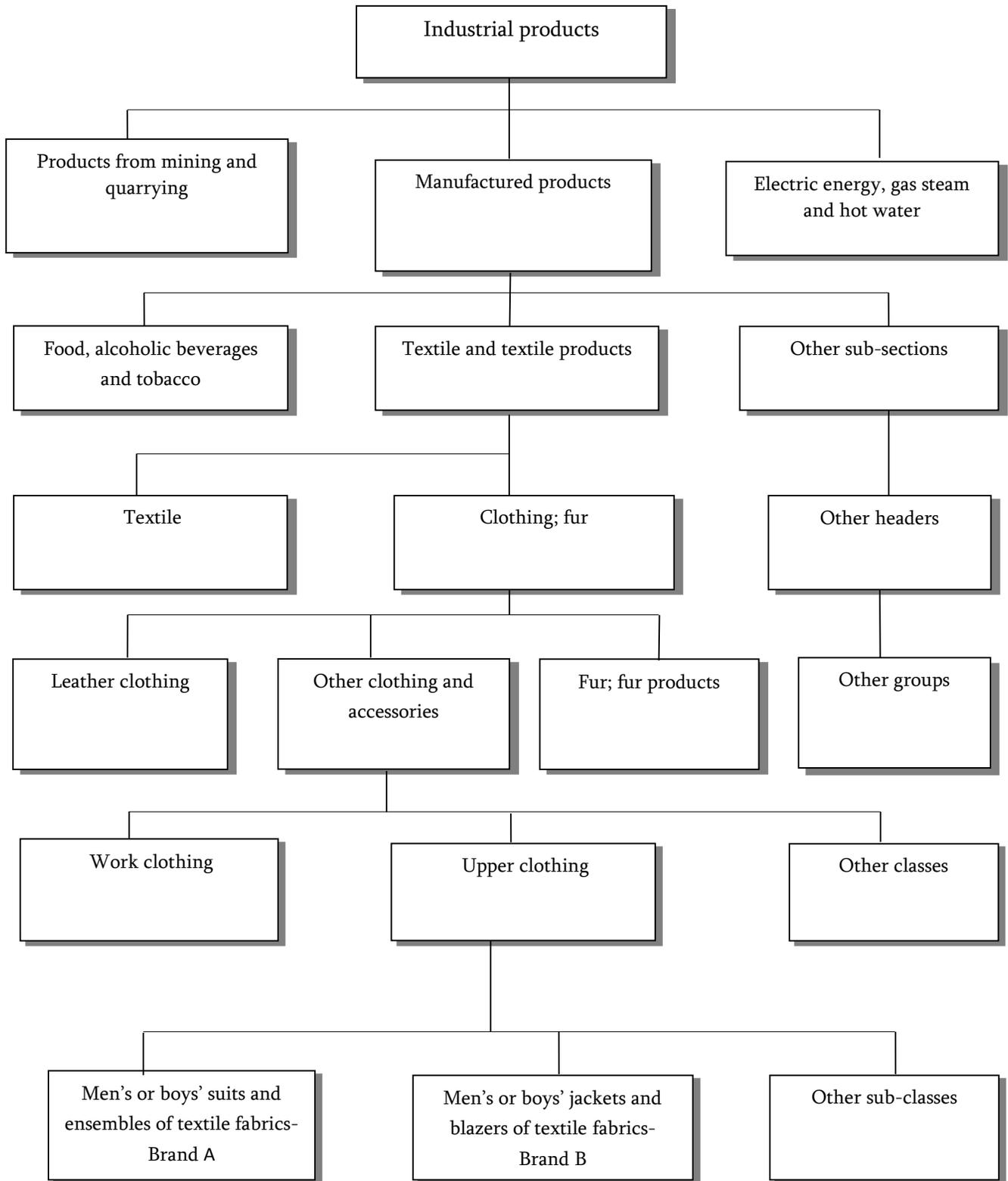$$I_i^{t/0} = \frac{p_i^t}{p_i^0}$$

Where:

i - a product, imported by organization, for which the comparable price is registered;

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

p_i^t - price of product i in period $t;$

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

Graph #1. Import Structure

Industrial products

Products from mining and quarrying

Manufactured products

Electric energy, gas steam and hot water

Food, alcoholic beverages and tobacco

Textile and textile products

Other sub-sections

Textile

Clothing; fur

Other headers

Leather clothing

Other clothing and accessories

Fur; fur products

Other groups

Work clothing

Upper clothing

Other classes

Men's or boys' suits and ensembles of textile fabrics– Brand A

Men's or boys' jackets and blazers of textile fabrics– Brand B

Other sub-classes

8.2 The MPI for separate groups and the total section

The long term index for the total import compared to the price reference period is calculated using the following Laspeyres-type formula:

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

$I_i^{t/0}$ is 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 the share of product i in the whole volume of import, where $\sum_{i=1}^{n} s_i^b = 1$.

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

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

The same formula is used for calculation of all upper level indices. For example, a group index is calculated by weighting the long term indices of the products within this group, where the sum of the weights of the indices equals 1.

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 organizations and import products or their specifications 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 (total import) 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: $I^{01.17/12.16} = \Sigma_i I_i^{01.17/12.16} \times k_i = 102$

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

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 release for import price index is published through the Geostat website (www.geostat.ge) on a monthly basis. It contains information about monthly and annual MPI rates, as well as the contributions of sections and divisions to the index formation. The press release also includes a time series graph.

9.1.1 Contributions of product groups to the overall index percent change

Calculation of contributions of certain product groups to changes in the overall index provides a powerful analytical tool for analyzing the 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 an index of any product 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 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 the annual index is calculated using the following formula:

Contribution of the group i 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 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 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 – index for the group i in period t;

I_L^a – the 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 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 index of October 2018, considering the weights of 2017 and 2018 (0.35 and 0.28, respectively), can be calculated as follows (see table 6):

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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

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

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 Import price index time series

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

1. MPI to the previous month;
2. MPI to the same month of previous year;
3. MPI 12 month average over the previous 12 month average.

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

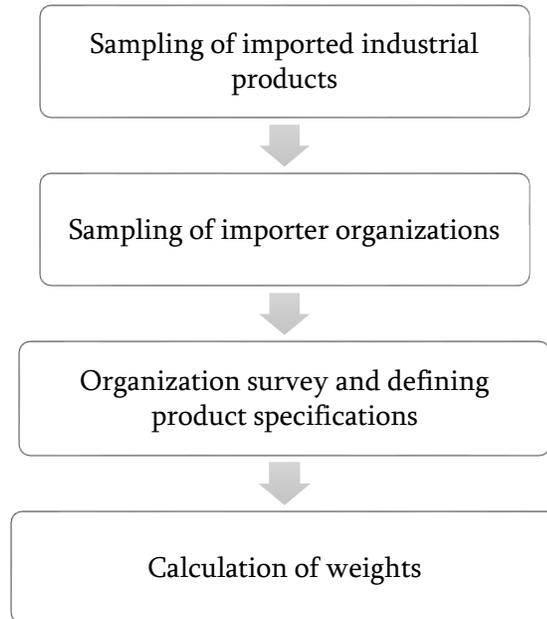The time series data is published on the website along with the corresponding graphs.

The data is also available by using PC-Axis - data dissemination software. 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 the website of Geostat (www.geostat.ge).

The MPI data is also disseminated through an android application.
Graph # 2 represents the stages of the MPI calculation and its periodicity.

Graph #2. Stages of the MPI calculation

Annual activities:

Sampling of imported industrial products

↓

Sampling of importer organizations

↓

Organization survey and defining product specifications

↓

Calculation of weights

Monthly activities:

Price collection

Data validation

Index calculation

Index analysis

Data dissemination