Annex I

IMPROVEMENT OF QUALITY NATIONAL ACCOUNTS

Project 2:

Improving price and volume measures with respect to ESA 2010

Czech Republic

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Input-Output Tables in the Czech Republic

(ESA 2010)

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Foreword

The document represents the comprehensive description of sources and methods used in compilation of supply and use, symmetric input-output tables. It also describes role of supply and use tables in Czech national accounts. This document may help users to have detailed information how supply and use, symmetric input-output tables are compiled.

Supply and use tables, symmetric input-output tables have been affected by changes in methodology. ESA 2010 has changed many issues that have an impact on interpretation of supply and use, symmetric input-output tables. The first part is devoted to compilation of macro-aggregates focusing on commodity structure. Data sources, methods and assumptions are explained. Balancing process is also introduced.

Next part is devoted to deflation techniques and price indices used. Our approaches to all macro-aggregates are described. Special attention is focused on changes caused by ESA 2010.
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1. Introduction

System of national accounts represents a tool for description of economy. It may be divided into two main parts. The first one is focused on production, distribution and redistribution of income and accumulation of wealth. It leads to sector accounts. The second one is system of supply and use tables, symmetric input-output tables. These tables describe sources and uses of products and technological relations. They are used for balancing of GDP from production and expenditure approach and deflation of macro aggregates. They can be also employed for econometric modelling.

Compilation of national accounts should be based on the same definitions and principles in order to ensure international comparability. International standard SNA 2008 is international recommendation. However, European standard ESA 2010 is obligatory for EU countries. It was published in the Official Journal on 26 June 2013 and implemented in September 2014 in EU.

The Czech Statistical Office produces a set of estimates of national accounts based on its revision policy. A very first estimate of development of GDP (nothing else) is available 45 days after the referred quarter. Sources and uses of GDP are published on 60\(^{th}\) day and quarterly sector accounts 90\(^{th}\) day after the quarter. Supply and use tables are not compiled quarterly nevertheless some structures from supply and use tables are used.

Concerning annual national accounts the Czech Statistical Office (CZSO) produces two versions of annual national accounts: preliminary (t+6 months after the referred year) and definitive (t+18 months). However, following versions are compiled to ensure the consistency with government statistics that has different revision policy. As these changes have usually small impact of transactions in product, supply and use tables are not affected significantly.

2. Input-Output Tables

Input output tables is designation for two types of tables: supply and use tables (SUTs) and symmetric input-output tables (SIOTs). SUTs in form of matrices record how supplies of different kinds of goods and services are allocated between intermediate consumption and final uses. They are used as a balancing tool for national accounts. Base for their compiling is a balance between sources of goods and services (left side of equation) and their uses (right side of equation). This equation (1) is valid in classification by products according to CPA classification:

\[
 O + I + NTP = IC + FC + GFCF + \Delta In + E
\]  

Where:
- \( O \) is output of goods and services,
- \( I \) is import of goods and services,
- \( NTP \) are net taxes on products (taxes – subsidies),
- \( IC \) is intermediate consumption,
- \( FC \) is final consumption,
- \( GFCF \) is gross fixed capital formation including valuables,
- \( \Delta In \) are changes in inventories,
- \( E \) is export of goods and services.
Supply and use tables are a necessary first step in preparing of symmetric input – output tables (SIOTs), which are derived by mathematical transformation from SUTs at basic prices. These tables are used mainly for economic analysis and econometric modelling. SIOTs are compiled in two types:

- product (CPA) x product (CPA)
- industry (NACE) x industry (NACE)
Where: P.2 (b. p.) is intermediate consumption at basic prices, 
D.21-D.31 are net taxes on products, 
P.2 (p. p.) is intermediate consumption at purchasers’ prices, 
B.1g is gross value added, 
P.1 is output at basic prices, 
P.7 is import.

The dimension of SIOT is same for product by product and industry by industry type. In both cases 2-digit level classification of products (2-digit CPA) resp. industries (2-digit NACE) is used. Some products (industries) are aggregated so the final dimension of intermediate consumption matrix in both types of SIOTs is 82 x 82 items (products resp. industries).

2.1. Input-Output Tables in the Czech Republic

Supply and use tables are compiled within all versions of annual national accounts and they are fully consistent with sector accounts. Annual GDP and its components are balanced and deflated within SUTs. Two main approaches to SUTs are applied.

The first version of annual accounts is compiled within system MS Excel files that have been developed by the Czech Statistical Office. This system is also used for compilation of SUTs within extraordinary revisions (e.g. transition to ESA 2010). This is based on two MS Excel files that contain data on resources (SUP file) and uses (USE file). These files are interlinked. There are several sheets usually each sheet is designed for particular macro aggregate. There is a set of tables in each sheet. The very first one contains input data (compiled outside, e.g. output matrix or calculated, e.g. matrix of trade margin), next matrix is designed for balancing adjustment and final tables that are sum of input data and balancing adjustments. Some sheets are devoted to estimates that are used for compilation of symmetric input output tables (use table of domestic products). Size of SUTs is 120 industries and 89 products, some indicators (e.g. export and import) are divided to more categories (merchanting, processing …).

Definitive version of supply and use tables is prepared within software SNA-NT. This software was developed by Norwegian statistical office and is based on ORACLE database. It has almost no limit to number of products, industries etc. Balancing and deflation is carried out within SNA-NT software then data are downloaded to MS Excel in order to prepare publications. About 200 product groups are used, but many of them are divided into other categories due to specific deflation (processing, merchanting, non-market services, agriculture self-supply etc.). Almost 2500 product codes are used in the Czech Republic.

The CZSO compiles SIOTs according to EUROSTAT Manual regularly in five year period that is required by the EU transmission programme (years with 0 and 5 at the end). Due to the fast changes of structures in the Czech economy, the CZSO publishes also preliminary tables to provide users updated data. Up to now, the CZSO published product-by-product SIOTs only. From 2012, the CZSO publishes also industry-by-industry SIOTs. In ESA 2010 methodology are available SIOTs for 2010 only. Another years since 1990 will be published on 31 March 2015.

Product-by-product tables describe structure of sources, uses and value added by individual products. The calculation is based on Product technology assumption (model A of Manual). This method supposes that products are produced by the same technology in all industries.

Industry-by-industry tables describe structure of sources, uses and value added by industries. For example, in the matrix of intermediate consumption you can find inputs to individual industries not in the form of products but in the form of output of industries. The calculation is based on assumption of Fixed product sales structures (model D of Manual).
3. Compilation of supply and use tables at current prices

3.1. Output

Output consists of the products created during the accounting period. Basically it is the sales of own products and services.

Three types of output are distinguished in the ESA 2010:

**Market output (P.11)** consists of output that is disposed of on the market or intended to be disposed of on the market, **output produced for own final use (P.12)** which consists of goods or services that are retained either for final consumption or for gross fixed capital formation by the same institutional unit and **other non-market output (P.13)** that covers output that is provided for free, or at prices that are not economically significant to other units.

The output is also divided based on relation to individual institutional units: **market producers** (the major part of their output is market output), **producers for own final use** (the major part of output is for own final use within the same institutional unit) and **other non-market producers** (the major part of the output is provided for free or at not economically significant prices).

**All output has to be valued at basic prices.** It is the price receivable by the producers from the purchaser for a unit of a good or service produced as output, minus any tax payable on that unit as a consequence of its production or sale (i.e. taxes on products), plus any subsidy receivable on that unit as a consequence of its production or sale (i.e. subsidies on products). It excludes any transport charges invoiced separately by the producer.

**P.1 structure according to CPA x NACE:**

In the sector-industry tables (SO- tables) output is in form of vector, but for needs of SUTs compilation, P.1 has to be layout into form of matrix. This layout to matrix (CPA x NACE) proceeds in several stages:

At first subsectors data are divided into individual type of producers: market producers (market output of sectors S.11 - S.15) and non-market producers (non-market output of government and NPISH).

Then the vector of NACE for P.1 for each type of correction x subsector is taken over from the relevant SO-tables that must be maintained in a matrix P.1. Individual types of corrections are:

- **KZ** = input data (each sector has a different data source);
- **KO** = corrections of the input data (corrections to the data reported in the statistical questionnaire as data sources, corrections from analysis industry and corrections from analysis of discrepancy B.9);
- **KU** = adjustment assumed for completeness of the economy (grey and illegal economy, intentional misrepresentation, wages in kind, estimate for units without a registration obligation, estimate for units that have not been interviewed and for units which do not subject to discovery);
- **KE** = extrapolation (consumption of fixed capital, housing services, extrapolation of undetected data, flows of commodities, capitalization of software produced own-account, entertainment, literary and artistic originals, capitalization of R&D expenditure, notional units);
- **KK** = a conceptual adjustments (gain / loss from holding, leasing, merchanting, wages in kind, travel expenses, taxes / subsidies, insurance / pension entitlements, FISIM, activation-exclusion turnover within the company, emission allowances, consolidation of energies (electricity and gas) and fuels, small tools, agency work, etc.);

In the next step output is divided into individual types, i.e. on P.11 without trade margins, trade margins in P.1, P.12, P.131 and P.132. Their structures are treated differently according to the following procedure:
P.11 without trade margins (TM) + P.131

The structure of P.11 is collected and compiled every year. For P.131 the same structure like for P.11 is used. The structure of commodities (CPA) is created by using the statistical questionnaire P 5-01/A050 (for NACE 01-02 and 41-99) and statistical questionnaire Prum 2-01/004 and 2-01/500. The industry structure (NACE) is created by using statistical questionnaire P 5-01/A024 (from the A024 relevant rows are used depending on how P.11 is calculated). Then the vector of NACE is weighed to the individual commodities according to questionnaire A050. For S.12 and NACE 65 structure is submitted from the financial accounts department in the national accounts => for individual subsectors and types of adjustments (without specific commodities and commodities that are allocated according to the substantive point of view) the same layouts to CPA are used.

For P.131 the same structure like for P.11 is used. Only for the statistical questionnaires in which this type of production is included (i.e. VI 1-01 and NI 1-01) => for individual subsectors and types of adjustments the same layout to CPA is used and virtually only for sectors S.13 and S.15.

Trade margins in P.1 (CPA 45 to 47)

The structure is collected and compiled every year. For NACE 01-03 and 41-99 the statistical questionnaire P 5-01/A070 is used and for NACE 03-39 Prum 2-01/700 is used. In both statistical questionnaires the difference of two items is used (Sales from sold goods - Costs of goods sold) => for individual subsectors and types of adjustments the same layout to CPA is used.

P.12

The structure is also collected and compiled every year. According to the matrix of gross fixed capital formation (GFCF) relevant commodities are selected. Then from statistical questionnaire P 5-01/A050 (for NACE 01-02 and 41-99) and from statistical questionnaires Prum 2-01/004 and 2-01/500 (for NACE 03-39) the relevant CPA are selected in breakdown into tangible and intangible assets (according respective products from GFCF). Total value of indicator "Activation tangible assets" is allocated to products according the structure. It is done for each industry separately. This vector is then weighed by the structure of CPA. The same procedure is used for intangible assets with indicator "Activation intangible assets" from A024. Then these two matrices are merged => for individual subsectors and types of adjustments (without specific commodities and commodities that are allocated according to the substantive point of view) the same layout to CPA is used.

P.132

The structure for CPA is not surveyed, but is automatically assigned to the cross (i.e. the value of NACE 010 is assigned to the CPA 01, etc.).

We distinguish also specific commodities (CPA):
- more detailed breakdown of beverages (CPA 11 – structure according to A050) to spirits, wine, beer and non-alcoholic beverages (by individual NACE)
- distribution of electricity and gas for households (351A00 resp. 352A00) and for other users (351B00 resp. 352B00)
- rental paid (CPA 68 by individual sectors and NACE)
- distribution on individual types of buildings: residential buildings (by individual NACE), individual housing construction (IHC) – only NACE 68, non-residential buildings (by individual NACE)
- own–account production of agricultural products, for example plants, livestock, firewood, meat, fats or beverages
- FISIM (CPA 641 and only NACE 640)
- CNB (Czech National Bank) (CPA 641 and only NACE 640)
- imputed rent (CPA 682 and only NACE 682)
- research and development – only P.12: R&D – natural and technical sciences and human sciences (by individual NACE)
- capitalization of software produced own-account (CPA 62 and by individual NACE);
- services processing - export (matrix CPA x NACE is taken from the foreign trade statistic in the national accounts)
Assignment to commodities:

Adjustments KU:
- a) N7 - wages in kind for the P.131 (CPA according to the breakdown by items of the wages in kind, each item corresponds with the respective CPA). This type of adjustment is made in all sectors (S. 11 – S. 15).
- b) N2 - illegal activities (drugs, prostitution, stolen cars, illegal copying, fuel, tobacco or alcohol). The production is allocated on the diagonal of matrix and adjustments are made only for sectors S. 11 and S. 14.
- c) N3 - own-account production of agricultural products for the P.11 without trade margin, gardeners for the P.11 without trade margin or services of domestic staff for the P.11 without trade margin (S. 14)

Adjustments KK:
- a) C6 - taxes and subsidies for the P.11 without trade margin and P.12 are assigned to the cross according to NACE for sectors S. 11 and S. 14
- b) C10 - emission allowances and consolidation in the energy sector (electricity and gas) for the P.11 without trade margin are also assigned to the cross according to NACE (only S. 11)
- c) C13 - agency works and sales of mobile phones for the P.11 without trade margin are assigned to the cross according to NACE) S. 11

Adjustments KE:
- a) E6 - entertainment, literary and artistic originals and mark-up factor for operating surplus (CPA 41 for the tangible fixed assets and by individual NACE x CPA 62 for the intangible fixed assets and by individual NACE) for sectors S. 11 and S. 14
- b) E9 - notional units for the P.12 (are assigned to the cross according to NACE) S. 14

According to these individual steps each matrix of P.1 is compiled. The final P.1 matrix is the sum of individual matrices (according to the aforementioned steps). 
The resulting matrix of P.1 enters into the SUTs as the input data source (for format SNA-NT and Excel). Matrix is modified by individual adjustments during balancing of the SUTs. 
The whole matrix (at the beginning and at the end) should apply the rule of diagonalization, i.e. the biggest part of the NACE should be assigned to the cross, (to the CPA, which corresponds to respective NACE (e.g. in NACE 010 should be the largest share in the CPA 01, etc.).

3.2. Intermediate consumption

Intermediate consumption consists of value of goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as a consumption of fixed capital. The goods and services are either transformed or used up by the production process.

Intermediate consumption (executive consumption) includes: consumption of materials, energy, the cost of rent, travel expenses, transport, repairs and maintenance, other material operations, costs of external works, supplies and services (except of depreciation of long period tangible and intangible property and personal costs). Also commission of insurance intermediaries for insurance contracts, costs of advertisement, costs of companies for bank services, fees for accounts etc. are included there.

Products used for intermediate consumption are caught and priced in a moment of their entrance into manufacturing process. Intermediate consumption is priced at purchasers’ prices, but output is priced at basic prices. Matrix of intermediate consumption is constructed for both versions (preliminary and definite) and the source file is called P.2. The basic for the matrix construction is questionnaire
P5-01, the largest and relatively most exact data on enterprises. Survey is made usually once in 5 years. If current data are not available, estimation according to previous period (version) is used. The estimation uses entrance (structural) matrices of non-market intermediate consumption for sectors S15, S133, S131+S134, market intermediate consumption, processing (import) and merchanting (import). Source data are taken from sector industry tables (SO tables). Data are presented in NACE classification according to industry as a vector of intermediate consumption (in 120 NACEs) according to institutional economic sectors. These vectors are sent to a matrix of intermediate consumption according to entrance matrix for each CPA (2-digit CPA 89 commodities or 3-digit CPA 252 commodities) and for each economic sector. Then the vectors are adjusted to data in SO tables. Data on FISIM and CNB are added from financial accounts of bank statistics. Data on intermediate consumption related to import of merchanting and processing is taken over from foreign trade statistics. Data on processing are surveyed for the whole supply matrix. Data on merchanting are surveyed only overall for each 3-digit CPA and has to be calculated also according to NACE. In processing we need to edit the source data for NACE, where there is the biggest deviation in CPA diagonal in comparison with previous version. The reason for this adjustment is that statistical units do not always distinguish between standard import and import for processing. These data need to be adjusted.

The editing of entrance data is done in relation to methodical differences between business and national concept of accounting according to new ESA principles. Except mentioned data on FISIM and CNB it includes leasing (the biggest part is included in a fixed capital formation), costs of research and development etc. The consolidation adjustments are made (transformation of costs to related industries) in order to avoid distortion of economic indices (production without related material entrances or the number of employees etc.). These adjustments refer mainly to refineries, energetics and gas distribution. The main reason for consolidation is different deflation in the industry of manufacture and trade (refineries), also the use of another way of deflation for household consumption and another way for manufacturer (energetics and gas).

During the balancing process of intermediate consumption in SUTs RAS procedure is often used – editing of CPAs (sometimes also NACEs) in intermediate consumption. The aim of this procedure is to avoid destruction of the matrix structure of intermediate consumption. By using RAS procedure CPAs (possibly NACEs) are edited to require values resulted from the balancing process. For this procedure row (CPA) and column (NACE) coefficients are used and entrance structural matrix. This entrance structure is adjusted by using row and column coefficients and after certain number of interactions the square deviation difference is minimized. The adjustments are performed in RAS table by using visual basic macro. The macro works with a condition that difference of a row and a column vector should be equal to zero. The difference to the original structure is transformed into SUTs as an adjustment from RAS procedure. The calculation of intermediate consumption at current prices (so called deflation) will be described in a separate chapter. It is necessary to transform the matrix of intermediate consumption from purchaser’s to basic prices. The quality of the matrix related to intermediate consumption (margins, taxes, subsidies) determines the quality of deflation of intermediate consumption, which is one of the most complicated areas of price calculations.

3.3. Final consumption

3.3.1. Final household consumption expenditure

Final household consumption expenditure (FHCE) is in SUTs recorded on the uses side at purchaser’s prices and national concept. This is the expenditure of residents’ households in the country and abroad. FHCE is primarily recorded in the COICOP (classification of individual consumption by purpose) at the 4-digit level (about 370 items) and published at 2-digit level classification. It is available at the national and domestic concept. Final household consumption expenditure in relation to the supply and use tables should be expressed in matrices COICOP x CPA and divided into three main segments:
- FHCE of domestic households in the Czech Republic
- FHCE of domestic households abroad
- FHCE of non-resident households in the Czech Republic

The matrices of FHCE are compiled in the dimension 4-digit COICOP x 2-digit CPA in the preliminary version of the SUTs. The SUTs in definite version is compiled in a Norwegian software SNA-NT, where the commodity structure of the FHCE corresponds to the items in 3-digit CPA classification. The commodity structure consists of the common code of products (related to 3-digit CPA) and specific code of products that are excluded from the common products. Reasons for commodity exclusion could be that:
- items are out of the balancing process (use side equals to supply side), for example imputed rents, paid rents, FISIM, highway labels, fee for registration of a vehicle, household personal services, own-account production or illegal activities or
- alternative estimate, including estimate of illegal parts, is used, for example for tobacco, alcohol, electricity or gas

FHCE of domestic households in the Czech Republic is primary compiled in the 4-digit COICOP and then by using the transition matrix is constructed the matrix of the FHCE of domestic households in the Czech Republic in 4-digit COICOP x 2 or 3-digit CPA (depends on the version of the national accounts). This matrix shows common and specific products. Some items of CPA are assigned to the competent item of COICOP.

FHCE of domestic households abroad and final household consumption expenditure of non-resident households in the Czech Republic are primarily compiled in the classification CPA and then by using the transition matrices are constructed matrices 4-digit COICOP x 2 or 3-digit CPA.

Balancing process and FHCE
There are two possible situations in the balancing process in relation to the FHCE. In the preliminary version the SUTs are compiled in 2-digit CPA classification. There are three vectors in breakdown into CPA (domestic consumption, residents, and non-residents) in the FHCE. It is available in size 4-digit COICOP x 2-digit CPA. The balancing adjustments to FHCE in the SUTs are recorded in the vector of 2-digit CPA and then by using the transmission matrices are transferred to the COICOP. Three final matrices are distinguished (domestic consumption, residents, and non-residents).

In the definite version the SUTs are compiled by software SNA-NT. The balancing adjustments to the FHCE are specifically recorded in dimensions 4-digit COICOP x CPA. The direct output of the SNA-NT is also in three matrices (domestic consumption, residents, and non-residents). Specific products mentioned above (e.g. imputed rent, agriculture self-supply) are not subject of balancing.

3.3.2. Government final consumption expenditure (GFCE)
Government final consumption expenditure (GFCE) consists of all government current expenditure incurred by general government on both individual consumption goods and services and collective consumption services. GFCE includes two categories of expenditures:
- other non-market output produced by government
- social transfers in kind (D.632), which are purchases of goods and services by general government, produced by market producers that are supplied to households, without any transformation. This implies that general government just pays for goods and services that sellers provide to households

We distinguish between two groups of GFCE:

Goods and services for individual consumption (P.31) are goods and services acquired by a household and used to satisfy the needs and wants of members of that household. Examples
of these products and services are: medical products, appliances and equipment, outpatient services, hospital services, public health services, recreational and sporting services, cultural services and education.

Individual goods and services have the following characteristics:
- it has to be possible to observe and record the acquisition of the goods and services by an individual household or member thereof and also the time at which the acquisition took place
- the household has to agree to the provision of the goods and services and takes the action necessary to consume the goods and services, for example by attending a school or clinic
- the goods and services are such that their acquisition by one household or person, or by a group of persons, precludes its acquisition by other households or persons

Collective services (P.32) are services for collective consumption that are provided simultaneously to all members of the community or all members of a particular section of the community, such as all households living in a particular region. It could by these products and services: general public services, army, public order and safety, economic affairs, environmental protection, housing and community amenities, general administration, regulation, dissemination of general information and statistics.

Collective services have the following characteristics:
- they can be delivered simultaneously to each member of the community or to particular sections of the community, such as those in a particular region or locality
- the use of such services is usually passive and does not require the agreement or active participation of all the individuals concerned
- the provision of a collective service to one individual does not reduce the amount available to other in the same community or section of the community

Structure of GFCE by CPA:
D.632 - „Social transfers in kind“
The breakdown into CPA is based on the direct administrative data. This item is for S.1311 and S.1313 reported by state organizational units and local budgetary organizations. Data reported in the budget structure are used for the fulfilment of this item and for its layout into CPAs. Budgeted expenditures are broken down by items (i.e. the breakdown allows classification of items to ESA 2010) and by paragraphs (breakdown used for classifying expenditure in COFOG and CPA). Approximately 86 % of the items are reported for item D.632 for S.1311 and S.1313. It presents a housing allowance and housing supplement (CPA 68). The rest consists mainly of expenditure on retraining (CPA 85), travel allowance (CPA 49) and funeral and death grants (CPA 96). Furthermore, allowance is paid for the purchase of special aids to mobility, for the purchase and operation of a motor vehicle, allowance for the purchase, repair and special modifications of a motor vehicle, special modifications and operations of the barrier-free apartment (CPA 26, 27, 30, 32 and 43). In the case of S.1314 item D.632 includes the cost of health services covered by public health insurance. The basis for allocation is an additional source of data "Cost structure for health services according to individual segments". In case of cost recovery on preventive health care from prevention fund public health insurance, the source is the utilization of this fund. These administrative data sources for public health insurance companies allow to layout item D.632 into CPA and COFOG (up to 4-digit COFOG classification).

P.132 – „Non-market output“
Non-market output is by definition automatically assigned to the diagonal (i.e. the value of NACE 010 and assigned to the CPA 01, etc.).

These individual vectors for GFCE serve as the input data for the SUTs (for format SNA-NT and Excel). Vectors are adapted by individual corrections during SUTs balancing.
This vector is for the needs of the SUTs divided on:
- Goods and services for individual consumption (P.31) which consist of item D.632 and partly of the item P.132. Attributable portion of the item P.132 on individual consumption is taken from the COFOG and is treated as to individual consumption in the CPA (ESA 2010 methodology must be complied in the inclusion of individual products and services - see above).
- Collective services (P.32) which consist of a part of the item P.132. Attributable portion of P.132 is also taken from COFOG and treated as collective consumption in the CPA (must follow ESA 2010 methodology in the inclusion of individual products and services - see above).

It is always ensured that the sum of the individual and collective consumption for each CPA must give item P.132 in this CPA.

3.3.3. NPISH final consumption expenditure (NPISHFCE)
According to ESA definition it consists of expenditure incurred by resident institutional units on goods or services that are used for the direct satisfaction of individual needs or wants or the collective needs of members of the community. The consumption expenditure may take place on the domestic territory or abroad. It includes two separate categories:
- the value of the goods and services produced by NPISHs other than own-account capital formation and other than expenditure made by households and other units
- social transfers in kind (D.632) which are expenditures by NPISHs on goods or services produced by market producers that are supplied without any transformation to the households for their consumption

Final consumption expenditures (P.3) by general government or NPISHs are equal to the sum of their output (P.1) plus the expenditures on products supplied to households via market producers minus the payments by other units and minus own-account capital formation (corresponding to P.12).

<table>
<thead>
<tr>
<th></th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Government</td>
</tr>
<tr>
<td>Individual consumption</td>
<td>X (D.632 - social transfers in kind)</td>
</tr>
<tr>
<td>Collective consumption</td>
<td>X</td>
</tr>
<tr>
<td>TOTAL</td>
<td>Government’s final consumption expenditure (GFCE)</td>
</tr>
</tbody>
</table>

Note: X = applicable and 0 = not applicable

Structure of NPISHFCE by CPA:
D.632 - „Social transfers in kind“
Purchased market production of NPISHs is due to the absence of source data transferred to the CPA by expert estimates according to earlier classification CZ-SKP. In the future, you might use source data from the CZ-COPNI, which are available only since 2012 in statistical questionnaire NI 1-01.

P.132 - „Non-market output“
The output is into individual CPA automatically assigned to the cross (i.e. the value of NACE 010 into the CPA 01, etc.). These individual vectors for NPISHFCE serve as the input data for the SUTs (for format SNA-NT and Excel). Vectors are adapted by individual corrections when the SUTs are balancing.

3.4. Gross capital formation

Gross capital formation (P.5) consist of gross fixed capital formation (P.51), changes in inventories (P.52) and acquisition less disposals of valuables (P.53).

3.4.1. Gross fixed capital formation

Gross fixed capital formation according to ESA 2010 definition consists of resident producers’ acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are produced assets used in production for more than one year.

Compilation of GFCF includes three steps:
- taking-over data from statistical surveys in an aggregate form
- methodological and conceptual adjustments
- balancing adjustments (balancing of existing fixed assets and adjustment to GFCF based on results from the balancing of SUTs)

Compilation of GFCF starts on the level of subsectors. Then the data on sectors and total economy are compiled. Figures for GFCF are the same for all tables and accounts.

The main data sources are statistical surveys carried out by the CZSO. For compilation of GFCF different statistical statements are used, for example: P 5-01, VI 1-01, NI 1-01 or administrative data from income tax return. These statements content identical sections for the fixed assets and small tools. For instance section A029 is for tangible fixed assets, section A027 for intangible fixed assets and section A055 for small tools.

Among methodological and conceptual adjustments belong small tools, financial leasing, research and development, individual housing construction and others.

Balancing adjustments consist of two steps. First step is balancing of existing fixed assets at purchasers’ prices. It is based on detailed verification of the available data. The aim of this step is to achieve the equality between purchases and sales (acquisitions = deliveries). Second step are adjustments to GFCF based on results from the balancing of SUTs. It is the acquisition of new fixed assets. For balancing of GFCF in SUTs is necessary to transform GFCF (S.1) from classification by type of fixed assets and NACE to the classification by CPA and NACE.

The structure of fixed assets in CPA classification is taken from section A052. Individual vectors of adjustments are proportionally allocated according to new founded structure of fixed assets in CPA into appropriate CPA code by using break down in table 1.
**Type of fixed assets** | **2-digit CPA**
--- | ---
AN.111 Dwellings | 41, 68
AN.112 Other buildings and structures | 41, 42, 68
AN.1121 Buildings other than dwellings | 41, 68
AN.1122 Other structures | 42, 68
AN.1123 Land improvements | 42
AN.113 Machinery and equipment | 13, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33
AN.1131 Transport equipment | 29, 30
AN.1132 ICT equipment | 26
AN.1139 Other machinery and equipment | 13, 24, 25, 26, 27, 28, 31, 32, 33
AN.114 Weapons systems | 25
AN.115 Cultivated biological resources | 01
AN.1151 Animal resources yielding repeat products | 01
AN.1152 Tree, crop and plant resources yielding repeat products | 01
AN.117 Intellectual property products | 43, 58, 59, 62, 71, 72, 90
AN.1171 Research and development | 72
AN.1172 Mineral exploration and evaluation | 43, 71
AN.1173 Computer software and databases | 58, 62
AN.11731 Computer software | 58, 62
AN.11732 Databases | 58, 62
AN.1174 Entertainment, literary or artistic originals | 59, 90
AN.1179 Other intellectual property products | x
P.512 Costs of ownership transfer on non-financial assets | 42

Table 1 – Type of assets

GFCF matrix (or vector) by CPA enters into SUTs. After balancing of the SUTs, balancing adjustments (for GFCF, intermediate consumption, changes in inventories…) are transferred back into GFCF by type of fixed assets and NACE. Vector of CPA is proportionally allocated into NACE according to the structure of GFCF matrix before balancing. Individual CPAs are proportionally allocated into appropriate assets (according to structure of fixed assets in subsectors). Balancing adjustments are divided just into subsectors S.111, S.112, S.113 and S.141. Adjustments based on results from SUTs balancing are allocated just into the acquisition of new fixed assets (existing assets are balanced separately before that). The whole process can be described by following scheme (figure 3).

Final figures for GFCF are the same in all tables and accounts.

### 3.4.2. Changes in inventories

Changes in inventories measure the value of entries less value of withdrawals in inventories during the accounting period. The compilation of changes in inventories in commodity breakdown (vector of 3-digit CPA) is important for the process of compilation and balancing of SUTs. The value is calculated as a difference between closing and opening stocks of inventories. Data sources for estimation of changes in inventories are statistical surveys P5-01 and Prům 2-01. For finished goods and work in progress data are in form of matrix of closing stocks (3-digit CPA x 3-digit NACE).
These matrices are subsequently adjusted by using matrix of production after balancing. New matrices contain values only for these commodities, which are expected to have inventories (for example electricity cannot be stored). The same principle is applied for the matrix with data on material. In this case is used structure of intermediate consumption. Statistical survey P5-01 is also data source for matrices of opening and closing stocks of goods for resale. For this type is data breakdown into trade commodities (6-digit CPA) and has to be transformed into product commodities (3-digit CPA). For this purpose expertly estimated bridge is used. Final data on goods for resale is in matrices 3-digit NACE x 3-digit CPA is used. Then all matrices are adjusted for non-productive activity changes, for example price changes or accidental events. Final output is the matrix 3-digit NACE x 3-digit CPA, which is sum of the matrices by the type of inventories. The estimation proceeds in the framework of the balance of inventories. There can be inventories found in combined breakdown according to:

a) type of inventories (materials and supplies, work in progress, finished goods, military supplies and goods for resale),
b) (sub-) sector (15 sub-sectors and 5 sectors) and
c) industry (120 industries)

Into SUTs enters only vector of changes in inventories and according to ESA 2010 is valuated at average prices of the actual period.

3.4.3. Acquisition less disposals of valuables

According to the definition, valuables are non-financial goods that are not used primarily for production or consumption, do not deteriorate (physically) over time under normal conditions and are acquired and held primarily as stores of value.

The estimation of acquisition less disposals of valuables did not change with ESA 2010. It is made in two groups:

a) jewellery and precious stones (CPA 321) and
b) works of arts, including antiques (CPA 900 and only these works, which can be consider as a valuables)

The estimation is made according following formula (2):

Acquisition less disposals of valuables = import + revenues from sales + trade margin – export – intermediate consumption – final households consumption expenditure

Data sources are statistics of foreign trade (export and import), statistical questionnaire and family budget survey. The production of valuables is valued at basic prices. All other acquisitions of valuables are valued at the purchaser's prices paid for them, including any agents' fees or commissions. They also include trade margins when bought from dealers. Disposals are valued at the prices received by sellers, after deducting any fees or commissions paid to agents or other intermediaries.

Nowadays acquisitions less disposals of valuables are about 0.4% of gross capital formation.

3.5. Foreign trade in goods and services

The compilation of foreign trade in goods and services is based on various different data sources. The main data source for the foreign trade in goods is national concept of foreign trade which is in the national accounts subsequently adjusted for goods sent for processing, merchanting and other conceptual adjustments and adjustments on exhaustiveness in order to follow ESA 2010 requirements. In case of services, there are three data sources, quarterly survey on foreign trade in services, financial services and tourism, which are also adjusted for conceptual adjustments and on exhaustiveness. Foreign trade in goods and services is primarily compiled in CIF/FOB
for the purpose of supply and use tables. The following description of the compilation of foreign trade in goods and services corresponds to the supply and use assemblage.

National concept of foreign trade

This initial data source takes into account both the current practice in collection of data on cross-border transactions and specifics of trade within the Single market in the EU. The national concept of foreign trade is provided by the Foreign Trade Department.

The Czech Republic has a small and open economy which is export dependent. The international orientation of the Czech economy increased significantly after the EU accession which gave rise to considerable FDI inflows focused mainly on export at the beginning of this century. Economic and customs union also led to an implementation of common VAT system and harmonized system of data collection on foreign trade. In this context one significant problem appeared: the valuation of trade flows based solely on recording of cross-border movements of goods overestimates the country's trade balance in comparison with domestic output and financial accounts. It was obvious that cross-border movements of goods can no longer be a sufficient proxy for the estimation of foreign trade, since the change of ownership between residents and non-residents was less often followed by physical movements (and vice versa). As a result the traditional primary data sources on merchandise trade (Intrastat, Extrastat in EU countries), based on the recording of cross-border movements of goods, must be adjusted or complemented with other data sources in order to estimate foreign trade in the Czech Republic.

Cross-border concept of foreign trade is based purely on primary data collected on physical movements of goods across the borders. However, the data problem is that in the Single market of the European Union any unit is allowed to participate in trade and movement of goods in any member state. Therefore, a considerable amount of cross-border movements of goods are conducted by non-resident units (often with only limited relation to the Czech economy) and also there are transactions within the domestic market of the Czech Republic conducted by non-residents with residents. National concept takes into account these aspects of Single market and provides better approximation of trade between Czech and foreign units.

The transition from cross-border concept to national concept of foreign trade follows the recommendation on this issue by Eurostat and consists of two steps:

1) Exclusion of cross-border transactions reported by non-residents primary data sources on merchandise trade, since these transactions cannot be considered as export or import of the Czech economy (no change of ownership between resident and non-resident occurs).

2) Inclusion of transactions by non-residents in the Czech domestic market, since these transactions represent the interaction (real trade) between residents and non-residents.

Cross-border transactions reported directly by residents into regular data sources remained unchanged and are identical in both concepts (there may be additional adjustments in NA for these transactions).

Step 1 - Exclusion: The cross-border transaction reported by non-residents cannot be considered as export or import for the Czech economy since there is:

a) Quasi-transit trade - no trade between resident and non-resident unit with the goods crossing the borders (usually related to goods stored in warehouse facilities), or

b) Trade in the domestic market between resident and non-resident unit related to the goods crossing the borders, but at considerably different price than reported at the borders (the trade in the domestic market is considered as export and import – see the Step 2).

Quasi-transit trade inflates the value of cross-border exports and imports compared to the real exports and imports (following the change of ownership between residents and non-residents) but also cause
the overestimation of balance of trade. This is because the value of exports related to quasi-transit trade is usually significantly higher than imports due to the revaluation of goods in the warehouses by the owner (non-resident unit) from cost prices (in-house prices) to final customer prices. The Czech Republic, its territory, is in this case used only as a transit (storage) area from production sites to final markets.

The identification of quasi-transit trade in primary data sources is not easily achievable. Therefore, in the Czech Republic it is impossible to distinguish goods related to quasi-transit trade (a) from goods that are intended for the Czech market (b). From practical point of view, at the moment of physical import of goods into a warehouse not even the owner of the goods can usually determine the goods that would be sent to another state or would end up in the domestic market in the Czech Republic.

Nonetheless, the impossibility of quasi-transit trade identification does not restrain us from pursuing the national concept compilation, because by definition no cross-border transactions reported by non-residents are relevant to real foreign trade of the Czech Republic. If the goods is physically imported into the Czech territory and sold by a non-resident in the Czech domestic market then the trade value of sale is import for the domestic economy (not the value reported by non-resident at the borders which is often lower than at sale). And vice versa, if the goods is purchase by a non-resident unit in the Czech domestic market and subsequently physically sent from the Czech territory, it is the trade value of purchase which has to be considered as export (not the value reported by non-resident at the borders which is often higher than at purchase).

**Step 2 – Inclusion:** Sales or purchases by non-residents with Czech residents in the Czech domestic market are considered as imports and exports for the Czech economy. Thus the difference between the real trade value (at the moment of change of ownership) and the value reported at the borders by non-residents is not included into exports, imports and balance of trade in national concept, contrary to cross-border concept. The estimation of sales and purchases by non-residents are based on VAT returns submitted by non-residents in the Czech Republic.

The estimation of the commodity breakdown of sales and purchases by non-residents (not provided in VAT returns) is based on the cross-border transactions breakdowns and also on industrial surveys which distinguish between output traded by Czech resident units right in the domestic market to non-residents or directly/indirectly across the borders or in the domestic market to residents.

**Conclusion of national concept:** Export and import of goods in national concept consist of direct trade by residents across the borders and sales or purchases by non-residents (traded with residents) in the domestic market. National concept of foreign trade is provided at 3-digit CPA level to national accounts, in CIF/FOB valuation. The core objective of national concept is to provide a competent estimation of balance of trade. The total value of export and import, as well as the commodity breakdown may be less reliable and is in national accounts assessed and if needed adjusted within the balancing process of SUTs after detailed analysis.

### 3.6. Valuation types

In order to produce SUTs at basic prices, which are crucial for deflation, valuation sets have to be estimated. They are calculated as separate layers in the same dimension as SUTs and they are compiled in purchaser’s prices. SUTs at basic prices are estimated as the difference between SUTs at purchaser’s prices and all valuation sets.

#### 3.6.1. Taxes on products

Taxes on products can be defined as taxes on goods and services that become payable as a result of the production, sale, transfer, leasing or delivery of those goods or services, or as a result of their use for own consumption or own capital formation. A tax on product is paid per unit of good or service.
It could be a specific amount of money per unit of quantity of goods or services or it could be a specified percentage of the price of goods or services. Almost all data on taxes at current prices are taken from the Ministry of Finance. Ministry provides data on taxes on products broken down into following types of taxes:
- value added tax
- excise duties and consumption taxes on:
  - wine
  - alcohol
  - beer
  - solid fuels
  - natural gas
  - electricity
  - tobacco products
- customs duty
- other taxes on products (e.g. real estate transfer tax, fees on permanent change in use of agricultural and forest lands, admission fee tax, fees for stay at a spa or recreation stay fee)

For the calculation of accrual taxes is used the “time-shift payment” (time – adjusted) method. This method is used only for significant taxes like import duties, taxes on imports excluding VAT and the real estate transfer tax. Less significant fees are assumed that paying (cash) is equal to accrual and no adjustment is made. Taxes on products are balanced on the side of resources in the allocation of primary income account as receipt of the sector of general government and on the side of use in the generation of income account with summary amount for total economy.

The exemption is car registration tax. This fee is estimated as number of registrations multiplied by tax rate multiplied by coefficient of exemption. Value of this coefficient was estimated in cooperation with experts because no data are available. Custom duty is allocated proportionally according to the import of goods. The final output is in form of vector in 2 or 3-digit CPA according to version of national accounts.

**Value added tax**
Value added tax was introduced for first time in the Czech Republic from 1.1.1993. Since 1.1.2015 two rates of VAT have been used:
- standard rate: 21%
- reduced rate: 15%

The Ministry of Finance of the Czech Republic provides three types of data:
- cash data on VAT,
- time-adjusted data on cash,
- selected data on tax declarations

Time shift data are used in the Czech Republic, the method of coefficient is not applied. The cash data on VAT have to be adjusted for following reason. Payment of VAT is due by 25th day after the end of the taxation period. Tax revenues for January are therefore allocated to previous year. Tax refunds are due by 25th day of the second month after the taxation period, so refunds for January and February are added to previous year. For national accounts compilation time-adjusted data are used.

VAT is applied to the following uses:
- intermediate consumption of VAT non-payers,
- final household consumption expenditure (residents abroad are excluded),
- government and NPISH consumption expenditures (only social transfers in kind),
- gross fixed capital formation for VAT non-payers,
- export (purchases of non-residents in domestic economy)

The estimation of the theoretical VAT is based on following formula (3):

\[
VAT = \left( U^{PP} - \frac{U^{PP}}{1+r} \right) s
\]

(3)

where \( U^{PP} \) is use at purchasers’ prices,
\( s \) is a share of non-payers on total users,
\( r \) is the rate of VAT on product.

For final household consumption expenditure, where usually no VAT is deducted, the rate \( s \) is equal to 1. The value of rate \( s \) for intermediate consumption is estimated for each industry by following formula: sales of VAT non-payers divided by total sales. In the case of GFCF is the estimation more complicated, because more information is taken into account. A share of non-payers on total users for each sector and industry is calculated similar to intermediate consumption. The estimation of the rate \( s \) for each industry is provided as weighted average of share of non-payers of VAT in sectors weighted by GFCF in each sector (4).

\[
s = \sum_i s_i \frac{GFCF_i}{GFCF}
\]

(4)

where: \( s_i \) is a share of non-payers on total users in sector \( i \),
\( GFCF_i \) is GFCF in sector \( i \),
\( GFCF \) is total GFCF in domestic economy.

### 3.6.2. Trade (retail) margin

A trade margin is according ESA 2010 defined as the difference between the actual or imputed price realized on a good purchased for resale (either wholesale or retail) and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of. In national accounts we do not distinguish between wholesale and retail margin. The distinction between these margins is very difficult in practice. Allocation of margin into use is done proportionally.

In the preliminary version, data on sales and costs on sold good is not available. Therefore data from the previous year is used. The first step is calculation of the rate of trade margin on product and type of use, according following formula (5):

\[
r = \frac{U^{PP} - VAT - TM}{U^{PP} - VAT - TM - RM}
\]

(5)

where: \( U^{PP} \) is use at purchasers’ prices,
\( VAT \) is value added tax,
\( TM \) is value of transport margin
\( RM \) is value of retail margin.

For definitive version more accurate and more sophisticate approach is used. The data source for calculation is statistical survey P5-01. Data on sales and costs of sold goods can be found in the same structure as for goods for resale, so in matrices 6-digit CPA (only trade commodities) x 3-digit NACE. For transformation into required matrices 3-digit NACE x 3-digit CPA the same estimated bridge as for the goods for resale is used. The next step consists of calculating of the trade margin, which is different between matrices of sales and costs (matrix of sales minus matrix of costs). Total sales, costs or trade margin for each CPA is equal to the sum of values in corresponding row and matrix. According to formula 6 rate of trade margin for each CPA is then calculated.
\[ r = \frac{\text{trade margin}}{\text{costs of sold goods}} \] (6)

Whether is the calculated rate of trade margin used or is more adjusted depends on expert's decision, who considers history of trade rate.
The calculation then continues with estimation of value of trade margin for each product and each type of use by using formula 7.

\[ RM = \left( U^{PP} - VAT - \frac{U^{PP} - VAT}{1+r} \right) \] (7)

where:
- \( U^{PP} \) is use at purchasers' prices,
- \( VAT \) is value added tax,
- \( r \) is the rate of trade (retail) margin on product and type of use.

The result of the procedure is in a matrix and into SUTs only vector of trade margins by products is taken. The total value of this vector for total economy is equal to zero, because the total trade margin by product is equal to the total margins by trade industries.

### 3.6.3. Transport margin

A transport margin consists of those transport charges paid separately by the purchaser in taking delivery of the goods at the required time and place.
The calculation of transport margin uses similar approach as for trade margins and consists of two steps. First step is estimation of rate of transport margin by using formula 8.

\[ r = \frac{U^{PP} - VAT}{U^{PP} - VAT - RM} \] (8)

Second step is calculation of value of transport margins by products according following formula (9).

\[ TM = \left( U^{PP} - VAT - \frac{U^{PP} - VAT}{1+r} \right) \] (9)

where:
- \( U^{PP} \) is use at purchasers' prices,
- \( VAT \) is value added tax,
- \( r \) is the rate of transport margin on product and type of use.

The same approach brought the same format of results. Similarly to trade margin, transport margin enters into SUTs in form of vector and its value for total economy is also zero.

### 3.6.4. Subsidies on products

The definition and the ways of calculation of subsidies on products are similar to approach used for taxes on products. The basic data sources on subsidies are represented by administrative data from the Ministry of Finance: state final account, financial statements of central and local budgetary organizations, financial statements of central and local semi-budgetary organizations and extra-budgetary funds. Subsidies on products are divided into:
- import subsidies
- other subsidies on products

In the Czech economy no import subsidies are provided. Other subsidies on products included:
- subsidies on agricultural products
- subsidies on services of transport, culture and private schools
- contribution to semi-budgetary organizations which are allocated to the public non-financial corporations sub-sector

The drawing of subsidies depends on the solvency of state or local budgets. They are no regulations for organization to draw of these subsidies and no obligation arises for general government. Accordingly, data on payments are considered as accrual-based and no adjustment is made. In the system of national accounts, subsidies on products are balanced on the side of resources in the allocation of primary income account of the sector of general government. Final output for subsidies is vector. For preliminary version it is in 2-digit CPA level, and for definitive in 3-digit CPA level. Subsidies on products are assumed as a negative tax according to the national accounts methodology, so in SUTs is vector of subsidies with negative sign.

4. **Price indices**

For purpose of deflation price indices for all commodities must be constructed. In case of preliminary version it is about 89 and in definitive version almost 2500 commodities. For each product PPI, CPI, index of import and export and index of merchanting (see chapter 7.2) are calculated. Most of these indices are taken from price statistics department. But there are also some exceptions where indices have to be calculated another way because the concept of their construction is not the same like in the national accounts (they are not suitable) or indices just do not exist. Good examples could be insurance, rent, gambling, research and development, forestry or rail transport. For calculation of indices for these products another types of sources are used, for example annual reports or statistics about wages (R&D). CPI used for deflation in the national accounts is calculated by vector of CPI from price statistics department in COICOP (Classification of individual consumption by purpose) and matrix of final consumption of households in previous year.

All these indices are compiling in 3-digit CPA (circa 250 products) and then are converted to 2-digit CPA by using weights. The exception is CPI which is calculated also in 2-digit CPA directly. Producer price indices are weighted by production for domestic use (output – non-market production – export) of previous year. Indices of export and import are weighted by values of export (without processing) respectively import (without processing and purchases of residents abroad) of previous year.

**Purchasers’ vs basic prices**

In the supply table, flows of goods and services are valued at basic prices. In the use table, the flows are valued at purchasers’ prices. In order to attain identities between supply and use a series of valuation matrices have to be added to the supply table. Two types of valuation vectors are distinguished: taxes less subsidies and distribution margins (trade and transport). These vectors are in aggregated versions and represent full size matrices of taxes, subsidies, trade and transport margins.

![Table: Current vs Previous years' prices](image)

\[
\text{Current prices} = \text{Purchasers' prices} = \text{Previous years' prices} \\
\begin{array}{ll}
\text{VAT} & + \\
\text{trade margin} & + \\
\text{transport margin} & + \\
\text{subsidies on products} & + \\
\text{taxes on products} & + \\
= & \text{basic prices}
\end{array}
\]

Figure 4 – Current vs previous years’ prices
For this reason it is important to know, how to revalue purchasers’ prices to basic (at current prices) and also how works reverse way at previous years’ prices. At current prices you have to take away from purchasers’ prices taxes, subsidies and margins (at current prices) to get basic prices. At previous years’ prices reverse way is used and to basic prices are added taxes, subsidies and margins. The result is equal to purchasers’ prices. All added valuation types are deflated separately (see chapters 6.3.6 – 6.3.8).

5. Balancing

The main purpose of balancing is to find balance between sources and uses (supply + import and demand + export) for each product. There are no strict rules how to make a balancing adjustment in order to balance commodity flows. Before balancing it is important to check commodities structure (output, intermediate consumption, final consumption...) by using time series. Any jump is supposed to be checked. Before making a balancing adjustment it is good to know history, quality and credibility of sources and experts’ opinion. It is almost impossible to let balance all commodities by one person. For this reason, and for getting more objective results, the responsibility of balancing is split among balancing team. Each member of team has his/her commodities and industries. Supervisor coordinates balancing works and verifies balancing adjustments made by team members.

In preliminary version all balancing adjustment are done directly to supply or use table. Adjustments in definitive version are made at first to SNA-NT software, where they are automatically converted by price indices to previous years’ prices. At the end of the balancing, small adjustments are made into supply and use table directly without another actions. The bigger ones have to be manually converted into previous years’ prices by price index and then done directly to supply table in both types of prices. This adjustment at previous years’ prices ensures that the deflator will not change.

Chain linked indices

The fixed base method uses for particular years still the same, constant, weights intended by base year. Between base and current year could be more or less another years and weights gradually lost their relative representativeness. Chain linking means construction of long-term price and volume indices by cumulating of short-term indices with different, but current weights. It means that in this chain base method is no fixed base period. The year immediately preceding the one, for which price index has to be calculated, is assumed as the base year. Thus, for the year 2014 the base year would be 2013, for 2013 it would be 2012, for 2012 it would be 2011 and so on. For example chain linked index (CI) measuring change between years 0 and t (CI \(_{0→t}\)) is constructed by multiplication of indices still between two following years (10):

\[
CI_{0→t} = I_{0→1} \times I_{1→2} \times \cdots \times I_{(t-1)→t} = \prod_{s=1}^{t} I_{(s-1)→s}
\]  

The chief advantage of this method is that the price relatives of a year can be compared with the price level of the immediately preceding year. Another advantage of the chain base method is that it is possible to include new items in an index number or to delete old times which are no more important. In fixed base method it is not possible. In practice aggregates and their parts are linked separately. For this reason a problem of non-additivity appears where the sum of linked parts is not equal to linked total. The practical example on non-additivity can be seen below in table 2.
<table>
<thead>
<tr>
<th>GVA (current prices)</th>
<th>in mil. CZK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td>2010</td>
</tr>
<tr>
<td>Output</td>
<td>9 258 166</td>
</tr>
<tr>
<td>Intermediate consumption</td>
<td>5 675 297</td>
</tr>
<tr>
<td>Gross value added</td>
<td>3 582 869</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GVA (previous years’ prices)</th>
<th>in mil. CZK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td>2010</td>
</tr>
<tr>
<td>Output</td>
<td>9 262 019</td>
</tr>
<tr>
<td>Intermediate consumption</td>
<td>5 606 921</td>
</tr>
<tr>
<td>Gross value added</td>
<td>3 655 098</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GVA (volume indices, p.y.=100)</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td>2010</td>
</tr>
<tr>
<td>Output</td>
<td>102.7</td>
</tr>
<tr>
<td>Intermediate consumption</td>
<td>103.2</td>
</tr>
<tr>
<td>Gross value added</td>
<td>102.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GVA (volume indices, 2010=100)</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td>2010</td>
</tr>
<tr>
<td>Output</td>
<td>100.0</td>
</tr>
<tr>
<td>Intermediate consumption</td>
<td>100.0</td>
</tr>
<tr>
<td>Gross value added</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GVA (Prices of the year 2010)</th>
<th>in mil. CZK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Label</strong></td>
<td>2010</td>
</tr>
<tr>
<td>Output</td>
<td>9 258 166</td>
</tr>
<tr>
<td>Intermediate consumption</td>
<td>5 675 297</td>
</tr>
<tr>
<td>Gross value added</td>
<td>3 582 869</td>
</tr>
<tr>
<td>Non-additivity</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2 – Non-additivity

6. Compiling of supply and use tables at previous years’ prices

Deflation of national accounts aggregates in preliminary version is based on simplified model in MS Excel, which uses 2-digit CPA. The only difference from SNA-NT system is the reduction of number of products from almost 2500 to 89 and distinction only basic types of supplies and uses. The main reason for this simplification is time, because there are only two weeks for balancing of this version (for definitive version it is circa two months). It follows, that the quality and the range of SUTs and their deflation is much higher in second version.

Deflation of SUTs in definitive version proceeds in SNA-NT system. This advanced database system developed by Norwegian statistical office is intended for balancing current and previous years’ prices. The main advantage of this software is that deflation could be made on very detailed structure – extended 3-digit CPA. This system has been used by CZSO since 2003. SUTs in second version consist of almost 2500 products, which have 6 digits codes based on 3-digit CPA (first three digits) and three specific characters (last three digits). The purpose of specific characters is to distinguish products for reasons of different balancing principle, different way of deflation or too low detail in 3-digit CPA etc. Each product in the system has price index of import, export, CPI and PPI.
Deflation of margins and taxes proceeds automatically and guarantees continual consistency of aggregates. SNA-NT software uses three dimensions system, where first dimension is set by size of the row (product – CPA). Second is set by column (combination of type of supply/use and another character). It could be for example 23010, what means market production (23) in NACE 010 (010) or code 51110 stands for export (51) of goods (110). Last dimension determines in what kind of price is the value expressed e.g. 10 means basic prices and 13 stands for producers’ prices.

Model of SNA-NT system can be described by following figure 5, which was taken from SNA-NT manual.

Figure 5 – Structure of SNA-NT system

Deflation of national accounts aggregates is always based on deflation of individual products in SUTs. Aggregates (output, intermediate consumption…..) are not directly deflated by price indices, but their components (products) are deflated instead. Aggregated deflators, which are usually published for these aggregates, are derived implicitly, as ratio of aggregates at current and constant prices (in most cases at previous years’ prices).

Each component of SUTs is deflated separately by appropriate price indices by products. For the purposes of deflation most of components are divided into separate parts – see following text. This method ensures the consistency of recalculation into previous years' prices on sources and uses side. For SUTs the balance equation is valid (1) at current prices and constant prices of previous year. For example GDP (production method) at previous years’ prices is obtained as (11):

\[
\text{GDP} = O - IC + NTP = \text{GVA} + NTP
\]  

(11)

Where deflation of gross value added (GVA) is called double deflation, because output and intermediate consumption are deflated separately.
6.1. Output deflation

The output matrix is calculated at basic prices, it is not necessary to adjust the data as in deflation of intermediate consumption. For reasons of different deflation of individual items we split the total output into separate matrices, concretely:

- matrix of output of non-market services
- matrix of output for export
- matrix of output of specific products
- matrix of output for domestic use

6.1.1. Market output for domestic use

Market output for domestic use is deflated by appropriate producer price indices (PPI), which are calculated as aggregation of individual simple price indices based on modified Laspeyres formula. Weighting schemes are revised regularly. Detailed information can be found on the websites of Czech Statistical Office (www.czso.cz) in Price section. If the PPI for specified product is not available then appropriate consumer price index (CPI) or a specific method is used (see chapter 7). Most of output of goods is covered by appropriate price indices. On the other hand there are some problems with services where specific methods are used more often when appropriate index is not available. In case of market services, it is difficult to separate subsidies which are according to NA standards deflated separately (for example for passenger transport output).

6.1.2. Non-market output

Deflation of non-market services is done within cost method. Cost method is based on deflating of each component of costs (intermediate consumption, compensation of employees, consumption of fixed capital and other net taxes on production). Intermediate consumption matrix is deflated by weighted price indices of intermediate consumption by groups of products, which includes intermediate consumption from import and intermediate consumption from domestic output. Other component of costs is consumption of fixed capital, which is primarily estimated at previous years’ prices of base year by method PIM or by quantitative methods and then recalculated to current prices and previous years’ prices by price indices. Estimate of index for deflating of compensation of employees is based on data on compensation of employees and number of employees in each industry. Thus we obtain average compensation of employees for two following years, where the result index is obtained as their ratio, which is then adjusted by estimated 0.5 % yearly growth of labour productivity.

6.1.3. Matrix of output for export and specific products

Matrix of output for export is deflated by export price index (see chapter 6.2). Deflation of export of services is done similarly but alternative methods (for example export of transport services) are used more often than goods, which are well covered by price statistics. Deflation of output of specific commodities (merchanting…) is described in details in the seventh chapter.

6.2. Deflation of export and import

Index of import and export prices of goods in Czech Republic is calculated since 1993 and regularly it is the subject of revision. The index is compiled according to Harmonized system – customs tariff, and then it is recalculated according to main groups of classification SITC Rev.4 and for national accounts and Eurostat purposes to 3-digit CPA. Detailed description of compiling of the index is available on the websites of the Czech Statistical Office.

6.2.1. Deflation of import

For deflation purposes the import is divided into import of goods and import of services.
Import of goods
Import of goods is divided into reexport, merchanting and other import.

Price indices of import are used for deflation of each component of import of goods. In case those price indices are not available domestic price indices adjusted by the change of exchange rate are used.

Import of services
This item is divided into processing service, other services and purchases of residents abroad.

Processing service and other services
Price indices of import are used for deflation of processing service and other services. In case those price indices are not available domestic price indices adjusted by the change of exchange rate are used.

Purchases of residents abroad
The Czech Statistical Office prepares adjusted foreign consumer price indices, which include changes in exchange rate between domestic currency and currency of a country from which goods and services are imported and also differences in price development on each market. Specifically there are consumer price indices of selected countries, adjusted to changes of exchange rate, weighted by number of nights spent in each country. Purchases of residents abroad are classified by groups of purchased goods or services for recalculation to previous years’ prices. Dividing by destination, where the purchase was realized, is not possible because of lack of information. Therefore the structure by geographic area is based only on data on tourism which show, in which countries residents were, but it is not possible to derive, what they exactly purchased. External trade statistics department prepares data on travelling of residents abroad (information about 20 countries), about number of nights spent abroad and about average expenditures in each country. This information is used for calculation of weights. Information about yearly average exchange rates for each visited country is taken from the website of Czech National Bank (www.cnb.cz) and then the indices of exchange rates of Czech crown to other currencies are calculated. The data on CPI in each EU country are taken from the EUROSTAT website. Deflation is made on the level of 12 divisions of COICOP classification and for selected groups from division Accommodation and Food. For countries which are not included (for example they are not EU members) a publication Main Economic Indicators (published by OECD) or data from national statistical offices websites are used.

6.2.2. Deflation of export
The procedure for conversion of exports at previous years’ prices is similar to that of imports. Exports are divided into the export of goods and export of services.

Export of goods
Reexport and merchanting
Deflation of reexport and merchanting uses the method based on specific indices. Calculation of specific index for deflation of merchanting is described in chapter 7.2.

Other export
Exports of other goods are deflated by export price indices, which are taken over from the price statistics department. In case that the price indices are not available, an alternative approach is used. Firstly each CPA (3-digit level) was assessed whether contracts are made in domestic or foreign currency. If the majority of contracts is in the domestic currency, then domestic Producer Price Index (PPI) is used. Otherwise, the deflation is applied with a domestic producer price index adjusted to changes in exchange rate.
Exports of services

Processing service
For deflation of this component of export of services domestic producer price indices (PPI) are used.

Purchases of non-residents in the Czech Republic
Mirror-image of purchases abroad by residents are non-residents purchases in domestic economy. At domestic market goods and services are supplied under the same terms to all buyers, domestic prices become the only factor affecting the consumer price indices and the appropriate deflator to estimate purchases of residents at previous years’ prices. The development of exchange rates in this case is not necessary to be included in the model because it affects the visitors spending indirectly only.

Other services
This matrix includes transportation and other services. CZSO uses export price indices for deflation. If they are not available, the same procedure as a replacement for the export of other goods is used.

6.3. Deflation of domestic use

Domestic use is the sum of:
- intermediate consumption
- final consumption expenditure of households
- government expenditure
- non-profit institutions expenditure
- gross fixed capital formation
- net acquisition of valuables
- and inventory changes

6.3.1. Final consumption expenditure of households
Final consumption household expenditure (FCHE) is recorded in SUTs in the national concept, i.e. consists of expenditure of resident households in the country and abroad. Expenditure abroad is deflated by the import of services (see chapter 6.1.2). Following text refers to the expenditure of resident households in the country only. Data on the FHCE are in the purchaser’s prices, which distinguishes this area from others. Data on FCHE are available in a detailed classification COICOP (Classification of Individual consumption by purpose) and they are deflated by consumer price index primarily by classification COICOP, in which a consumer price index is available from the price statistics department. Due to different classifications and different concept of prices the deflation is done outside the system of SUTs. Classification COICOP (4-digit) is used for estimate of household consumption at previous years’ prices. Implementation of the results is performed by the transmitted 4-digit COICOP (approximately 370 items) and 3-digit CPA (about 250 items).

6.3.2. Intermediate consumption
Deflation of intermediate consumption belongs to the most complex price conversions. The starting point is the transfer of matrix of intermediate consumption to basic purchase price through the system of valuation matrices (trade and transport margins, taxes and subsidies). Quality of valuation matrices determines directly the quality of deflation of intermediate consumption. The matrix of intermediate consumption at basic prices is divided into a matrix of intermediate consumption from import (deflated by price indices of goods, respectively, imports of other services) and the matrix of domestic intermediate consumption (deflated by domestic PPI, respectively, price indices of services). Description of deflation of balancing matrices is given elsewhere in this chapter. Intermediate consumption at previous years’ prices is then obtained as the sum of all sub-matrices.
6.3.3. Final consumption expenditure of government and non-profit institutions
Final consumption expenditure of government and non-profit institutions is composed of non-market output and social transfers in kind (STK). Description of deflation of non-market output is included at the beginning of the chapter 6. STK are the benefits that government and non-profit institutions buy from market producers and then grant to households, such as medicines. Vector of expenditure on social transfers in kind is recorded at the purchaser’s prices. The principle of deflation is similar to other transactions on the use side. Transport and trade margins, taxes and subsidies are deflated separately. Vector of social transfers in kind at basic prices is divided into STK from import (deflated by import price index) and domestic STK (deflated by PPI).

6.3.4. Gross fixed capital formation
Approach to gross fixed capital formation (GFCF) is almost the same as in the case of intermediate consumption. Valuation matrices are deducted from matrix of GFCF at purchaser prices and deflated separately. A net acquisition of valuables is comprised of two products (CPA 32 and CPA 90). Deflation is carried out by the PPI.

6.3.5. Changes in inventories
Approach to changes in inventories is the same as for GFCF.

6.3.6. Taxes and subsidies on products
Taxes at previous years’ prices are obtained by application of tax rates valid in year \( t-1 \) to the base in year \( t \) at prices of year \( t-1 \). For each type of use are established and regularly updated tax rates on products at the 3-digit CPA. Change of rates would be included in the deflator and not in the index of physical volume.
Conversion of taxes and subsidies to prices of the previous year, takes place in case of definitive report automatically at SNA-NT. The basis for the conversion is expressed in the producer’s prices at which a previous year rate is applied. In the case of the preliminary report, this procedure is the same, only conducted on a less detailed level in MS Excel.

Value added tax
VAT at previous years’ prices is estimated by rate of VAT in previous year, ratio of VAT non-payers in previous year and base of VAT at previous years’ prices as follow:

\[
VAT_{CP} = rate_{t-1} \times s_{t-1} \times base_{CP},
\]

where:
- \( rate_{t-1} \) is rate of VAT in previous year,
- \( s_{t-1} \) is ratio of VAT non-payers in previous year,
- \( base_{CP} \) is base of VAT (basic prices + taxes + subsidies + trade margin + transport margin) at previous years’ prices.

Other taxes
Other taxes on products at previous years’ prices are estimated as follows:

\[
T_{CP} = rate_{t-1} \times base_{CP},
\]

where:
- \( rate_{t-1} \) is rate of taxes in previous year,
- \( base_{CP} \) is base of taxes at previous years’ prices.

6.3.7. Trade margin
The deflation of trade margin (wholesale and retail together) is made in use table as follows:

\[
TM_{CP} = rate_{t-1} \times base_{CP},
\]
where: \( \text{rate}_{t-1} \) is rate of TM in previous year
\( \text{base}_{CP} \) is base of TM (basic prices + taxes + subsidies) at previous years’ prices.

6.3.8. Transport margin

The deflation of the trade margins is made in the use tables. Data in supply table are taken over from use table. Formula for deflation of transport is similar to formula for trade margin.

6.3.9. Subsidies on products

The principle of deflation of subsidies is the same as for taxes. Therefore it lies in the application of existing subsidy rates in the previous year’s transactions, expressed at base-year prices. The base is again expressed in producer’s prices. In the Czech Republic, the most frequent are subsidies to public transport and subsidies on agricultural products.

7. The transition to ESA 2010 and the deflation

7.1. Research and development

According new standard ESA 2010 is R&D defined as follows:
“Research and Development is creative work undertaken on a systematic basis to increase the stock of knowledge, and use of this stock of knowledge for the purpose of discovering or developing new products, including improved versions or qualities of existing products, or discovering or developing new or more efficient processes of production”.

Output of R&D at current prices is calculated as follows:

\[
\text{Output} = \text{compensation of employees} + \text{non-investment costs} + \text{consumption of fixed capital} + \text{profit margin} + \text{other costs}
\]

Each output of production is deflated separately. For deflation of compensation of employees earning index (NACE 72) is used. For deflation of non-investment costs and consumption of fixed capital index of intermediate consumption of R&D is used. Profit margin and other costs are deflated by index of production of R&D. The output of R&D at previous years’ prices is a sum of its components at previous years’ prices.

<table>
<thead>
<tr>
<th>2013</th>
<th>Current prices</th>
<th>Indices</th>
<th>Previous years’ prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation of employees</td>
<td>33 658</td>
<td>98.74</td>
<td>34 089</td>
</tr>
<tr>
<td>Non-investment costs</td>
<td>26 538</td>
<td>100.66</td>
<td>26 364</td>
</tr>
<tr>
<td>Consumption of fixed capital</td>
<td>2 744</td>
<td>100.66</td>
<td>2 726</td>
</tr>
<tr>
<td>Profit margin</td>
<td>2 281</td>
<td>97.68</td>
<td>2 335</td>
</tr>
<tr>
<td>Other costs</td>
<td>4 361</td>
<td>97.68</td>
<td>4 465</td>
</tr>
<tr>
<td>Output of R&amp;D</td>
<td>69 582</td>
<td>-</td>
<td>69 979</td>
</tr>
</tbody>
</table>

Table 3 – Deflation of R&D

7.2. Merchanting

There are two different types of merchanting: traditional merchanting and negative merchanting. Traditional merchanting is defined in ESA 2010 as purchases and sales of goods by residents without goods entering the economic territory of the merchants’ country. Since the goods do not cross the borders of the Czech Republic, these transactions between residents and non-residents are not recorded in initial data sources for foreign trade, Intrastat and Extrastat, and thus have to be added into export of goods when compiling national accounts\(^1\). Sales by residents are recorded as export

\(^1\) ESA 2010 article 1.16, 3.164d, 18.38-43.
of goods, purchases by residents as negative exports of goods, thus only the margin is recorded as export of goods.

Negative merchanting is analogous to traditional merchanting and can be defined as purchases and sales of goods by non-residents without goods leaving the domestic economic territory. In other words these are transactions between residents with a non-resident as an intermediary merchant in the domestic territory. Negative merchanting is not explicitly mentioned in any methodical manual. However, ESA 2010 article 3.164 lists examples of exports of goods without cross-border movements and says that analogous cases occur on import side. Thus these transactions, as they have to be considered as export and import (since there is change of ownership between residents and non-residents), are recorded analogously to traditional merchanting: sales by non-residents as imports of goods and purchases by non-residents as negative imports. These transactions are also not recorded in Intrastat or Extrastat because there is no cross-border movement of goods and thus have to be added into import of goods when compiling national accounts. Negative merchanting is estimated on the basis of VAT declarations submitted in the Czech Republic by non-residents who participate very little or not at all in cross-border transactions. Sales are defined as realized taxable supplies by these non-residents and purchases as received taxable supplies by these non-residents. The adjustment of import is net value (realized margin by non-residents).

The estimation of traditional merchanting is based on the statistical survey of import and export of services (ZO 1 04) conducted by the CZSO, in which the value of purchased and sold goods abroad is surveyed (respondents are only residents). Countries are divided into three areas: Europe – western countries (representative is Germany), Europe – eastern countries (Hungary) and other countries (Russia). With help of the matrix of import the weights of areas for each CPA are calculated. These weights are multiplied by domestic producer prices indices of representatives. The final index is the deflator of purchases. (The dot product of these weights and domestic producer price indices of representatives is the deflator of purchases.) The source for these indices is OECD database for Russia and Eurostat database for Germany and Hungary. The same principle is used for export. Value of merchanting at current prices is calculated as value of sales minus value of purchases at current prices. The same method is used for previous years’ prices. The final deflator of merchanting is equal to merchanting at current prices divided by merchanting at previous years’ prices.

### 7.3. Processing

Deflation of processing is described in chapters 6.2.1. and 6.2.2. (deflation of export and import).

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2 Purchases and sales by non-resident entities that participate in cross-border transactions are covered in national concept of foreign trade.
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