

**Economic and Social Council**Distr.: General
25 April 2017

English only

Economic Commission for Europe

Conference of European Statisticians

Group of Experts on National Accounts**Sixteenth session**

Geneva, 31 May – 2 June 2017

Item 5 of the provisional agenda

Price and volume measures**Czech Approach to Price and Volume Measures of Global Production****Prepared by the Czech Statistical Office¹***Summary*

Globalization is a phenomenon that influences economies of almost all countries. National accounts should reflect it. Therefore several manuals and other guidance have been published. However, most of them are focused on recording globalization in indicators at current price prices and very little attention is drawn to price and volume measures. The aim of the paper is to present the deflation techniques that are applied by the Czech Statistical Office on foreign trade, especially merchanting, re-export and processing. They have been used since 2014 when a major revision of national accounts took place.

¹ Prepared by Petr Musil.

I. Introduction

1. Globalization is phenomena, which is going on rapidly and the Czech Republic has significantly been influenced. The Czech Statistical Office has been dealing with globalization for about 10 years. Work has been supported by Eurostat grants under which methodology has been developed. The results can be found in publications Foreign Trade in Czech National Accounts and Input-Output Tables in the Czech Republic.

2. Current methodological framework, the System of National Accounts 2008 (2008 SNA) and the European System of Accounts 2010 (ESA 2010) respectively, take into account globalization issues. Supplementing Manuals such as Guide to Measuring Global Production have been published as well. However, economy is changing day to day and compilers have to react immediately to cover and record all transactions occurring in the national economy.

3. The Czech Statistical Office carried out a major revision of national accounts in 2014. The revision was focused on a transition from ESA 1995 to ESA 2010. Moreover, some other improvements were also implemented. Initially statisticians focused mainly on estimates at current prices and less on volume measures. As there was no international guidance the Czech Statistical Office has developed own deflation techniques for foreign trade. Special attention was drawn to deflation of re-export and merchanting. The Czech approach has been promoted at international meetings such as Task Force on Price and Volume Measures, Technical Group on Consolidated EU28 and Euro Area Supply-Use and Input-Output Tables.

II. Foreign trade

4. Deflation techniques cannot be presented without a brief introduction to the compilation of foreign trade statistics in the Czech Republic. In the past foreign trade in goods was based on Intrastat and Extrastat that record physical movement of goods. It was an approximation of the change in ownership principle. However, it was found out that the assumption is no longer valid as the Czech Republic joined the EU and the single market in 2004. The discrepancy between cross border statistics and foreign trade based on the ownership principle was detected within supply and use tables. Export based on cross border concept of particular products was significantly higher than output. It led to changes in export and import in national accounts and subsequently concept of foreign trade statistics (FTS) was moved from cross border concept to changes in ownership concept. Results were published in 2011 when a major revision of national accounts took place.

5. The method of estimating foreign trade has been improving since 2011. Moreover, the method had to be changed in 2014 as the new standard, ESA 2010, became effective. Following components of export and import are recognized:

- Export
 - Goods
 - Merchanting
 - Re-export
 - Other goods
 - Services
 - Processing
 - Purchases of non-residents with domestic territory
 - Other services

- Import
 - Goods
 - Merchanting
 - Re-export
 - Other goods
 - Services
 - Processing
 - Purchases of resident households abroad
 - Other services

6. Each component of export/import is also available in product breakdown (CPA classification), i.e. 6 vectors of export and 6 vectors of import are taken over from FTS to national accounts. In addition to that, industrial breakdown (NACE classification) is available for processing only.

III. Deflation of foreign trade in national accounts

7. Supply and use tables (SUTs) are an integral part of Czech national accounts and full consistency between sectoral accounts and supply and use tables is ensured. Balancing of annual GDP by production and expenditure approach is also carried out within SUTs. Adjustments resulting from the balancing process are taken over to sectoral accounts and also to balance of payment. Supply and use tables represent a powerful tool for deflation as detailed product structure and appropriate valuation are used. Preliminary version of SUTs is compiled using less detailed product breakdown (CPA 2 digit level, 88 products), however the second version of SUTs is produced using more than 200 products. Moreover, some products are divided into additional components such as processing service, merchanting, agriculture self-supply, non-market output. As a result about 2.000 product codes are applied within the second version of SUTs. For each of the 2.000 products appropriate price index is used.

8. Each the above mentioned types of export and import has its own price indices. As globalisation is increasing, merchanting, processing and re-export are becoming more and more important. Besides methods of the estimation of indicators at current price the Czech Statistical Office has focused on price and volume measures of these indicators.

A. Merchanting

9. The concept of merchanting has been significantly changed. ESA 1995, and 1993 SNA respectively, recognize merchanting as a trading service and it is recorded in export of trading products (CPA 45-47). The new definition set by ESA 2010 (SNA 2008) requires 'net' recording of merchanting under goods as the difference between sales and costs on sold goods traded abroad. Actually, it is measured as margin. Goods are purchased by a resident abroad and subsequently sold in the same country or another country. Nevertheless, goods must not cross borders of domestic territory otherwise the transaction is considered as re-export.

10. Data on sales and costs related to merchanting of resident units is surveyed with the statistical questionnaire on Export and Import of services (ZO 1-04). Respondents are asked to report costs and sales related to goods that are purchased/sold abroad. Information on countries where goods are purchased/sold is also collected.

11. The Czech approach to deflation of export of merchanting is very similar to double deflation applied of gross value added. Export of merchanting is not deflated directly as trade margin because a traditional method for deflation cannot be applied. Basic price of the product that is traded (CPA 35 in the following example) is zero and there is no base, see the example in figure 1:

Figure 1

Use table, Export of merchanting

Product (CPA code)	Label	Purchasers' prices	Trade margin	Basic prices
35	Electricity, gas, steam	100	100	0
46	Wholesale trade service		-100	100
	Total	100	0	100

Source: the author, fictitious data

12. It means that purchases and sells of goods are deflated separately by producer price indices of countries where the transactions occur. These indices are adjusted to changes in exchange rates. The process of deflation is described in the following paragraphs.

13. Two matrices are prepared using survey data:

- Matrix of shares of purchases (sales) CPA x NACE
- Matrix of value of goods purchased (sold) countries x NACE

14. The presented illustrative example uses fictitious data. It shows the approach of estimation of tradition merchanting at previous year's prices. Countries are marked by upper case letters K, L, M, O and P, industries (NACE) by lower case letters a, b, c and d and products (CPA) by upper case letters A, B, C and D.

15. In real data, there are much more countries, industries and products and most cells in the tables are empty. The most important countries for Czech merchanting activities are Germany, Hungary, Poland or Slovakia. Merchanting is observed in industries NACE 351, 352, 453 or 467. The biggest values for products are for CPA 351, 352 or 291. Table 1 records shares of total purchases of goods in breakdown by NACE (a, b, c, d) and CPA (A, B, C, D). Therefore the sum of the values in this table has to be equal to 1.

Table 1

Shares of total purchases

CPA / NACE	a	b	c	d
A	0.0348	0.0307	0.0846	0.0682
B	0.0648	0.0614	0.0648	0.0607
C	0.0969	0.0382	0.1003	0.0450
D	0.0491	0.0839	0.0539	0.0628
Total	0.2456	0.2142	0.3035	0.2367

Source: the author, fictitious data

16. Table 2 shows value of purchases of goods in breakdown by NACE (a, b, c, d) and country (K, L, M, N, O and P). There are also countries divided into three areas, for reasons which will be described below.

Table 2
Value of purchases

Countries / NACE	a	b	c	d	area
K	70	26	130	90	w
L	66	88	15	74	e
M	12	94	83	78	o
N	59	20	10	28	e
O	88	69	60	100	w
P	56	51	20	79	o

Source: the author, fictitious data

17. The first step is modification of the matrix CPA x NACE (table 1). Shares of each CPA code for the total value of NACE are calculated, see table 3:

Table 3
Shares of each CPA on the value of NACE

CPA / NACE	a	b	c	d
A	0.142	0.143	0.279	0.288
B	0.264	0.287	0.213	0.256
C	0.394	0.178	0.330	0.190
D	0.200	0.392	0.178	0.265
Total	1.000	1.000	1.000	1.000

Source: the author, fictitious data

18. The next step is transposition of table 3:

Table 4
Transposition of table 3

NACE / CPA	A	B	C	D	Total
a	0.142	0.264	0.394	0.200	1.000
b	0.143	0.287	0.178	0.392	1.000
c	0.279	0.213	0.330	0.178	1.000
d	0.288	0.256	0.190	0.265	1.000

Source: the author, fictitious data

19. After that the estimation continues with modification of the matrix Countries x NACE (table 2). The countries are divided into three areas: Europe – western countries (representative is Germany), Europe – eastern countries (representative is Hungary) and other countries (representative is Russia). Representatives are the countries, which have the biggest values of purchased goods in the respective area. The reason for this division is greater accuracy of the estimate. On the other hand it is not possible to do calculation country by country that would be too demanding. Each area has different domestic producer price indices, which are used for calculation in the following step. The difference between the indices of different areas is so reflected in the final results.

Table 5
Aggregation into areas

Countries / NACE	a	b	c	d
western (w)	158	95	190	190
eastern (e)	125	108	25	102
other (o)	68	145	103	157
Total	351	348	318	449

Source: the author, fictitious data

20. In order to obtain the matrix Countries x CPA, matrix Countries x NACE (table 5) is multiplied by matrix NACE x CPA (table 4). This matrix is transposed and the result is presented in table 6:

Table 6
Matrix CPA x Countries

CPA / Countries	western (w)	eastern (e)	other (o)	Total
A	143.69	69.55	104.36	317.60
B	158.22	95.44	121.76	375.42
C	178.17	96.23	116.57	390.96
D	152.92	98.79	130.31	382.02

Source: the author, fictitious data

21. Then the shares of groups of countries in the sales/costs of each product are calculated, see the table 7:

Table 7
Weights of areas

CPA / Countries	western (w)	eastern (e)	other (o)	Total
A	0.452	0.219	0.329	1,000
B	0.421	0.254	0.324	1,000
C	0.456	0.246	0.298	1,000
D	0.400	0.259	0.341	1,000

Source: the author, fictitious data

22. Weighted price index of sales/costs for each product is calculated. PPIs of respective countries (Germany, Hungary and Russia) are applied. Using these indices sales and costs at previous year's prices are estimated. Then merchanting at previous year's prices is estimated. Implicit deflators of merchanting (merchanting at current prices divided by merchanting at previous year's prices) in commodity breakdown are estimated and used in national accounts.

23. Another issue that has not been solved yet is the import of merchanting. Sometimes it is called inverse (negative) merchanting. It is a mirror case to 'traditional' merchanting, but there are no guidelines for it even for estimates at current prices. Currently, price

indices of import are applied. Separated deflation of sales and costs seems to be quite demanding provided its insignificance in the Czech Republic.

B. Processing

24. Export of processing services is deflated by producer price indices. It is supposed that the price development of the processing service is the same as the price development of the goods themselves. The Task Force on Prices and Volumes discussed possible methods for deflation. Another option that was considered was deflation by price indices of inputs: wages, intermediate consumption. However, in most countries including the Czech Republic input structure is not known. Last option is 'double deflation' i.e. to deflate material inputs and goods separately. In the past, this approach was used in the Czech Republic, but we don't have good experience. The different types of price indices can vary due to many reasons, but processing fees are usually fixed in the contract and they are not subject to sudden changes. Similarly, import of processing services is deflated by price indices of import.

C. Re-export

25. The concept of re-export is very similar to merchanting. The good is purchased from a non-resident and subsequently sold to another non-resident. Unlike merchanting the good has to enter into the domestic territory and later leave the territory. Merchanting is recorded on 'net' basis (margin) but re-export on 'gross' basis. As ESA 2010 stresses the ownership principle it is difficult to distinguish between these transactions. However, the Czech Statistical Office follows ESA 2010 and records them separately. Re-export is included in trade in goods and it has to be separated. It is crucial for the compilation of SUTs and even for input-output tables that there is a division between imported products and domestic products. The separation of re-export has no impact on the balance of foreign trade at current prices but it may have an impact on volumes depending on deflation methods used. The value of the good itself is deflated by import price indices on the both sides (import and export). The margin, which is recorded under export and which is realized by the resident, is deflated applying margin-to-basis ratio from the previous period. The same approach is generally applied to the whole margin of the economy. Export price indices are not used as they may have a notable impact on the balance at previous year's prices when different types of price indices are applied on import and export.

IV. Conclusion

26. Deflation of foreign trade represents a challenging task as globalization is speeding up and it is dependent on to the applied estimation methods of foreign trade at current prices. Deflation methods should follow the definition of export and import. Merchanting and processing become more and more important. Actually, these are services transactions in spite of recording merchanting under export or import of goods. Price statistics provides no specific indices for these transactions in the Czech Republic and probably the situation is similar in other countries.

27. Generally, deflation of services is more complex as the definition of representatives is more complicated, etc. Only few producer price indices for services are available and no price index is compiled for merchanting and processing. The assumption of the same price evolution of the service and good itself is applied in the Czech Republic. Deflation of processing was discussed at a meeting on Price and Volume Measures. We are convinced that the assumption presented above is acceptable. Other suggested methods are double

deflation method or input method. Double deflation (deflation of export and import of goods for processing separately) may lead to implausible results as the service can be very small compared to the value of good itself and the results could be volatile. Input structure is usually not known.

28. Deflation of export of merchanting is slightly tricky as it is recorded on net basis as trade margin. We were discussing the deflation method for a long time in the office. As no guidance was available we developed our own method. We presented it at a meeting of Task Force on Price and Volume Measures in 2015. We are persuaded that this is the best possible method and it reflects reality as close as possible, despite the fact that prices in the country of purchase and in the country of sale may significantly differ.

29. The main task was to prepare new deflation techniques as ESA 2010 became effective in 2014. New methods were developed and they had also to be implemented in SUTs. It required additional breakdowns of export and import and technical procedures had to be changed as well.

References

CZSO. 2014. Foreign Trade in Czech National Accounts (ESA 2010). Praha, 2014.
Available from: https://apl.czso.cz/nufile/Methodology_FT_ESA2010_CZ_web_May2014_grant.pdf

CZSO. 2016. Input-Output Tables in the Czech Republic (ESA 2010). Praha, 2016.
Available from: https://apl.czso.cz/nufile/Inventory_SC_ESA2010_en_final.pdf

EUROSTAT. 2016. Handbook on Price and Volume Measures in National Accounts.
Luxembourg, 2016.
