Producer Price Index for Freight Transport

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. *"Methodological Guide for Developing Producer Price Indices for Services", OECD, Eurostat and others, 2005;*

   Responsible Organizations: European Commission, Organization for Economic Co-operation and Development (OECD) and European Statistical Office (Eurostat).

   https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/KS-BG-06-003

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1. Introduction

1.1 The Producer Price Index for Freight Transport and its use

The Producer Price Index for Freight Transport measures the average price level of the services provided by transportation companies compared to the reference period.

The index covers freight shipments carried out using freight transport by road, water and air, which corresponds to Divisions 60, 61 and 62 of the Transport and communication sections (Section I) in the statistical classification of economic activities in the European community (NACE) standard.

The producer price index for freight transport is used for the following purposes:

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

1.2 Coverage of the PPI for freight transport and the observable prices

The prices for freight transport shipments are collected in transportation organizations operating in the country. The observable price is the value of the cargo shipment carried out by the company in the specified period.

2. The selection of organizations and observable shipments

The selection of observable transportation organizations across the country is based on the statistical data of enterprises. The selected sample consists of all large and medium size organizations that are relevant to the Divisions 60, 61 and 62 of transport and communication sections in NACE classification, while small organizations are chosen selectively.

After the selection of organizations, the survey is conducted in order to determine the freight shipments and their characteristics. For this purpose, the selected transportation organizations are provided with additional electronic questionnaires, where they are required to indicate four main types of shipments (less than four in case of absence) during the previous year and the share of each of these shipments in the whole transportation services provided by the company.

During the shipment 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 shipment, rather than by changes in characteristics. Relying on the obtained survey data the prices for sampled shipments are recorded in every month across the year.

The sample of organizations for the purpose of the price collection is updated annually, based on the statistical data of enterprises. In case when the organization stops functioning it is not replaced before the update of the sample.

3.   Price collection fieldwork

During the price collection fieldworks, the representative of the organization fills the questionnaire published on the Geostat website. The price collection fieldworks are conducted from the 1st to the 8th of the month following the reporting period. The questionnaire consists of the following information: the selected four directions of transportation, the transport equipment used, the type of the cargo, measurement unit, prices in the reference and previous months and, in case of a price change, the reasons of this change.

The information about the prices for freight transport provided by the transportation 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 procedures for the price index for freight transport are conducted in two stages:

On the first stage validation takes place simultaneously with the price registration fieldworks. In the 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 indices.

The index is considered to be reliable if the control stages mentioned above are passed.

5.   Weights

The weight of an individual freight shipment, which is included in producer price index for freight transport, represents the share of the value of this shipment in the total value of the freight transportation services. For the weights for period *t* the data from *t-2* period is used. The weights are updated annually, based on the total revenue received from transportation services provided by the selected companies in *t-2* period. During the annual update the shipments list in the index might also change.

6.   Imputation method

During the calculation of the index, if in the reference period no price is recorded for one of the shipments, one of the following two imputation methods is used:

Table1.

Shipment	Product weight, %	Base price	Price in March	Price in April	Price Ratio (March/December)	Price Ratio (April/December)
Shipment A	0.051	4.55	4.50	-	4.50/4.55≈0.99	1.15*
Shipment B	0.032	5.20	5.20	5.50	5.20/5.20=1.00	5.50/5.20≈1.06
Shipment 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 shipment 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 shipment A = $1.16 \times 0.99 \approx 1.15$.

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2. As an exception, if in the reporting month no price is recorded for shipments included in NACE group (3 digit level), imputation will be conducted using the carry-forward method, according to the structure of NACE.

7.   Quality adjustment

If during the reporting period the company stopped the observable shipment, but carries out other similar type of shipment, it is possible to replace the old with the new one.

If the characteristics of the observable shipment have changed, but the criteria for comparison is not violated, it is allowed to compare the old and new shipments. In this case it is important that the price change caused by quality change not to be reflected in the index.

In order to ensure the comparability of prices, a quality adjustment method should be used, for which a conditional base price is calculated using the following methods:

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

Table 2.

Shipment	Base price	Price in March	Price in April	Qualitative difference	Price ratio (April/December)
Shipment A	4.55	4.50	-		
Qualitatively different shipment B	5.86*	-	8.50	1.30	8.50/5.86≈1.45

*Imputed base price

The imputed base price for shipment B is calculated in the following way:

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 shipment, base price for the latter is calculated using this price and the index of previous month (Table 3).

Table 3.

Shipment	Base price	Price in March	Price in April	Price ratio (March/December)	Price ratio (April/December)
Shipment A	4.55	4.50	-	4.50/4.55≈0.99	
Substitute shipment B	5.26*	5.20	5.50		5.50/5.26≈1.05

*Imputed base price

The imputed base price for the shipment B is calculated the following way:

Base price = 5.20/(4.50/4.55) ≈ 5.26

3. If in the reporting period a price enumerator discovers that shipment A will no longer be available 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 shipment B, the difference between current month's price of shipment B and previous month's price for shipment A will be totally treated as the qualitative difference.

The imputed base price of the replacement shipment is calculated based on current month's index and price of shipment B (Table 4).

Table 4.

Shipment	Shipment weight, %	Base price	March price	April price	Long term index in March	Long term index in April
Shipment A	0.051	4.55	4.50	-	4.50/4.55≈0.99	
Substitute shipment B	0.051	6.09**	-	7.00		7.00/6.07≈1.15*
Shipment C	0.032	5.20	5.20	5.50	5.20/5,20=1.00	5.50/5.20≈1.06
Shipment 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 shipment B is calculated the following way:

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 shipment A $= 1.16 \times 0.99 \approx 1.15$;

5. Imputed base price for shipment B $= 7.00/1.15 \approx 6.09$.

8. Calculation of the index on different levels

8.1 Calculation of the lowest level index

While calculating the price index for freight transport, elementary price index is the index, calculated for each individual shipment carried out by a transportation organization. Graph #1 shows the structure of the transport section, where indices for shipment A, B and C are the lowest level indices. The lowest level of index compared to the price reference period, is obtained from the ratio of reporting (t) and the reference period prices.
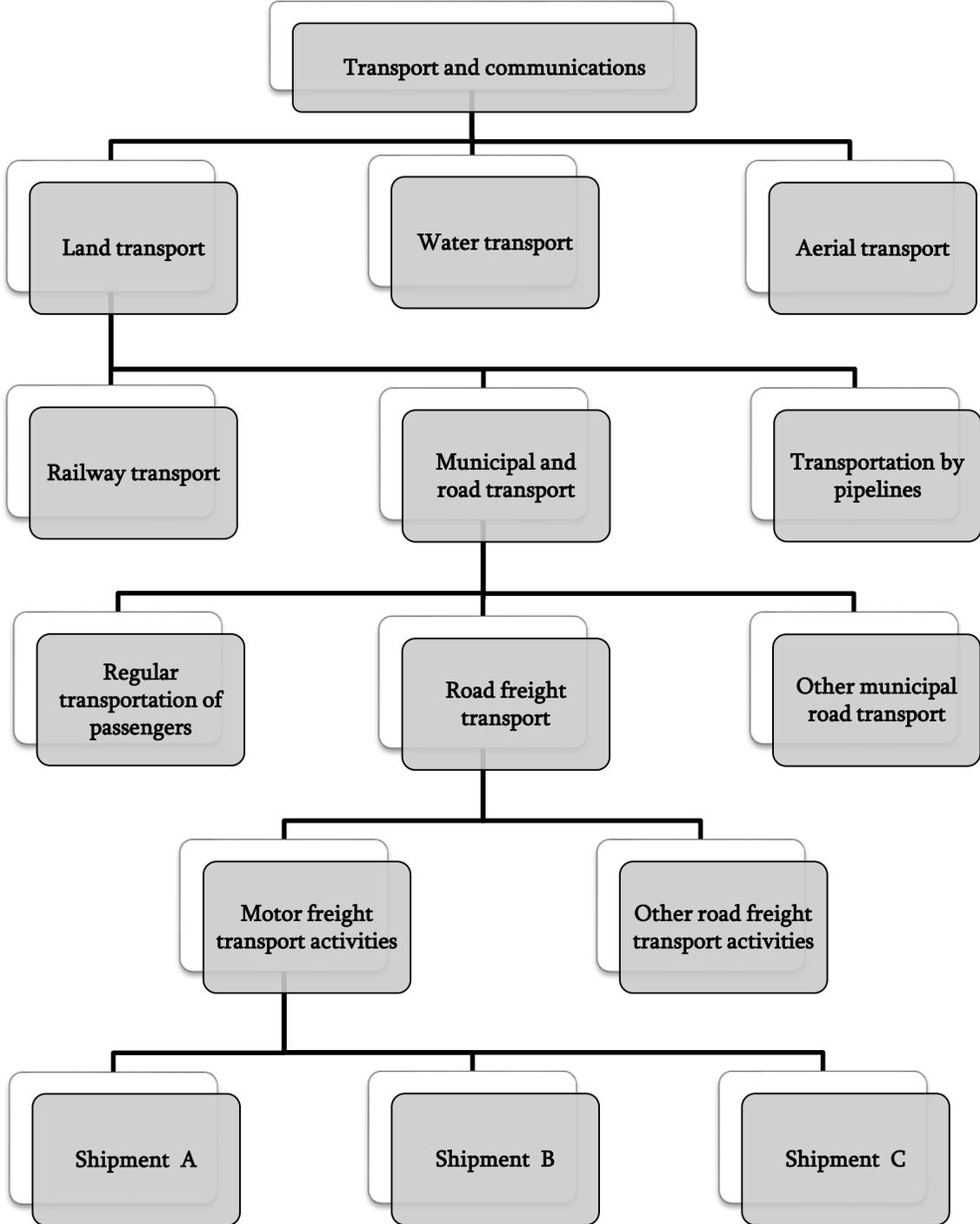
$$I_i^{t/0} = \frac{p_i^t}{p_i^0}$$

Where:

i – shipment carried out by organization for which the comparable price is indicated

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

p_i^t - price of shipment i in period t;

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

Graph #1. The structure of the transport section

8.2 The index for separate groups and the total section

The long term index for the whole section compared to the price reference period is calculated using the following Laspeyres-type of 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 shipment 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 shipment i in the weight reference period, which represents the share of shipment i in the whole volume of shipment, where $\sum_{i=1}^{n} s_i^b = 1$.

p_i^b - the price of shipment i carried out by the sampled organization in the weight reference period (b);

q_i^b – quantity of shipment i carried out in the weight reference period (b).

The same formula is used for calculation of all upper level indices. For example, the sub-section index is calculated by weighting the long term indices for its shipments, where the sum of the weights of these indices is 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 transportation organizations and shipments in the update period, December, prices are collected for shipments 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: $I^{01.17/12.16} = \sum_i I_i^{01.17/12.16} \times k_i = 102$	

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

Te following result is derived from the chain-linking as well:

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

9.   Publication

Different time series of the producer price index for freight transport are published on the website every month: compared to the previous month, to the long term base period (average of 2010=100), over the same month of previous year and 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 corresponding graphs.
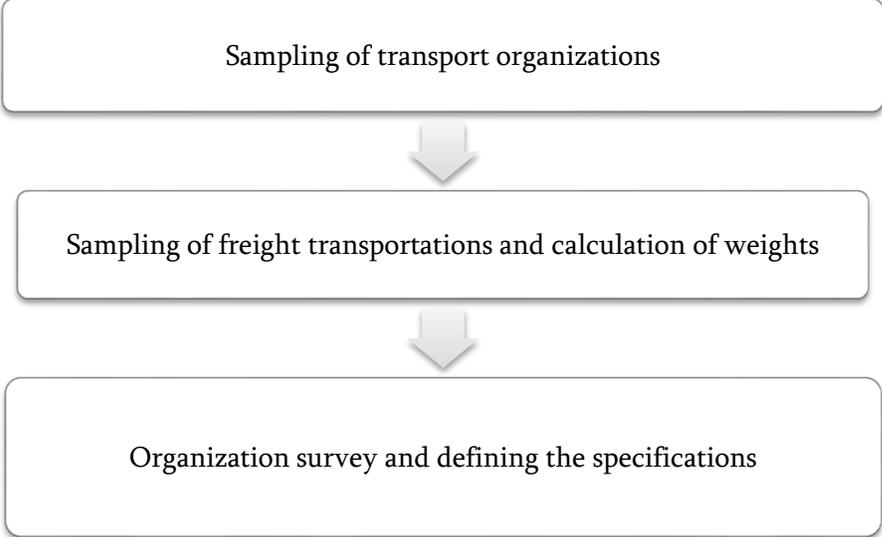
The data is also available by using PC-Axis - data dissemination software. It is a complex system of data dissemination that gives an opportunity to a user to obtain different types of needed information in different format (text, tables, graphs, etc.) from Geostat's website (www.geostat.ge).

The index data is also disseminated through an android application.

Graph #2 represents stages of index calculation and its periodicity.

Graph #2. Stages of calculation producer price index for freight transport

Annual activities:

Sampling of transport organizations

Sampling of freight transportations and calculation of weights

Organization survey and defining the specifications

Monthly activities:

Price collection

Data validation

Index calculation

Index analysis

Data disseminaton