

Producer Price Indices 2010=100

Handbook for Users

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Foreword

In February 2012, Statistics Finland began publishing new producer price indices with 2010 as the new base year. Due to a structural change in the electrical and electronics industry after this, the weight structures of producer price indices were changed again. The revised weight structures have been in use from the January 2013 statistics. The handbook's structure and methodological

description are based on the previous Producer Price Indices Handbook for Users, compiled for the index with 2005 as the base year. The descriptions and methods of the revised index have been updated in this handbook. Pirkko Hemmilä, Ilkka Lehtinen, Anna-Riikka Pitkänen and Toni Udd have participated in compiling the handbook.

Helsinki, Statistics Finland, November 2013
Leena Storgårds
Director

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1 Introduction

Statistics Finland has made revisions to the producer price indices. In February 2012, the indices were released with a new base year of 2010. In the renewal, the weight structures of the indices and the item sample and sample of enterprises were updated to correspond with the structures of the base year.

Due to the structural change in the electrical and electronics industry in 2012, the weight structures of the 2010=100 indices had to be corrected. The revised weight structures have been in use from the January 2013 statistics. The base year of the indices is still 2010.

New producer price indices 2010=100

Producer Price Index for Manufactured Products 2010=100

Export Price Index 2010=100

Import Price Index 2010=100

Basic Price Index for Domestic Supply 2010=100

Basic Price Index for Domestic Supply, Including Taxes 2010=100 (former Wholesale price index)

Key changes

The weight structures and the monitored commodity headings of the new indices were revised to correspond with the structures of production,

imports and exports in 2010. Using these structures, 2010=100 indices were compiled for 2010, 2011 and 2012. The weight structures are based on data from Statistics Finland's National Accounts and Statistics on Industrial Output and on the Foreign Trade Statistics of Finnish Customs. At the beginning of 2013, the weight structures of the indices were updated due to a structural change in the electrical and electronics industry. The revised weight structures are used from the January 2013 statistics. The calculation method of the indices was also changed at the same time.

In the 2010=100 renewal, the Basic Price Index for Domestic Supply, Including Taxes replaced the Wholesale Price Index. The Basic Price Index for Domestic Supply, Including Taxes corresponds with the previous Wholesale Price Index. The Index now also covers industry category F Construction.

The release date of the producer price indices was altered. From now on, the indices will be released on the 24th day of the month or on the first weekday following it. The data for November are released on the last weekday preceding 24 December.

2 *Producer price indices as part of the system of statistics on prices*

Producer price indices measure the development of commodity prices from the perspective of enterprises. The producer price indices comprise five separately calculated indices: Producer Price Index for Manufactured Products, Export Price Index, Import price index, Basic Price Index for Domestic Supply and Basic Price Index for Domestic Supply, Including Taxes. The above indices measure price development differently because the used price concepts and the covered industries vary by index.

The statistics are classified by the national TOL2008 version of the European Union's NACE Rev. 2 classification. The classification used at the product level, i.e. six-digit level, is the European Union's Statistical Classification of Products by Activity (CPA). Its first four levels are consistent with TOL2008 so the CPA product classification clarifies the TOL2008 classification. In addition, commodities are classified by their intended use into energy products, raw materials and producer's goods, investment goods, and durable and other consumer goods. The SITC (Standard International Trade Classification) is used in indices whose base year is 1949. In addition, the ISIC (International Standard Industrial Classification) is used in the Producer Price Index for Manufactured Products 1949=100.

Producer price indices are compiled on product basis. The indices describe development in the prices of goods and services in primary and secondary production. The main industry of the enterprise producing the goods and services has no significance. If an enterprise also produces other services than industrial services, its other services do not come under the scope of description of the producer prices indices. On the other hand, an enterprise that mainly produces services may also produce goods, in which case its goods production does come under the scope of description of the producer price indices.

2.1 *Descriptions of the producer price indices*

Producer Price Index for Manufactured Products 2010=100

The Producer Price Index for Manufactured Products measures average changes in the prices of goods sold by domestic producers. The index includes both goods sold at home and goods sold abroad. The price for goods intended for the domestic market is the so-called factory price exclusive of taxes. The price for export goods is the price obtained by the exporter, which is usually the same as the f.o.b.¹ (free on board) price. The Producer Price Index for Manufactured Products covers the TOL2008 categories B-E, that is, commodities ranging from minerals to water and waste management services.

Export Price Index 2010=100

The Export Price Index measures changes in the f.o.b. prices of export goods. Foreign-currency export prices are converted to EUR using the Bank of Finland's mean rate for the statistical reference month. The Export Price Index covers TOL2008 categories A-E, that is, commodities ranging from agricultural products to water and waste management services.

Import Price Index 2010=100

The Import Price Index measures development in the c.i.f.² prices of imported goods. C.i.f. prices are inclusive of cost, insurances and freight. Foreign-currency import prices are converted to EUR using the Bank of Finland's mean rate for the statistical reference month. The Import Price Index covers TOL2008 categories A-E, that is, commodities ranging from agricultural products to water and waste management services.

1 f.o.b = free on board. Value of goods at basic price inclusive of transport and delivery to a named border location and possible taxes on export goods less subsidies.

2 c.i.f = cost, insurance and freight. The vendor delivers the goods when the goods are taken on board the vessel at the designated loading harbour. The vendor pays the sea freight fare up to the agreed destination harbour and takes, in the name of the purchaser, sea insurance to guard against risks during transport.

Basic Price Index for Domestic Supply 2010=100

The Basic Price Index for Domestic Supply measures changes in the tax-free prices of goods used in Finland as they first enter the market.³ The index includes both domestic and imported goods. The price for domestic goods is the factory price exclusive of taxes. The price for imported goods is the c.i.f. price of the imports plus customs duties. The Basic Price Index for Domestic Supply covers TOL2008 categories A–F, that is, commodities ranging from agricultural products to construction.

Basic Price Index for Domestic Supply, Including Taxes 2010=100

The Basic Price Index for Domestic Supply, Including Taxes (former Wholesale Price Index) corresponds with the Basic Price Index for Domestic Supply, but shows also changes in the value added tax, excise taxes and motor vehicle taxes. The index includes both domestic and imported goods. The index includes the value-added tax and other indirect taxes. Besides the value-added tax, indirect taxes comprise diverse excise duties, and the motor car and motorcycle tax. The price for domestic goods comprises the factory price without taxes, the value-added tax and other indirect taxes. The price for imported goods, in turn, comprises the c.i.f. price of the imports, customs duties, value-added tax and other indirect taxes. The Basic Price Index for Domestic Supply, Including Taxes covers TOL2008 categories A–F, that is, commodities ranging from agricultural products to construction.

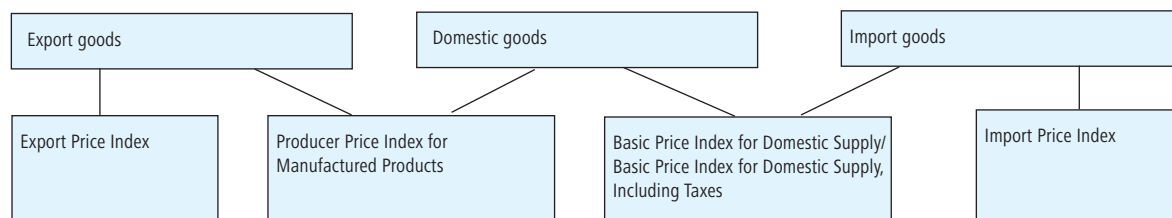
Figure 1 shows the inclusion of domestic, export and import goods in the different indices.

2.2 Commodity price index system

The price indices concerning commodities compiled by Statistics Finland can be described as a system whose aim is to measure the development of prices at different stages of production and distribution. Producer price indices describe the price development at the early stage of price formation as products leave their producers or enter the country. The price index for wholesale goods would locate in the second stage of distribution. Statistics Finland does not compile a price index for wholesale goods (the Wholesale Price Indices compiled with old base years describes the prices for purchasers into the wholesale trade; the shares of transport costs in product prices were assumed to remain unchanged). Wholesale and retail trade margins come under the scope of description of Producer Price Indices for Services. Statistics Finland does not compile price indices for trade margins. In the industrial classification they mainly come under categories 46 Wholesale trade and 47 Retail trade; wholesale and retail trade of motor vehicles is differentiated into category 45. Development in the prices of consumption goods and services at the end use stage is measured by the Consumer Price Index.

Figure 2 describes the commodity price index system and the indices associated with each step of the system. For the time being price indices are not produced for wholesale goods or trade margins.

Figure 1.
Inclusion of domestic, export and import goods in different indices



³ As the index measures the tax-free price development of total domestic supply at the stage when products leave the producers and enter the market, and correspondingly as products arrive in the country after customs, it is more accurate to talk of the basic price of a product than of the producer price.

Figure 2.
Commodity price index system

	Producer		Wholesale trade			Retail trade		
Prices of production inputs	Producer's margin	Producer price, price at/to border	Purchase price into wholesale trade	Wholesale trade margin	Sale price of wholesale goods	Purchase price into retail trade	Retail trade margin	Price of retail trade goods and services
Purchase price indices for production inputs, cost indices		Producer price indices (incl. PPI for Construction)		Industry G46, Wholesale trade of PPI for Services	Wholesale Price Index		Industry G47, Retail trade of PPI for Services	
Indices compiled by Statistics Finland								
Index of Purchase Prices of the Means of Agricultural Production		Index of Producer Prices of Agricultural Products, Producer Price Index for Manufactured Products, Producer Price Index for Services, Export Price Index, Import Price Index						Consumer Price Index

3 *Sampling for producer price indices*

The calculation of producer price indices is based on a sample. The CPA product categories are selected first and a sample of enterprises is then drawn for each CPA product category. The price data used to calculate the index are collected from enterprises included in the sample. This price index is considered to be descriptive of average development in the prices of all commodities included in the population. The samples of CPA product categories and enterprise data suppliers included in producer price indices is revised generally at five-year intervals to maintain the timeliness of the indices. However, minor updates are made continuously to the sample of enterprises due to changes in enterprises' activities: if an enterprise included in the sample no longer produces, exports or imports products belonging to a certain CPA category, a new enterprise is selected in its place.

3.1 *Construction of sample frames*

The frames of CPA product categories for the producer price indices is built by using the Supply and Use Tables of National Accounts and Finnish Customs' Statistics on Foreign Trade. The frames contain the values of production produced in Finland, and exports and imports by product category. The import and export data of the Supply

and Use Tables also include transit exports via Finland. Transit exports are deducted from exports, so the figure that remains is the value of exports produced in Finland only. Transit exports are correspondingly deducted from imports so the figure that remains is the value of imports remaining in Finland only. The value of production staying on the domestic market is obtained by deducting exports from the value of domestic supply.

The frames of the data supplier sample have been formed by using data from Statistics on Industrial Output and from the Board of Customs' Statistics on Foreign Trade. The enterprise sample frames for exports and imports are formed by using data from Finnish Customs' Statistics on Foreign Trade. The enterprise frame for production that remains on the domestic market is formed by using heading-specific data on enterprises from Statistics on Industrial Output. Data on enterprises' exports by commodity heading are deducted from the values whereby the remaining figure describes the domestic supply.

To reduce small enterprises' data supply burden, enterprises whose exports, imports or domestic supply had a value of less than EUR 200,000 were removed from the enterprise frame. In addition, enterprises were removed for specific product categories if the value of their exports, imports or domestic supply for those product categories was less than EUR 20,000.

3.2 Selection of CPA product categories

One of the most important functions of producer price indices is to serve as deflators. Producer price indices are used to deflate the value of production in, for instance, National Accounts calculations. From the deflator perspective it is important that a price index is also compiled for all CPA product categories for which domestic supply/exports/imports is high.

The emphasis on the indices' function as deflator affects the selection of product categories for producer price indices. In the past, some of the product categories were selected by random sampling. Now, the idea of the cut-off method was used when selecting product categories. The CPA product categories with the highest production value/exports/imports were selected for the price indices. In the 2010=100 base year review, the sample of the CPA product categories was supplemented by the inclusion of missing headings with the highest values. However, this was not a pure cut-off method in which all units beyond a certain threshold would be included. Occasionally, a product category that should in fact be included in the sample may be missing and, on the other hand, product categories that do not exceed the threshold value may be included. Table 1 describes the proportion of the value of the included CPA product categories of the total value of domestic supply/exports/imports.

No relevant changes occurred in the coverages due to the weight structure update in early 2013: the values of populations and included CPA product categories decreased but their relations remained almost unchanged. The number of CPA product categories did not change in connection with the weight structure renewal.

3.3 Data supplier sample and selection of products for price monitoring

The enterprise sample was drawn by stratified sampling. The basis for the stratification was the value of an enterprise's domestic supply/exports/imports. Simple random sampling was used within

Table 1.

Coverage of product categories included in producer price indices of total value

Statistics	Proportion of included CPA product categories of total value
Producer Price Index for Manufactured Products	88%
Export Price Index	91%
Import Price Index	84%
Basic Price Index for Domestic Supply/Basic Price Index for Domestic Supply, Including Taxes	88%

Table 2.

Stratification of producer price indices' sample and numbers of selected enterprises

Group	Case	Strata	Selected enterprises per stratum
1	1–3 enterprises	1	All
2	1 dominant (>50% of value of heading)	2 (dominant/others)	1/2
3	2 dominant (>80%)	2 (two dominant/others)	2/2
4	4–10 enterprises	2 (large/small)	2/2
5	Enterprises >10	3 (large/medium/small)	2/2/2

the strata. However, dominant⁴ enterprises for each heading were selected to the sample with a probability of one. The number of enterprises selected for each heading depended on the number of enterprises under the heading.⁵ Table 2 shows the stratification used in the sampling of the producer prices indices and the numbers of enterprises selected from the strata.

The products belonging to a CPA product category included in the actual price monitoring were selected in co-operation with the data suppliers. The objective is that the monitored product would be as representative as possible and its price could be monitored as well as possible. The selection criteria for products were:

- The proportion of the product in an enterprise's domestic supply, exports or imports of the product category concerned is significant.
- The product reflects as well as possible the average price development for other products of similar type.
- The price for the product concerning a certain unit (e.g. number, litre, kilogram) and quality can be quoted regularly each month (or less frequently). Quality is defined by e.g. a trademark, product code or other such quality identifier. The price must be comparable between statistical reference months.

4 The value of an enterprise's imports, exports or domestic supply exceeded 50% of the corresponding value for the entire heading or two enterprises together represented over 80% of the value of the entire heading.

5 The number of selected enterprises could additionally be proportioned to the variance of price development for the products included in each CPA heading. However, this was not done in this sampling, as the variance of price development could not be calculated. The cost of data collection could also be taken into consideration in determining the optimum sample size, but it is almost the same irrespective of heading.

Table 3 gives the numbers of the data suppliers, CPA product categories and price data for the producer price indices.

Table 3.
Number of data suppliers, CPA product categories and price data for producer price indices

Index	No. of data suppliers	No. of CPA product categories	No. of price data
Producer Price Index for Manufactured Products	960	600	2.700
Export Price Index	440	350	1.000
Import Price Index	910	600	2.400
Basic Price Index for Domestic Supply/Basic Price Index for Domestic Supply, Including Taxes	1.580	850	4.150

4 Weight structures

The overall indices of the producer price indices describe the average development in the prices of the headings included in the indices. The individual products whose prices are monitored, or variants, reported by an enterprise do not have their own weights but the enterprise-specific CPA product category indices, or micro indices, are calculated as the geometric average of the price ratios (=current price/price at base period) of the products belonging to that category. The micro indices are combined into an overall index with a weight coefficient corresponding to each product category and enterprise. In other words, changes in the price ratios of individual commodities have different-sized effects on the overall index. At the 4-digit level of the TOL2008 industrial classification, the producer price indices are Laspeyres indices. Below the 4-digit level, the weights can be revised as necessary and new commodities or data suppliers included in the index.

The values of domestic production, imports and exports for the forming of the weights were obtained from the Supply and Use Tables of National Accounts and from Finnish Customs' Statistics on Foreign Trade. The latest data from the Supply and Use Tables of National Accounts concerned the year 2008. In respect of domestic supply and exports these were raised by using the data on 2010 that were available from National Accounts. Thus, the data describing value in the indices are from 2010 but the detailed commodity structures are based on data concerning 2008. The weight structure for imports was formed by using 2010 Customs' Statistics on Foreign Trade.

The forming of weights was started by deducting transit exports from the values of imports and exports, and exports from domestic values. This yielded for imports the value of imports remaining in Finland, for export the value of exports of goods produced in Finland only and for domestic supply the value of production remaining in Finland.

The value of the production/exports/imports of small CPA product categories excluded from the sample was also taken into account in the forming of the weight structures. So-called bootstrapping of representative values was used in the calculating of the weights. The bootstrapping of representative values means that the CPA product categories included in the index get their value weight based on the gross value of the entire industry so that the product categories included from an industry share the gross value of that entire industry. Thus, through their weight structure, the CPA product categories included in the index also represent those product categories in their industry that are not included in the index.

The weight structure were corrected in early 2013 due to a structural change in the electrical and electronics industry. The weight structures are still based on the weight structure calculations of the 2010=100 renewal, but the effects of the structural change have been updated in them. The corrections relate to industries 26 Manufacture of computer, electronic and optical products and 27 Manufacture of electrical equipment. The weights of the other industries expressed in euros remained unchanged. The shares of all industries in the overall index changed, however. The production, imports or exports values of the electrical and electronics industry were reduced so the shares of these industries decreased in the overall index. Similarly, the shares of all industries increased. The biggest changes were directed at the weights of the Export Price Index. The revised weight structures are used from the January 2013 statistics.

Tables 4 and 5 show the weight structures of producer price indices at a less detailed level. The weight structures in Table 4 were used from 2010 to 2012 and the weights in Table 5 are used from the January 2013 statistics onwards. Table 6 shows a rough industry-level comparison of the weight

structures of 2010=100 indices. Appendices 1 and 2 contain the weight structures of the producer price indices at 2-digit level.

Weights at the enterprise level were formed after the bootstrapping of representative values. The enterprise weights are based on the stratification used in the sampling and they were formed as follows:

- If the product category included dominant enterprises⁶, they were assigned the proportion their own domestic supply/imports/exports represented of the total value of the product category. The remainder of the value of the product category was divided evenly between other enterprises.

Table 4.

Weight structures of the producer price indices, ‰, in use until Dec. 2012

Industry	Name	Producer Price Index for Manufactured Goods	Export Price Index	Import Price Index	Basic Price Index for Domestic Supply	Basic Price Index for Domestic Supply, Incl. Taxes
TOTAL	Total index	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
A	Agriculture, forestry and fishing	–	5.9	27.3	64.0	59.5
B	Mining and quarrying	17.0	2.7	171.9	70.3	68.6
C	Manufacturing	886.2	982.7	762.3	593.8	605.2
10–11	Food industry	89.6	24.4	58.9	79.7	80.5
12	Manufacture of tobacco products	0.0	–	2.5	0.9	5.3
13–15	Manufacture of textiles, wearing apparel and leather	10.1	12.9	45.5	18.9	18.4
16–17	Forest industry	167.6	213.3	28.9	63.6	61.6
18	Printing and reproduction of recorded media	11.9	4.2	0.3	7.7	7.4
19–22	Chemical industry	170.9	189.8	188.0	128.3	141.2
23	Manufacture of other non-metallic mineral products	22.4	11.9	12.4	17.1	16.5
24–30, 33	Metal industry	397.8	514.8	399.9	260.7	258.0
26–27	Manufacture of electronic and electrical goods	98.6	179.1	147.1	63.3	61.3
31	Manufacture of furniture	9.5	3.3	8.6	9.0	8.8
32	Other manufacturing	6.2	7.9	17.1	7.8	7.6
D	Electricity, gas, steam and air conditioning supply	78.3	4.0	14.2	62.8	64.1
E	Water supply; sewerage, waste management and remediation activities	18.5	4.7	24.4	20.7	20.1
F	Construction	–	–	–	188.4	182.6

Table 5.

Weight structures of the producer price indices, ‰, in use from Jan. 2013

Industry	Name	Producer Price Index for Manufactured Goods	Export Price Index	Import Price Index	Basic price index for domestic supply	Basic Price Index for Domestic Supply, Incl. Taxes
TOTAL	Total index	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
A	Agriculture, forestry and fishing	–	6.2	27.9	64.6	60.0
B	Mining and quarrying	17.4	2.9	175.9	70.9	69.2
C	Manufacturing	883.8	981.9	756.7	590.2	601.8
10–11	Food industry	91.4	25.6	60.3	80.4	81.2
12	Manufacture of tobacco products	0.0	–	2.5	0.9	5.3
13–15	Manufacture of textiles, wearing apparel and leather	10.4	13.5	46.6	19.2	18.6
16–17	Forest industry	171.1	222.7	29.5	64.2	62.2
18	Printing and reproduction of recorded media	12.2	4.4	0.3	7.7	7.5
19–22	Chemical industry	174.5	198.3	192.6	129.5	142.4
23	Manufacture of other non-metallic mineral products	22.8	12.5	12.7	17.2	16.7
24–30, 33	Metal industry	385.2	493.4	385.8	254.2	251.6
26–27	Manufacture of electronic and electrical goods	79.9	142.9	127.1	54.9	53.4
31	Manufacture of furniture	9.7	3.4	8.9	9.1	8.8
32	Other manufacturing	6.4	8.3	17.5	7.9	7.7
D	Electricity, gas, steam and air conditioning supply	79.9	4.1	14.5	63.4	64.6
E	Water supply; sewerage, waste management and remediation activities	18.9	4.9	25.0	20.9	20.2
F	Construction	–	–	–	190.0	184.1

⁶ The value of an enterprise's imports, exports or domestic supply exceeded 50% of the corresponding value for the entire heading or two enterprises together represented over 80% of the value of the entire heading.

Table 6.
Comparison of the weight structures of producer price indices

Industry	Name	Producer Price Index for Manufactured goods			Export Price Index			Import Price Index		
		2010=100 until 12/2012	2010=100 from 1/2013	difference % points	2010=100 until 12/2012	2010=100 from 1/2013	difference % points	2010=100 until 12/2012	2010=100 from 1/2013	difference % points
TOTAL	Total index	1,000.0	1,000.0	0.0	1,000.0	1,000.0	0.0	1,000.0	1,000.0	0.0
A	Agriculture, forestry and fishing				5.9	6.2	0.3	27.3	27.9	0.6
B	Mining and quarrying	17.0	17.4	0.4	2.7	2.9	0.2	171.9	175.9	4.0
C	Manufacturing	886.2	883.8	-2.4	982.7	981.9	-0.8	762.3	756.7	-5.6
10–11	Food industry	89.6	91.4	1.8	24.4	25.6	1.2	58.9	60.3	1.4
13–15	Manufacture of textiles, wearing apparel and leather	10.1	10.4	0.3	12.9	13.5	0.6	45.5	46.6	1.1
16–17	Forest industry	167.6	171.1	3.5	213.3	222.7	9.4	28.9	29.5	0.6
19–22	Chemical industry	170.9	174.5	3.6	189.8	198.3	8.5	188.0	192.6	4.6
24–30, 33	Metal industry	397.8	385.2	-12.6	514.8	493.4	-21.4	399.9	385.8	-14.1
26–27	Manufacture of electronic and electrical goods	98.6	79.8	-18.8	179.1	142.9	-36.2	147.1	127.0	-20.1
D	Electricity, gas, steam and air conditioning supply	78.3	79.9	1.6	4.0	4.1	0.1	14.2	14.5	0.3
E	Water supply; sewerage, waste management and remediation activities	18.5	18.9	0.4	4.7	4.9	0.2	24.4	25.0	0.6
F	Construction	-	-	-	-	-	-	-	-	-

Table 6 continues.
Comparison of the weight structures of producer price indices

Industry	Name	Basic Price Index for Domestic Supply			Basic Price Index for Domestic Supply, Incl. Taxes		
		2010=100 until 12/2012	2010=100 from 1/2013	difference % points	2010=100 until 12/2012	2010=100 from 1/2013	difference % points
TOTAL	Total index	1,000.0	1,000.0	0.0	1,000.0	1,000.0	0.0
A	Agriculture, forestry and fishing	64.0	64.6	0.6	59.5	60.0	0.5
B	Mining and quarrying	70.3	70.9	0.6	68.6	69.2	0.6
C	Manufacturing	593.8	590.2	-3.6	605.2	601.8	-3.4
10–11	Food industry	79.7	80.4	0.7	80.5	81.2	0.7
13–15	Manufacture of textiles, wearing apparel and leather	18.9	19.2	0.3	18.4	18.6	0.2
16–17	Forest industry	63.6	64.2	0.6	61.6	62.2	0.6
19–22	Chemical industry	128.3	129.5	1.2	141.2	142.4	1.2
24–30, 33	Metal industry	260.7	254.2	-6.5	258.0	251.6	-6.4
26–27	Manufacture of electronic and electrical goods	63.3	55.0	-8.3	61.3	53.3	-8.0
D	Electricity, gas, steam and air conditioning supply	62.8	63.4	0.6	64.1	64.6	0.5
E	Water supply; sewerage, waste management and remediation activities	20.7	20.9	0.2	20.1	20.2	0.1
F	Construction	188.4	190.0	1.6	182.6	184.1	1.5

- If there were no dominant enterprises in the product category, a certain proportion of the total value of the product category was divided evenly among the enterprises in each stratum. Large enterprises shared a bigger proportion and small enterprises a smaller proportion of the total value of the product category.

Table 7 describes the distribution of enterprise weights in the strata.

Table 7.
Distribution of enterprise level weights in producer price indices

Group	Strata	Distribution of weights
1	1 (1–3 dominant enterprises)	own weight
2	2 (one dominant/others)	own weight/even distribution
3	2 (two dominant/others)	own weight/even distribution
4	2 (large/small)	65/35
5	3 (large/medium/small)	65/25/10

5 Collection of price data

As a rule, the price data for the producer price indices are collected direct from enterprises. The majority of the data are collected with a web-based collection system or by email. In addition to the data collected direct from enterprises, price data or point figures from other statistics of Statistics Finland are also used in calculating the producer price indices. These statistics include the Index of Producer Prices of Agricultural Products, the Building Cost Index, the Cost Index of Civil Engineering Works and the Volume Index of Newbuilding. The data of the Index of Producer Prices of Agricultural Products are used in the monitoring of vegetable prices. The data of the Building Cost Index are used to monitor the prices of certain building products. An implicit price index derived from Volume Index of Newbuilding and the Cost Index of Civil Engineering Works are used to monitor prices in construction.

The development in the prices of certain raw material headings in imports and exports is measured with the import and export unit value prices obtained from the Foreign Trade Statistics of Finnish Customs. Unit values are used to measure development in the prices of homogeneous product groups only⁷, such as timber and cereal, and changes in the prices of imported and exported electricity.

Apart from the data from Finnish Customs, data on timber prices from the Finnish Forest Research Institute and data on district heating prices from Finnish Energy Industries are used in the producer price indices.

The price data collected from enterprises are average prices weighted by sales volume for the product in question in the month of the inquiry. If an average price cannot be determined, the price data notation may also be the price for delivery/invoicing/payment on the 15th day of the month.

Producer price indices are monthly statistics, which means that as a rule all prices are collected every month. However, some price data are collected less often due to practical reasons. The proportion of price data collected less frequently than quarterly of all price data is roughly one fourth.

Export and import prices are generally collected as currency prices. The conversion to euro is performed at Statistics Finland using the monthly average exchange rates per currency published by the Bank of Finland.

The monthly response rate of the price data inquiry ranges between 95 and 98 per cent. The non-response rate is kept low by actively reminding respondents to supply the requested data.

5.1 Changes in quality

Producer price indices are “pure” price indices, which are not affected by changes in the quality of the products. Efforts are made to eliminate from the index price changes that are caused by changes in quality. Both the physical and economic (such as conditions on financing, guarantee, whether product is sold to a wholesaler or retailer) characteristics of a product must remain unchanged. In practice, product characteristics change continuously. Qualitative changes and their treatment are among the main challenges in index calculations. In producer price indices changes in quality are controlled for with several methods to make sure that the best possible method for measuring price change is always used.

In the first place, efforts are made to collect an overlapping price observation for the changed product. In practice this means that as the product changes the price for the preceding month is collected in addition to the price for the reference month. This allows the real change in price to be calculated and the price history stays unbroken despite the change in the monitored product. If overlapping price observations cannot be obtained, expert assessment is used. In these cases the data supplier is asked to assess which proportion of the price change is a genuine change in price and which proportion is due to the change in the quality of the product. The expert assessment is based on the idea that the data supplier enterprise is best equipped to estimate the price development of its own products. If neither an overlapping price observation nor an expert opinion can be obtained, the price development of

⁷ The change of the unit value index corresponds to a pure change in prices only when the unit value has been calculated from a homogeneous group or, in the case of a heterogeneous group, if the sales volumes and quality of products in the group have stayed unchanged for two periods. For example, the unit value index is not suitable for monitoring price changes for mobile phones as it is possible that more basic phones were sold in one month, whereas in another month the sales volumes of higher-quality phones were higher. This would change the unit value even if there was no change in the prices.

the product is imputed with the average change in the prices of other products belonging to the same commodity group. The imputation is based on the assumption that the prices of products in the same commodity group develop in roughly the same way.

If none of the above methods can be used, discretionary use of the following methods is possible:

- The quality of the changed product is assumed to be the same as that of the earlier product. In this case the price change is allowed in the index as such.
- The price change is assumed to derive entirely from a change in quality, in which case the index does not change as the product changes.

Methodologies to control for changes in quality are constantly being developed and international guidelines and recommendations are taken into account when applying different methods.

5.2 *Commodities with seasonal variation*

Commodities with seasonal variation are commodities whose price reacts strongly to different seasons or which are available only during limited time periods. Commodities with seasonal variation include e.g. fresh fruit and vegetables as well as winter and summer clothing. In producer price indices commodities with seasonal variation are treated with a method in which prices are recorded only in the months during which the commodity is typically used while the latest recorded price is used in other months.

6 Compilation of indices

6.1 Calculation method

The overall indices of the producer price indices describe the average development in the prices of the product categories included in the index and as sample-based statistics this is considered to describe price development in the whole population. Geometric averages for the CPA product categories of each enterprise are calculated with price ratios (=current price/price at base period) derived from individual variants. These micro indices are combined into an overall index/industry-specific index by weighting each micro index with its own weighting coefficient. In other words, price changes of individual commodities have different-sized effects on the overall index. At the 4-digit level of the TOL2008 industrial classification, the producer price indices are Laspeyres indices. Below the 4-digit level, the weights can be revised as necessary and new commodities or data suppliers included in the index.

In connection with the weight structure update of the producer price indices, the calculation method of the index was also changed: starting from the January 2013 statistics, the index point figures are calculated by chaining. Until December 2012, the statistics were calculated using the original weights. For chaining purposes, the index point figures for December 2012 were also calculated using the new weight structures. The chaining coefficients were created with the help of the December index point figures. With the help of these and the index point figures calculated with the renewed weights, the original 2010=100 time series can be extended from 2013 onwards. From 2013, the 2010=100 index point figures develop in accordance with the new weight structures. Chaining is carried out at all levels, that is, on industry and CPA product category levels.

The index for point in time t is calculated with the formula:

$$I_t = \sum \frac{P_{(t)i} Q_{(0)i}}{\sum P_{(0)i} Q_{(0)i}} * \frac{P_{(t)i}}{P_{(0)i}},$$

where

$P_{(t)i}$ = price of commodity i at point in time t

$P_{(0)i}$ = basic price of commodity i, that is, average price at base year

$P_{(0)i} Q_{(0)i}$ = value of commodity i at base year (price*volume)

$\sum P_{(0)i} Q_{(0)i}$ = sum of values of commodities

Example. Let us calculate a price index for a product category with two data supplier enterprises. Take January 2010 as base period and February 2012 as the inquiry month. At the base period the index point figure is 100. Both enterprises supply price data on three products in the product category.

Enterprise 1

Product A price in February 2012: EUR 35

Product A price in January 2010: EUR 42

Product B price in February 2012: EUR 14

Product B price in January 2010: EUR 11

Product C price in February 2012: EUR 53

Product C price in January 2010: EUR 60

Enterprise 2

Product D price in February 2012: EUR 67

Product D price in January 2010: EUR 62

Product E price in February 2012: EUR 52

Product E price in January 2010: EUR 62

Product F price in February 2012: EUR 43

Product F price in January 2010: EUR 45

Let the total value of the product category be EUR 1,000,000 of which enterprise 1 accounts for EUR 300,000 and enterprise 2 for the remaining EUR 700,000.

First the geometric averages of price ratios are calculated for both enterprises for their products: Enterprise 1

$$g_1 = \left(\frac{35}{42} \times \frac{14}{11} \times \frac{53}{60} \right)^{\frac{1}{3}} = 0.978497$$

Enterprise 2

$$g_2 = \left(\frac{67}{62} \times \frac{52}{62} \times \frac{43}{45} \right)^{\frac{1}{3}} = 0.953199$$

From which we obtain the price index:

$$I = \frac{(0.978497 \times 300000 + 0.953199 \times 700000)}{(300000 + 700000)} = 0.960789$$

When this is multiplied by 100, we obtain a point figure of 96.1 for the February 2012 price index of the product category. The prices of the product category concerned have fallen by an average of 3.9 per cent during the examined period.

Example. Compiling the 2010=100 index. The weight structure of the index is changed at the turn of the year 2013. Until December 2012, the index is calculated with original weights and from that point forward with new weights. The aim is to continue producing and publishing the original

2010=100 index despite the change in the weight structure. This requires a 2010=100* index point figure calculated with the new weights and chaining coefficient. The new 2010=100* index is only a "tool" for calculation: the point figures it gives are not used as such or published but the index develops according to them.

A chaining coefficient is formed, which enables compilation of the original 2010=100 index despite the change in the weight structure. The January 2013 index point figure for the 2010=100 index is formed by calculating the 2010=100* index point figure for January 2013 and multiplying it with the chaining coefficient. In the example below, the January 2010=100* index point figure is 124.0 and when it is multiplied with the chaining coefficient 1.05, formed with the help of the December 2012 point figures (the original point figure divided with the new one), the 2010=100 index point figure is 130.2. The same procedure will in future be carried out for each month.

Chaining of the original index using a chaining coefficient
Weight structure revision from January 2013 onwards

Time period	2010=100*		2010=100
11/2012			122.0
12/2012	120.0		126.0
01/2013	124.0	=1.05*124	130.2
02/2013	128.0	=1.05*128	134.4
03/2013	132.0	=1.05*132	138.6

Chaining coefficient 126/120=1.05

Using chaining coefficients corresponds with the 2010=100 index being chained forward from January 2013, that is, being multiplied with changes according to the 2010=100* index: in January 2013 with the change between January and December 2012, in February 2013 with the change between February and December 2012, and so forth. Because, for instance, the change between February 2013 and December 2012 can be shown as a product of the monthly change, a product of the changes between December and January and between January and February (January is reduced), chaining also means that the 2010=100 index point figures are moved forward with the monthly changes of the new 2010=100*

index. The example below illustrates chaining of the 2010=100 index utilising the changes of the 2010=100* index. The index point figures are identical with the point figures in the previous example.

Chaining of the original index with the change
Weight structure revision from January 2013 onwards

Time period	2010=100*	Change from December 2012		2010=100
11/2012				122.0
12/2012	120.0	120/120=1.0000		126.0
01/2013	124.0	124/120=1.0333	1.0333*126=	130.2
02/2013	128.0	128/120=1.0667	1.0667*126=	134.4
03/2013	132.0	132/120=1.1000	1.1000*126=	138.6

6.2 Compilation of indices with old base years

Producer price indices with old base years are not calculated genuinely but they are chained with the new 2010=100 indices by using a coefficient calculated from December 2011 index point figures. The weight structure changes made in the indices in early 2013 did not affect the chaining coefficients of old indices. From the point of time of the chaining onwards, monthly changes in the new and old indices are the same and annual changes are also identical from December 2012 onwards (due to the calculation method, there may be an occasional up or downward deviation of a tenth in the decimal). The chaining of a certain series of the old index is performed with the corresponding series of the new index. Statistics Finland calculates the coefficients with figures truncated to two decimal places. The coefficients include five decimal places.

The rule in the compilation of these statistics with old base years is that Statistics Finland always compiles and publishes them with the previous base year and with base year 1949=100. Now that indices with base year 2010=100 are being produced, they are also published with base years 2005=100 and 1949=100. However, only the total series is chained of the series with the previous

Table 8.
Chaining coefficients of old overall indices

	1949=100	1975=100	1980=100	1985=100	1990=100	1995=100	2000=100	2005=100
PPI for Manufactured Products / Production Price Index	18.4351	3.07129	1.94623	1.41588	1.27976	–	1.05261	1.08302
PPI for Manufactured Products, domestic goods	–	–	–	–	–	1.30217	–	–
Basic Price Index for Domestic Supply	–	3.38286	2.0855	1.52088	1.37669	1.28857	1.18269	1.14269
Export Price Index	16.3257	2.49394	1.66932	1.26971	1.17548	0.97721	0.90403	0.9824
Import Price Index	14.9241	3.06179	1.74533	1.39646	1.5021	1.23581	1.11131	1.09181
Wholesale Price index	20.1164	–	2.15995	1.55259	1.40808	1.27088	1.15579	1.13747

base year (for instance, the Basic Price Index for Domestic Supply covers both goods produced at home and imported goods, which together form the total - only this total series is chained).

Example. Let us study the point figure for domestic supply for industry C Manufacturing in the Basic Price Index for Domestic Supply 2005=100. As of 2012, Statistics Finland no longer calculates the point figure in question but it can be formed by chaining.

The chaining coefficient is formed with the point figures for December 2011 (latest point in time before publishing of indices with base year 2010=100 was started). The point figure for domestic supply for industry C Manufacturing in the Basic Price Index for Domestic Supply 2005=100 is 124.0. The point figure for domestic supply for industry C Manufacturing in the Basic Price Index for Domestic Supply 2010=100 is 106.4. Therefore, the chaining coefficient is obtained as $(124.0/106.4)$.

Starting from the January 2012 statistics, the 2005=100 point figures are formed with the 2010=100 point figures and a chaining coefficient. The chaining coefficient remains unchanged from one month to the next. In January 2012, the point figure for domestic supply for industry C Manufacturing in the Basic Price Index for Domestic Supply 2010=100 is 107.2. When this is multiplied by the chaining coefficient $(124.0/106.4)$ we receive the 2005=100 point figure for January 2012, which is 124.9. Correspondingly the point figure obtained for April 2012, for instance, is $109.4*(124.0/106.4)=127.5$.

Example. Let us study industry DJ27 Manufacture of basic metals in the 2000=100 Wholesale Price Index. Industrial classification TOL2002 was used in the 2000=100 statistics whereas the 2010=100 statistics are compiled by industrial classification TOL2008. Industry C24 Manufacture of basic metals in the new classification corresponds with category DJ27. In addition, the Wholesale Price Index has been replaced in the 2010=100 statistics by the Basic Price Index for Domestic Supply, Including Taxes.

The chaining coefficient is formed from the point figures for December 2011. The point figure for industry DJ27 Manufacture of basic metals in the 2000=100 Wholesale Price Index is 146.6 and the point figure for industry C24 Manufacture of basic metals in the 2010=100 Basic Price Index for Domestic Supply, Including Taxes is 105.3. The chaining coefficient is $(146.6/105.3)$.

We want to know what the February 2012 point figure for industry DJ27 is in the 2000=100 Wholesale Price Index. The point figure for February 2012 for industry C24 in the 2010=100 Basic Price Index for Domestic Supply, Including Taxes is 105.9. Therefore, the point figure for February 2012 for industry DJ27 in the 2000=100 Wholesale Price Index is $(146.6/105.3)*105.9=147.4$.

Where possible the user can start using the 2010=100 point figures, meaning that chaining is not needed.

6.3 Possible sources of error in producer price indices

Producer price indices use the Laspeyres index formula. Scientific literature on indices often refers to the substitution bias that the Laspeyres index formula may create. The direction of the bias depends on the target of measurement. In the case of the producer price index, substitution bias may arise because (when maximising their profits) enterprises react to changes in relative prices by changing their production volumes. For example, if the price of light fuel oil rises relative to petrol, an enterprise engaged in the oil industry can produce more light fuel oil. Then an index calculated with the Laspeyres formula underestimates price development from the enterprises' perspective⁸. The significance of the substitution bias depends on the scale at which individual enterprises are able to redirect their production when relative prices change.

Producer price indices may contain a bias resulting from the entry of new products on the market. When speaking of new products reference is often made to electrical products whose production and sales can grow quite rapidly in the course of a five-year time span. If the change is vigorous, the index may not describe sufficiently accurately the average development in the prices of the commodities produced in the economy. However, in practice the bias caused by new products is not very significant, because below the 4-digit level of the industrial classification a new commodity can be added to the index price monitoring if its production and sales volumes have increased significantly.

The objective of producer prices indices is to describe pure price development, which is why changes in the quality of products must be taken

⁸ In the Consumer Price Index the possible substitution bias is exactly the opposite as consumers shift their consumption to commodities that become relatively cheaper.

into consideration in their calculations. The problem of quality change is usually encountered either when a data supplier reports that a variant on which data are collected is no longer produced, imported or exported, or that changes have been made to the variant concerned. Changes in quality may cause error in the index as the defining of a pure price change can be difficult and, conversely, the proportion of a price change that is due to changed quality is difficult to estimate and eliminate from calculations. If, as a product changes, we assume that the entire price change is due to a change in quality, we may disregard genuine changes in price, whereby the index does not change at all for the commodity in question. If, then again, we assume that the entire price change is due to a genuine change in price, we

may disregard changed quality and the index changes too much. The methods used in producer price indices to control for changes in quality are described in Section 5.1.

The calculation of producer price indices is based on a sample. Sampling error is always associated with sampling. Sampling error can be measured with standard error. Confidence intervals have not been estimated for producer price indices.

Other factors that have a bearing on the precision of the index are accuracy of the data on which the sampling frame and weight structure are based, possible errors in the processing of individual data items, and non-response. The monthly non-response rate ranges from 2 to 5 per cent in producer price indices.

7 *European producer price indices*

Regulations 1165/1998 and 1158/2005 of the European Union define at what level and with which price concepts Finland must supply data to Eurostat, the Statistical Office of the European Communities. The Regulations can be found from the European Union legislation database by entering the number and year of the Regulation as search criteria.

The producer price indices published in Finland differ from the harmonised series supplied to Eurostat in the following ways: The indices delivered to Eurostat include only industries B-E36 for domestic supply and exports, and industries B-D for imports (TOL2008).

International index data contained in publications and databases are available from the Library of Statistics at Statistics Finland.

International Data On Producer Price Indices

Eurostat compiles a producer price index which measures the price development of goods produced in the EU area. EU index data are published on Eurostat's website in the "Short-term business statistics" section under the theme of "Industry trade and services".

The IMF producer price index manual

<http://www.imf.org/external/np/sta/tegppi/index.htm>

IMF manual concerning export and import price indices

<http://www.imf.org/external/np/sta/xipim/pdf/xipim.pdf>

Eurostat's manual on price and volume calculations for National Accounts

http://www.euklems.net/pub/eurostat_handbook_on_volumes_&_prices.pdf

8 *Producer price index publications and other information service*

Producer price indices are published on the 24th day of the month following the statistical reference month or on the first weekday following it. The data for November are released on the last weekday preceding 24 December. A short release on the latest figures is published on the home page of the statistics (http://tilastokeskus.fi/til/thi/index_en.html).

The published producer price index point figures are available in Statistics Finland's StatFin database service. The service is free of charge and located under Tables/Database tables on the web page of producer price indices. Time series from the new 2010=100 indices are available starting from index data for January 1995 (however, for the years 1995 to 2009 only at the 2-digit level and without the division of the Producer Price Index for Manufactured Products into domestic and export goods and the division of the Basic

Price Index for Domestic Supply and the Basic Price Index for Domestic Supply, Including Taxes into domestic and imported goods). As regards old indices, 2005=100 series are produced for the time being, without the division of the Producer Price Index for Manufactured Products into domestic and export goods and the division of the Basic Price Index for Domestic Supply and the Basic Price Index for Domestic Supply, Including Taxes into domestic and imported goods. All publishable point figures are produced from the 1949=100 series.

A monthly publication is produced of the producer price indices, which can be downloaded free in pdf format from Available products and services link on the web page of producer price indices. For the time being, the publication can also be ordered as a charged paper version.

9 *Customer-specific indices*

A customer-specific index can be compiled for groups of goods that are not included in Statistics Finland's regular index production or classification. Such indices can be produced from all price indices and data from Statistics Finland's other statistics can be combined with them.

A customer-specific index can be compiled either for an industry or a product category. It is calculated from the price data used in regular index production. Thus, customer-specific indices can only include industries and product categories that are included in the regular indices. By contrast, as regards the weights for the included industries and product categories, the customer can either use the index weights or give them their own value weights. The CPA product categories and their weights included in the indices can be

found <http://tilastokeskus.fi/til/thi/men.html> on the web pages of the statistic (only in Finnish).

A customer-specific index is formed in the following way:

- Select the index that is best suited for the customer.
- Select the industries and/or product categories that are of interest to the customer.
- Select either the value weights of the index or the customer's own value weights.

The compilation of customer-specific indices is subject to the same data protection rules as other published point figures. Customer-specific indices cannot be produced for industries in which the price development of an individual enterprise can be deduced from the development of the index.

10 *Usages of producer price indices*

Producer price indices have the following usages, among others:

- One of the key usages of producer price indices is to function as a deflator in National Accounts calculations for converting the value of production or sales to the volume of production or sales.
- Producer price indices can be used for describing short-term inflationary pressures on various sectors of the economy. Especially central banks and government ministries utilise producer price indices for this purpose. Many enterprises, such as investment banks, can also exploit the data in their macroeconomic forecasting models.
- Producer price indices can be used as an index clause in agreements. An index clause means that the final amount of a payment specified in an agreement is tied to a change in some index. Indexing is a means of seeking protection against inflationary risks. In practice an index clause is generally used in long-term agreements in which the period of time between the placing of an order and the delivery of goods is relatively long. Enterprises can use the data of the producer price indices when comparing the price development of their purchases or sales with the average development.
- Data from producer price indices can be combined with other data on business trends, such as those of the Volume Index of Industrial Output in order to analyse business trends more closely.

11 Calculating with indices

11.1 Change coefficients for value of money

Change coefficients for value of money provide answers to the following questions:

- How much would an amount of money in a previous year be at current value?
- How much would an amount of money at current value be at the value of a previous year?

Change coefficients for value of money are formed from index series. The purpose of use of the coefficient determines which index the coefficient will be calculated from. Usually the coefficient for value of money is calculated from the Cost-of-living Index (Consumer Price Index), but if the change in the value of money is monitored from the perspective of an enterprises' production, e.g. to ascertain the value of tin plate production in today's money, it is advisable to use coefficients calculated from the Producer Price Index for Manufactured Products. If, then again, the change in the value of money is monitored from the perspective of an enterprise's purchases, e.g. to see what the purchase price of an industrial machine would be in today's money, coefficients calculated from the Basic Price Index for Domestic Supply, Including Taxes or the Wholesale Price Index should be used.

Example. We want to calculate how much a machine that cost EUR 500 in 2002 would have cost in euros in 2011. We use the point figures of the Wholesale Price Index 2000=100 to calculate the coefficient for value of money. The average for the overall index of the Wholesale Price Index in 2002 is 97.7. In 2011 the corresponding figure is 124.6. Calculated from these, the coefficient for value of money is

$$\frac{124.6}{97.7} \approx 1.27533$$

We can now multiply the EUR 500 in 2002 by the coefficient for value of money and obtain $1.27533 \cdot 500 \approx 637.7$. Thus, in 2011 money, the price of the machine would be EUR 637.7.

Example. We want to calculate how much a machine that cost EUR 500 in 2011 would have cost in euros in 2002. We use the same point figures of the Wholesale Price Index 2000=100 as above to calculate the coefficient for value of money. Calculated from these, the coefficient for value of money is

$$\frac{97.7}{124.6} \approx 0.78410$$

We can now multiply the EUR 500 in 2011 by the coefficient for value of money and obtain $0.7841 \cdot 500 \approx 392.1$. Thus, in 2002 money, the purchase price for the machine would be EUR 392.1.

11.2 Calculation of price adjustment in an agreement with an index clause

The use of index clauses was restricted by law in Finland from 1968 until the end of 2012. Nowadays such restrictions do not exist. The most recent Act on Limiting the Use of Index Clauses of 11 December 2009/1046 dates from the year 2009. The legislation limiting the use of index clauses was specified several times during its validity and the validity was extended with small specifications. The Act contained many provisions with which it permitted the use of index clauses in various cases, such as foreign trade agreements.

Indices are applied to agreements in several ways. An index adjustment can be included in full or in part, e.g. as 70 per cent, in the agreement price. If an index clause is used, the agreement should include the following information:

- The exact name of the index and industry to which the agreement is tied.
- The base period of the agreement (month and year) and the corresponding index point figure.
- Agreed amount of money at base period prices:
- The adjustment period and the point in time whose index point figure is used in the adjustment.

Example. An agreement is tied to series 73 Transport equipment of the Wholesale Price Index 1949=100. The agreement sum of EUR 50,000 is adjusted annually on 1 January against the latest known point figure (November) and the index adjustment is taken into account in full. The agreement is signed on 1 January 2008 when the November 2007 point figure 2123 is known.

Name of index: Wholesale Price Index 1949=100, Total, 73 Transport equipment

Base period of agreement and point figure corresponding to it: 1.1.2008, 2123 (11/2007)

Agreed amount of money at base period prices:
EUR 50,000

Point of time of adjustment: annually on 1 January, point figure of November of the previous year

The agreement amount

Date	Point figure	Coefficient	Change from base period, %	Agreed sum
1 Jan. 2008	2123	–	–	50,000
1 Jan. 2009	2089	0.98398	–1.60	49,199
1 Jan. 2010	2151	1.01319	1.32	50,659
1 Jan. 2011	2187	1.03015	3.01	51,507

The coefficients by which the agreement amount is multiplied at the times of adjustment are obtained by dividing the point figure at time of adjustment by the point figure at base period. In January 2009, the agreement sum falls to EUR 49,199. From the beginning of January 2010 the agreement sum rises to EUR 50,659 and in 2011 to EUR 51,507.

Example. In the following example a three-year trade agreement is tied to industry C27 Manufacture of electrical equipments of the Producer Price Index for Manufactured Products 2005=100. The trade agreement is signed on 01/03/2009 when the January 2009 index point figure 110.7 is known. The value of the trade agreement is EUR 4.5 million. EUR one million is paid immediately and EUR one million together with the index adjustments on both 1 March 2010 and 1 March 2011. The remaining EUR 1.5 million and the remaining index adjustments are paid on 1 March 2012. The unpaid part of the total sum is tied to the index. It is adjusted three times, always on the 1st of March according to the overall point figure of industry C27 of the Producer Price Index for Manufactured Products (January).

The total sum paid under the agreement is EUR 4.5 million plus EUR 182,335 index adjustments.

Indexing of the total sum to the Producer Price Index for Manufactured products

Date	Point figure	Agreed sum, outstanding share, EUR	To be paid, agreed sum+index adjustments, EUR
1 March 2009	110.7	4,500,000	1,000,000
1 March 2010	113.1	3,500,000 * (113.1/110.7) = 3,575,881	1,000,000 + 75,881 = 1,075,881
1 March 2011	114.6	2,500,000 * (114.6/113.1) = 2,533,156	1,000,000 + 33,156 = 1,033,156
1 March. 2012	120.2	1,500,000 * (120.2/114.6) = 1,573,298	1,500,000 + 73,298 = 1,573,298

11.3 Calculating changes

The change in index figures between two points in time is usually calculated as a percentage. The change percentage is calculated as follows:

$$\frac{I_t - I_0}{I_0} * 100,$$

where I_t = index for the reference point in time and I_0 = index for the comparison point in time.

Monthly and annual changes in producer price indices are calculated at Statistics Finland from figures truncated to two decimal places. In the following example, annual and monthly changes in the overall index of the Producer Price Index for Manufactured Products 2010=100 are calculated for March 2012:

Point figure in March 2011: 106.1

Point figure in February 2012: 107.2

Point figure in March 2012: 107.6

$$\text{Monthly_change} = \frac{(107.6 - 107.2)}{107.2} * 100 \approx 0.4$$

i.e. 0.4 per cent

$$\text{Yearly_change} = \frac{(107.6 - 106.1)}{106.1} * 100 \approx 1.4$$

i.e. 1.4 per cent.

11.4 Changing an index reference year

To monitor the development of the index starting from a point in time for which an index series has not yet been calculated, the reference year of the index can be changed. We first select the index from which the point figures of the new index are to be calculated. The average index of the selected new reference year is thus 100 and the point figures for the subsequent points in time are calculated as follows:

$$\frac{I_t}{I_0} * 100 = \text{point figure of new index series at point in time } t$$

I_t = value of used index at point in time t

I_0 = value of used index at reference point in time

Example. To monitor changes in the Wholesale Price Index since year 1971, we use the Wholesale Price Index 1949=100.

Changing an index reference year

year	Wholesale Price Index 1949=100	Wholesale Price Index 1971=100
1971	312	$312 / 312 * 100 = 100$
1972	338	$338 / 312 * 100 = 108$
1973	398	$398 / 312 * 100 = 128$
...
2010	2000	$2000 / 312 * 100 = 641$
2011	2169	$2169 / 312 * 100 = 695$

In this example, the figures for the new reference year were calculated for annual averages, but they can of course be calculated also for monthly point figures, quarterly figures or for figures for any desired time period.

11.5 Nominal and real values

Nominal values can be converted to real values with a suitable deflator. With this procedure the impact of changes in the value of money can be eliminated from the nominal values.

(nominal value/suitable deflator) * 100 = real value

Example. Nominal interest rates are up by 0.8 per cent and simultaneously inflation, that is the annual change in consumer prices, has been roughly 1.5 per cent.

$$\frac{100.8}{101.5} * 100 \approx 99.3$$

Thus, real interest rates have fallen by 0.7 per cent (99.3–100).

11.6 Deflation and volume calculations

Price indices, such as the producer price indices, can be used as deflators in volume calculations. In such instances, the change in a certain value, such as the value of the sales of an enterprise (value index), is known. To find out the change in the volume over the same time period, a suitable price index, such as the Producer Price Index for Manufactured Products or one of its sub-indices, is used as a deflator. The volume index is calculated with the following formula:

$$\text{Volume index} = \frac{\text{value index}}{\text{price index}} * 100$$

Example. The value of the sales of an enterprise went up by 8.9 per cent from 2010 to 2011. The prices of the products the enterprise sells rose

by 0.3 per cent over the same period. Thus, the change in the volume of the sales was:

$$\frac{108.9}{100.3} * 100 \approx 108.6$$

The growth in the volume from 2010 to 2011 was 8.6 per cent.

The unit value index is a price index which measures the development of unit value prices, such as price per tonne. A unit value index can be calculated with the value index and the volume index in the following way:

$$\text{Unit value index} = \frac{\text{value index}}{\text{volume index}} * 100$$

11.7 Effect of price change on overall index

When examining the monthly and annual changes in producer price indices, the price changes having taken place must be proportioned to the weight of the commodity or commodity group if we wish to examine the impact of the commodity or commodity group on the overall index or the industry-specific index. Even a small change in the price of a commodity with a large weight, such as that of oil products in the Import Price Index, has a significant impact on the overall index.

The following is an example of the effect of a price change in industry C192 Manufacture of refined oil products on the monthly change of the Import Price Index 2010=100 in February 2012. For the calculation we need:

- Weight of oil products in the overall index (w): 4.52%
- January 2012 point figure for oil products (ind^{t-1}): 137.9
- February 2012 point figure for oil products (ind^t): 140.8
- Point figure for January 2012 in the overall index of the Import Price Index 2010=100 (k-kind^{t-1}), which is 110.9. In February 2012 the respective point figure is 112.1.

The monthly change in the Import Price Index is

$$\frac{(112.1 - 110.9)}{110.9} * 100\% \approx 1.1\%$$

We want to break down this change into additive components, or percentage points, and find out how much of the 1.1 per cent change was due to increases in the prices of oil products. In practice,

some import prices rose and some fell, but at the monthly level, import prices rose by an average of 1.1 per cent.

The effect of the price change on the monthly change is calculated with the formula:

$$\frac{w*(ind^t - ind^{t-1})}{k*ind^{t-1}},$$

whereby the effect of price changes of refined oil products on the Import Price Index is

$$\frac{4.52*(140.8-137.9)}{110.9} \approx 0.1$$

percentage points. Thus, 0.1 percentage points of the 1.1 per cent rise is due to increases in the prices of refined oil products and the remaining 1.0 percentage points due to increases in the prices of other products. Put in another way: approximately ten per cent of the monthly change in import prices was due to increases in the prices of refined oil products.

Appendix 1.

Weight structures of the producer price indices at 2-digit level, %, in use until Dec. 2012

Industry	Name	Producer Price Index for Manufactured Goods	Export Price Index	Import Price Index	Basic Price Index for Domestic Supply	Basic Price Index for Domestic Supply, Incl. Taxes
Total	Total index	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
A	Agriculture, forestry and fishing	–	5.9	27.3	64.0	59.5
A01	Growing of crops and farming of animals, hunting and related service activities	–	4.9	17.4	32.4	29.0
A02	Forestry and timber harvesting	–	1.0	7.1	29.5	28.6
A03	Fishing and hydroponics	–	–	2.8	2.1	1.9
B	Mining and quarrying	17.0	2.7	171.9	70.3	68.6
B05	Mining of coal and lignite	0.0	0.0	11.3	3.8	4.0
B06	Extraction of crude petroleum and natural gas	0.0	0.0	122.3	41.5	40.4
B07	Mining of metal ores	4.3	0.6	33.8	14.6	14.1
B08	Other mining and quarrying	12.7	2.1	4.5	10.4	10.1
C	Manufacturing	886.2	982.7	762.3	593.8	605.2
C10	Manufacture of food products	79.0	21.0	51.2	70.2	63.1
C11	Manufacture of beverages	10.6	3.4	7.7	9.5	17.4
C12	Manufacture of tobacco products	0.0	–	2.5	0.9	5.3
C13	Manufacture of textiles	5.5	6.3	10.9	5.7	5.6
C14	Manufacture of wearing apparel	2.9	4.1	26.5	10.0	9.7
C15	Manufacture of leather and related products	1.7	2.5	8.1	3.2	3.1
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	52.0	42.9	11.9	28.7	27.8
C17	Manufacture of paper and paper products	115.6	170.4	17.0	34.9	33.8
C18	Printing and reproduction of recorded media	11.9	4.2	0.3	7.7	7.4
C19	Manufacture of coke and refined petroleum products	69.8	73.8	47.4	43.7	60.6
C20	Manufacture of chemicals and chemical products	63.9	74.5	80.3	50.2	48.7
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	11.5	17.4	33.6	14.1	12.2
C22	Manufacture of rubber and plastic products n.e.c	25.7	24.1	26.7	20.3	19.7
C23	Manufacture of other non-metallic mineral products	22.4	11.9	12.4	17.1	16.5
C24	Manufacture of basic metals	83.2	122.8	65.0	43.0	41.6
C25	Manufacture of fabricated metal products, except machinery and equipment	60.4	23.5	26.5	46.7	45.3
C26	Manufacture of computer, electronic and optical products	55.0	107.1	97.1	37.9	36.7
C27	Manufacture of electrical equipment	43.6	72.0	50.0	25.4	24.6
C28	Manufacture of machinery and equipment n.e.c.	94.6	143.3	84.4	51.1	49.6
C29	Manufacture of motor vehicles, trailers and semi-trailers	14.1	23.2	61.3	23.6	28.0
C30	Manufacture of other transport equipment	13.5	22.9	15.6	7.7	7.6
C31	Manufacture of furniture	9.5	3.3	8.6	9.0	8.8
C32	Other manufacturing	6.2	7.9	17.1	7.8	7.6
C33	Repair and installation of machinery and equipment	33.4	–	–	25.3	24.6
D	Electricity, gas, steam and air conditioning supply	78.3	4.0	14.2	62.8	64.1
D35	Electricity, gas, steam and air conditioning supply	78.3	4.0	14.2	62.8	64.1
E	Water supply; sewerage, waste management and remediation activities	18.5	4.7	24.4	20.7	20.1
E36	Water collection, treatment and supply	5.0	–	–	3.8	3.7
E38	Waste collection, treatment and disposal activities; materials recovery	13.5	4.7	24.4	16.9	16.4
F	Construction	–	–	–	188.4	182.6
F41	Building construction	–	–	–	142.9	138.5
F42	Land and water construction	–	–	–	45.5	44.1

Appendix 2.

Weight structures of the producer price indices at 2-digit level, %, in use from Jan. 2013

Industry	Name	Producer Price Index for Manufactured Goods	Export Price Index	Import Price Index	Basic Price Index for Domestic Supply	Basic Price Index for Domestic Supply, Incl. Taxes
Total	Total index	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
A	Agriculture, forestry and fishing	–	6.2	27.9	64.6	60.0
A01	Growing of crops and farming of animals, hunting and related service activities	–	5.2	17.8	32.7	29.3
A02	Forestry and timber harvesting	–	1.0	7.2	29.8	28.9
A03	Fishing and hydroponics	–	–	2.8	2.1	1.9
B	Mining and quarrying	17.4	2.9	175.9	70.9	69.2
B05	Mining of coal and lignite	0.0	0.0	11.6	3.9	4.0
B06	Extraction of crude petroleum and natural gas	0.0	0.0	125.2	41.9	40.8
B07	Mining of metal ores	4.4	0.6	34.6	14.7	14.2
B08	Other mining and quarrying	12.9	2.2	4.6	10.5	10.2
C	Manufacturing	883.8	981.9	756.7	590.2	601.8
C10	Manufacture of food products	80.6	22.0	52.4	70.8	63.7
C11	Manufacture of beverages	10.8	3.6	7.9	9.6	17.5
C12	Manufacture of tobacco products	0.0	–	2.5	0.9	5.3
C13	Manufacture of textiles	5.6	6.5	11.2	5.8	5.6
C14	Manufacture of wearing apparel	3.0	4.3	27.1	10.1	9.8
C15	Manufacture of leather and related products	1.8	2.7	8.3	3.3	3.2
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	53.1	44.8	12.1	29.0	28.1
C17	Manufacture of paper and paper products	118.0	177.9	17.4	35.2	34.1
C18	Printing and reproduction of recorded media	12.2	4.4	0.3	7.7	7.5
C19	Manufacture of coke and refined petroleum products	71.3	77.1	48.6	44.0	61.1
C20	Manufacture of chemicals and chemical products	65.2	77.8	82.2	50.7	49.1
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	11.7	18.2	34.4	14.3	12.3
C22	Manufacture of rubber and plastic products n.e.c	26.3	25.2	27.4	20.5	19.9
C23	Manufacture of other non-metallic mineral products	22.8	12.5	12.7	17.2	16.7
C24	Manufacture of basic metals	84.9	128.2	66.5	43.3	42.0
C25	Manufacture of fabricated metal products, except machinery and equipment	61.6	24.5	27.1	47.1	45.7
C26	Manufacture of computer, electronic and optical products	35.3	67.8	78.2	30.1	29.3
C27	Manufacture of electrical equipment	44.6	75.1	48.9	24.8	24.1
C28	Manufacture of machinery and equipment n.e.c.	96.5	149.6	86.4	51.6	50.0
C29	Manufacture of motor vehicles, trailers and semi-trailers	14.4	24.3	62.7	23.8	28.2
C30	Manufacture of other transport equipment	13.8	23.9	16.0	7.8	7.7
C31	Manufacture of furniture	9.7	3.4	8.9	9.1	8.8
C32	Other manufacturing	6.4	8.3	17.5	7.9	7.7
C33	Repair and installation of machinery and equipment	34.1	–	–	25.6	24.8
D	Electricity, gas, steam and air conditioning supply	79.9	4.1	14.5	63.4	64.6
D35	Electricity, gas, steam and air conditioning supply	79.9	4.1	14.5	63.4	64.6
E	Water supply; sewerage, waste management and remediation activities	18.9	4.9	25.0	20.9	20.2
E36	Water collection, treatment and supply	5.1	–	–	3.9	3.7
E38	Waste collection, treatment and disposal activities; materials recovery	13.8	4.9	25.0	17.0	16.5
F	Construction	–	–	–	190.0	184.1
F41	Building construction	–	–	–	144.1	139.7
F42	Land and water construction	–	–	–	45.9	44.5

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