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Methodology of short-term business statistics

Interpretation and guidelines

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FOREWORD

Short-term business statistics are in great demand for economic analysis by a large number of users - in the Commission services, the European Central Bank, national governments as well as private sector companies and financial markets. Considerable progress has been achieved in recent years to improve their coverage, their content and their timeliness.

The basis of these improvements was Council Regulation 1165/98 in 1998 which set the legal basis and the framework for these improvements. In July 2005 an amending regulation (1158/2005) added new variables, in particular output prices for services and import prices. This new regulation obliged the Commission to publish an updated version of the methodological manual, taking into account these changes.

The present volume is the third edition of the **Methodology of Short-term Statistics**, **Interpretation and Guidelines**, updated to include these new variables. At the same time, some sections of the previous editions that had become obsolete with the passage of time have been deleted. Furthermore, the manual was reviewed to ensure as far as possible a consistency with national accounts definitions.

There are a number of supporting documents associated with this manual including the texts of the Council Regulations, the implementing Commission Regulations, a detailed description of the data delivery requirements resulting from the regulations, the NACE activity classification, the construction classification, various recommendations by the Working Group on Short-term Statistics and the detailed transmission protocol (GESMES) which ensures reliable and speedy transmission of the data between national statistical offices and Eurostat. These associated documents will be made available in electronic form.

Eurostat hopes this manual will be useful to both producers and users of short-term statistics to understand the contents and the compilation of these data.

Inna Steinbuka

The manual as a guide

Section A: Introduction

1. European statistics

Since February 1997 the organisation of the European statistical system has the Council Regulation on Community statistics as its legal basis and this is known as the statistical law. This legal basis concerns the production of Community statistics and lays down the roles to be played by national and Community authorities in the production of these statistics.

The statistical law is structured into four main parts:

- The procedures for the drawing-up and implementation of Community statistical programmes that all Community statistics, including business statistics.
- The definition of the principles of impartiality, reliability, relevance, cost-effectiveness, statistical confidentiality and transparency by which all Community statistics shall be governed.
- The dissemination of Community statistics with a qualified obligation on Eurostat to disseminate Community level results before the next transmission of national results is due.
- The definition of statistical confidentiality, the conditions under which such data must be transmitted to Eurostat and the uses that can be made of this data. This last part is of particular significance for business statistics.

A Commission Decision on the role of Eurostat as regards the production of Community statistics was adopted on the 21st of April 1997 which restates the principles of the statistical law to be followed by Eurostat, explains the tasks of Eurostat, its autonomy, its obligations to disseminate data simply and impartially and its responsibility for coordination and co-operation with other services of the Commission. This Decision reiterates the importance of the Community Statistical Programme, the rules governing the use of confidential data and the access to administrative data sources held by the Commission.

For more information on the statistical law see:
Council Regulation No 322/97 of the 17 February 1997 on Community statistics, Official Journal No L 52 p.1 of 22.2.97
Commission Decision No 281/97 of 21 April 1997 on the role of Eurostat as regards the production of Community statistics, Official Journal No L 112 p.56 of 29.4.97

Section B: Infrastructure & Coverage

2. Infrastructure

2.3. Statistical units

2.3.1. Introduction - Statistical Units Regulation and the list of types of statistical units

Statistical units play a prominent role in the EU system of business statistics. Indeed, the Council Regulation on statistical units (SU-Regulation) explicitly states "only if the member states use common definitions of statistical units will it be possible to provide integrated statistical information with the reliability, speed, flexibility and degree of detail required for the management of the internal market". Statistical units are therefore:

- the corner stones of business statistics;
- the building blocks of statistical aggregates;
- the links allowing statistics to be harmonised.

The SU-Regulation lists and defines eight types of statistical units and can be considered the methodological reservoir out of which the various Regulations like the 1995 ESA, SBS-Regulation, STS-Regulations and Statistical Business Register Regulation take the units that best serve their purposes. These statistical units are:

- the enterprise;
- the institutional unit;
- the enterprise group;
- the kind-of-activity unit (KAU);
- the unit of homogeneous production (UHP);
- the local unit;
- the local kind-of-activity unit (LKAU);
- the local unit of homogeneous production (LUHP).

The institutional unit, the UHP and the LUHP, are more commonly used in the field of national accounts. The legal unit is not listed as a statistical unit.

2.3.2. Definitions

Generally speaking, a unit is a specific entity that is defined in such a way that it cannot be confused with any other unit. Units are the elements of a population. It must be possible to count these elements without omissions or duplication. Statistical units may be identifiable legal or physical entities or statistical constructs.

The definitions contained in the Annex to the SU-Regulation are to be used by the national statistical authorities to identify units for the collection, transmission, publication and analysis of business statistics data. The SU-Regulation does not however specify which units should be used for each of these actions, nor does it specify which units should be used in particular surveys.
Section 2 of the Annex to the SU-Regulation lists three criteria, by which statistical units can be defined.

They are:
A. Legal, accounting or organizational criteria
In order to define units that are recognisable and identifiable in the economy, legal or institutional criteria must be applied. In some cases, legally separate units must be grouped together as they are not sufficiently autonomous in their organisation. In order to define some types of unit, accounting or financial criteria also have to be applied.

To constitute the enterprise unit, use is made of legal units that exercise, wholly or partially, a productive activity.

Legal units include:

- legal persons whose existence is recognised by law independently of the individuals or institutions which may own them or are members of them;
- natural persons who are engaged in an economic activity in their own right.

The legal unit always forms, either by itself or sometimes in combination with other legal units, the legal basis for the statistical unit known as the "enterprise".

B. Geographical criteria
A unit can be geographically identified. A distinction is made between local, regional, national, Community and worldwide areas.

The regional levels are defined by the nomenclature of territorial units for statistics (NUTS), which distinguishes three levels (I, II, III).

The observation and analytical units are defined in such a way as to permit data first to be determined

for each Member State and these data to be combined to give figures for the European Union as a whole or for larger areas.

The rules regarding geographical criteria must be in order to permit consolidation and avoid double counting and omissions.

C. Activity criteria

The economic activity of production - hereinafter referred to as "activity" - can be said to take place when resources such as equipment, labour, manufacturing techniques, information networks or products are combined, leading to the creation of specific goods or services. An activity is characterised by an input of products (goods or services), a production process and an output of products.

Activities are determined by reference to a specific level of NACE Rev.1.1.

If a unit carries out more than one activity, all the activities that are not ancillary activities are ranked according to the gross value added[1] which they generate. A distinction is made between principal activity and secondary activities.

If no value-added figures are available, other criteria must be used, such as, for example, employment, payroll, turnover and assets, with a view to obtaining the closest possible approximation of the classification that would have been obtained based on value added.

Units are classified in terms of their activities. If one-activity accounts for over 50 % of the value added this determines the classification of the unit. In all other cases, classification rules must be observed. Classification is carried out in stages from the highest level of aggregation that is the section (one letter), down to the class (four digits) via the division (two digits) and the group (three digits). The classification at each level must be compatible with the previous level. The Statistical Programme Committee referred to in Article 7 of Regulation (EEC) No 3037/90 has competence in this field.

Principal and secondary activities are backed up by ancillary activities, such as, for example, administration, accounts, data processing, process monitoring, purchasing, sales and marketing, warehousing, repairs, transport and renovation. These ancillary activities within a unit are carried out in order to permit or facilitate production by the unit of goods and services for third parties. The products of ancillary activities are not themselves supplied to third parties.

For more information on the concept of ancillary activities and the definitions on the full list of units, see the Annex to the SU-Regulation. The definitions of the enterprise and the KAU are given below, as these are the two main types of statistical unit used in the STS-Regulations:

1. Enterprise

The first statistical unit mentioned in the SU-Regulation is the Enterprise. It is defined as follows:

The enterprise is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit.

The enterprise thus defined is an economic entity that can therefore, under certain circumstances, correspond to a grouping of several legal units. Some legal units, in fact, perform activities exclusively for other legal units and their existence can only be explained by administrative factors (e.g. tax reasons), without them being of any economic significance.

A large proportion of the legal units with no persons employed also belong to this category. In many cases, the activities of these legal units should be seen as ancillary activities of the parent legal unit they serve, to which they belong and to which they must be attached to form an enterprise used for economic analysis.

2. Kind-of-Activity Unit (KAU)

The KAU is meant to reduce the heterogeneity according to activity, which is inherent to the Enterprise. At the same time, it tries to avoid being an artificial construct that could not be implemented.

The Kind of Activity Unit is defined in the SU-Regulation as follows:

The kind-of-activity unit (KAU) groups all the parts of an enterprise contributing to the performance of an activity at class level (four digits) of NACE

[1] In line with ESA 95; gross value added is measured at basic prices

Rev.1.1 and corresponds to one or more operational sub- divisions of the enterprise. The enterprise's information system must be capable of indicating or calculating for each KAU at least the value of production, intermediate consumption, manpower costs, the operating surplus and employment and gross fixed capital formation.

The KAU was devised as an observation unit in order to improve the homogeneity of the results of statistical surveys by activity and hence the international comparability of these results, since at the level of the enterprise different types of horizontal and vertical integration can be observed at both national and international level. An entity that only carries out ancillary activities for the enterprise to which it belongs cannot be considered as a separate KAU. In fact, the KAU corresponds to the operational definition given in paragraph 96 of the introduction to ISIC Rev.3.1.

The KAUs falling within a particular heading in the NACE Rev.1.1 classification system can produce products outside the homogeneous group, on account of secondary activities connected with them which cannot be separately identified from available accounting documents. Conversely, the KAUs classified under a particular heading in the classification system on the basis of a principal activity do not produce the entire output of homogeneous groups of specific products because the same products can be produced in secondary activities of KAUs falling under some other classification heading.

The internal accounts of enterprises (e.g. profit or cost centres) have often been developed according to criteria that are close: the activity concept. They enable the supply of data at KAU level, so that these can be observed.

All the costs of ancillary activities of an enterprise must be allocated to the principal and secondary activities and thus to the KAUs observed within the enterprise.

2.3.3. Use in business registers

The conceptual model of the information for registers implicitly defined by the Community Regulation on the harmonisation of the development of national business registers for statistical purposes is very simple. It explicitly comprises three units: the enterprise, the local unit and the legal unit, and three relationships between entities. It also implicitly comprises the [enterprise] group.

2.3.4. Use in short-term business statistics

The use of different types of statistical units in the STS-Regulations is laid down in each of the four Annexes. These Annexes specify the "observation units". The terms "observation unit" and "analytical unit" are also used several times in the SU-Regulation, but without a definition of their role in the production of statistics. The explanatory notes of NACE Rev.1.1 also refer to reporting units, again without defining the role of these units. Hence, the exact role of the units specified in the Annexes to the STS-Regulations may be open to some interpretation. A common interpretation of the term "observation" would suggest that the national statistical authorities should use these units as the units observed - in other words about which basic data is collected. However, bearing in mind the principle of subsidiarity and the aim to produce harmonised statistics (rather than to harmonise the production of statistics) that are both mentioned in the preamble of the STS-Regulations, it would seem more reasonable that, in the context of the STS-Regulations at least, the observation unit is in fact the unit for which the indicators transmitted to Eurostat should be compiled.

General rule on observation units

The choice of units in the STS-Regulations can be summarised as the KAU for indicators in Annexes A (industry) and B (construction) and the enterprises in Annexes C (retail trade) and D (other services).

Other observation units - Committee procedure

In all four Annexes it is foreseen that other observation units can be used following the Committee procedure laid down in the STS-Regulations.

Non-use of the KAU

In Annexes A and B it is foreseen that, instead of the KAU, the enterprise or the local unit could be used for those enterprises with few persons employed in secondary activities.

2.4. Classifications[2]

2.4.1. Development of classification systems

One of the basic requirements for statistical work is the existence of a recognised framework that can

[2] For the latest version of classifications see the RAMON classification server on
Internet: http://europa.eu.int/comm/eurostat/ramon

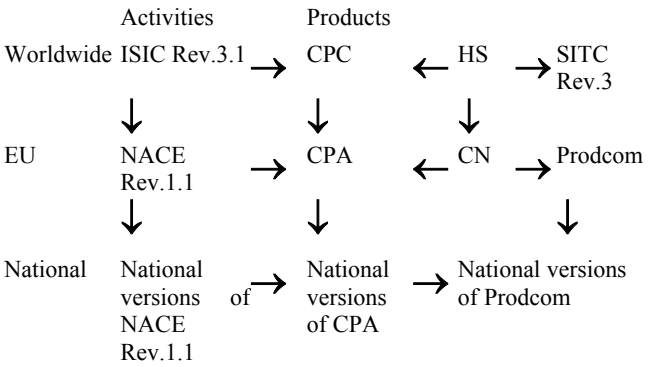
accommodate the vast range of statistical data available so that they can be presented and analysed in a meaningful way. Classification systems provide a common language both for the compilation and for presentation of statistics.

As classifications are the basic instruments for categorising phenomena of the real world there is a need to revise them from time to time as the real world changes. Such revisions usually affect not only the single elements of a classification but also the completely hierarchical structure. The more a classification is changed in its elements and in its structure, the more the continuity of the time series data based on that classification will be affected. There is, therefore, a trade-off between continuity and the necessary updating of the classification. It is thus advisable not to revise classifications too often. Furthermore, the applicability of a revised classification should be checked thoroughly before it comes into force.

Harmonization of classifications

Harmonisation has at least three aspects:

The first one relates to harmonisation between



classifications of the same nature. In this case, harmonisation is achieved if the elements of one classification are comparable with the elements of another. The relations between the elements could be 1:1, 1: n or n:1. The relationship 1:n or n:1 means that one classification is just a further aggregation or disaggregation of another. Such a relationship exists for instance between NACE Rev.1.1 and ISIC Rev.3.1 where the former is based on the elements of the latter. However, in achieving harmonisation it is not only necessary to consider the single elements but also to take into account the classification structure. This is especially necessary in the case of activity classifications where the hierarchical structure affects the classification of the statistical units because units are classified based on their principal activity by applying a top-down approach; i.e. classifying first to the highest level and then proceeding to the more detailed levels.

A second aspect relates to harmonisation between classifications of a different nature, especially between activity and product classifications. In this context, harmonisation means not aggregation or disaggregation but the maintenance of consistent conceptual relationships.

The third aspect is international harmonisation that is one of the main tasks of international statistical bodies.

International classifications/lists

A thorough revision of the international statistical classifications was completed during the 1990s, with the result that the classifications have been developed as an integrated system where the various classifications have been harmonised and linked at global, EU and national level. The EU classifications developed/revised during the 1990's are harmonised with classifications for worldwide use, in that the EU versions were derived on the principle of further disaggregation of the respective classification elements. This derivation principle holds true for the NACE Rev.1.1 with respect to the ISIC Rev.3. It also holds true for the Combined Nomenclature (CN) with respect to the HS as well as for the Classification of Products by Activity (CPA) with respect to the CPC. Thus, harmonisation is achieved between these most important economic classifications at the worldwide level and the corresponding classifications at EU level.

Implementation of NACE Rev.2

A change of all major international classifications of activities and products is planned for 2008. These revisions are motivated by the need of adapting the classifications to the changes in the world economy, mainly due to the developments in information and communication technology (ICT). A prime use of ISIC is for internationally comparable reporting of economic statistics by activity or industry in many statistical domains: for this reason, the new ISIC also reflects the outcome of a convergence exercise between NACE and NAICS.

The revised ISIC is expected to be adopted by the UN Statistical Commission in March 2006. NACE is strictly dependent on ISIC, and is being modified accordingly. Eurostat, together with other countries,

cooperates actively with the UN in the whole revision process.

NACE and CPA are adopted in EU Member States through Council and Parliament Regulations; therefore, changes to these classifications require the adoption of new Regulations. The implementation date in the EU statistical framework have been discussed by the Statistical Program Committee (SPC) in May 2005: it is proposed that for STS indicators the first reference year for NACE Rev. 2 will be 2009.

2.4.2. Activity classifications

A classification of economic activities is designed to categorise data that can be related only to the unit of activity, for example an individual plant or group of plants comprising an economic entity such as an enterprise. It provides the basis for preparing statistics of output, the various inputs to the production process (labour, materials, energy, etc.), capital formation and the financial transactions of such units.

Most European Union countries used to work with activity classifications that had been designed with specific national criteria in mind, producing activity data that was comparable between countries was causing considerable difficulties.
There was therefore general agreement that comparable data on activities for all Member States was essential and that these could be produced only if there was a harmonised classification.

ISIC Rev.3.1		NACE Rev.1.1		Code
17	Sections	17	Sections	Letters A to Q
-		31	Subsections	2-digit alphabetical codes
62	Divisions	62	Divisions	2-digit codes (01 to 99)
161	Groups	224	Groups	3-digit codes (01.1 to 99.0)
298	Classes	514	Classes	4-digit codes (01.11 to 99.00)

Classification systems have to be revised from time to time to reflect changes in technology and economic structures. Thus, the European Union activity classification has evolved over time.
Through a joint United Nations Statistical Office/Eurostat working party, Eurostat and representatives of the Member States were closely involved in the third revision of the International Standard Industrial Classification of All Economic Activities (ISIC Rev.3.1), which was adopted by the United Nations Statistical Commission in February 1989. Subsequently, a working party made up of Eurostat and representatives of the Member States developed NACE Rev.1.1. Starting from the structure of ISIC Rev.3.1, sufficient detail was added to reflect the more important activities of the Member States that were inadequately represented in ISIC. Special features of national classifications were introduced in this process.
Because NACE Rev.1.1 reflects national structures, it features not only the activities that are important in all Member States, but also those that are important in some countries and unimportant in others. The views of the relevant trade associations were taken into account at this stage. This has resulted in a considerable expansion of headings in NACE Rev.1.1 compared with ISIC.

The first level of ISIC Rev.3.1 (sections) is embodied in NACE Rev.1.1 as an alphabetical code, A to Q, and is further disaggregated in some areas into subsections indicated by 2-digit alphabetical codes. The second level of ISIC Rev.3.1 (divisions) is included in NACE Rev.1.1 without any changes. The third and fourth levels (groups and classes) are subdivided to reflect European needs, each 3- or 4-digit item in NACE Rev.1.1 being capable of being aggregated to the 3- or 4-digit levels of ISIC Rev.3 from which they have been derived.

To emphasise the differences in the coding systems, NACE Rev.1.1 codes include a full stop between the second and third digit. In addition, in ISIC Rev.3.1 the digit "9" always signifies "other", whereas in NACE Rev.1.1, "9" is used in the same way as any other digit, in order to provide for more subdivisions.

NACE Rev.1.1 may be regarded as a European version of ISIC Rev.3.1 that has been extensively enlarged.

Any level of a classification of economic activities can generally be described in terms of the output of its characteristic goods or services. It is, however, always necessary to have regard to the description of the activity as, in some instances, it is the process or the raw materials used, rather than the product, by which the classification is defined. As a tool in the practical everyday statistical work, the CPA can be helpful in delineating the characteristic products of the individual activities.

Definitions of activities and classification of units

An activity classification system is dependent on both the adoption of satisfactory descriptions of the respective activities and of the statistical units to which these activities are attributed. An activity is

said to take place when resources such as equipment, labour, manufacturing techniques, information networks or products are combined, leading to the creation of specific goods or services. An activity is characterised by an input of products (goods or services), a production process and an output of products.

In practice, the majority of units carry on activities of a mixed character. The identification of a "principal activity" is necessary to allocate a unit to a particular NACE Rev.1.1 heading. The "principal activity" is identified by the "top-down" method as the activity that contributes most to the total value added of the entity under consideration. The principal activity so identified does not necessarily account for 50% or more of the entity's total value added. A "secondary activity" is any other activity of the entity that produces goods or services.
Principal and secondary activities are generally carried out with the support of a number of ancillary activities, such as accounting, transportation, storage, purchasing, sales promotion, repair and maintenance, etc. Thus, ancillary activities are those that exist solely to support the main productive activities of an entity by providing non-durable goods or services for the use of that entity.

For more information on classification methods such as the top-down method and details of the definition of ancillary units see:
The explanatory notes of NACE Rev.1.1

MIGS

The objective of MIGS (Main Industrial Groupings) is to provide an activity breakdown of industry (Sections C to E inclusive) which is an intermediate level between the Sections and the Sub-sections. The need for an intermediate level comes from the fact that the three Sections provide only a limited amount of detail and in all EU Member States manufacturing dominates largely. The 17 Sub-sections belonging to these three Sections on the other hand are too numerous and too different in size to make it possible to explain succinctly the development of industry over time.

There are five MIGS, which, despite the reference in three cases to "goods" in fact regroup all of the activities without exception in Sections C to E. These are:

- intermediate goods;
- capital goods;
- consumer durables;
- non-durable consumer goods;
- energy.

These groupings of are based on the 3-digit level of NACE Rev.1.1, However, there is no connection with the 2-digit level as the majority of Divisions belong to at least two MIGS. It should be noted that the MIGS are not comparable in size, in particular the consumer durables heading is smaller than the others are.

2.4.3. Product classifications

Product classifications are designed to categorise products (goods and services) that have common characteristics. They provide the basis for preparing statistics of the price, production, distribution, consumption, external trade and transport of such products. The revised worldwide activity classification - ISIC Rev.3.1 - has its counterpart product classification in the Central Product Classification (CPC). For transportable goods, the building blocks of CPC are the elementary categories of the "Harmonised Commodity Description and Coding System"(HS). The European version of the CPC is the Classification of Products by Activity (CPA)

CPA is a product classification whose elements are related to activities as defined by NACE Rev.1.1. Each product - whether it is a transportable or a non-transportable good or a service - is assigned to one and only one NACE Rev.1.1 activity. The linkage to activities as defined by NACE Rev.1.1 gives CPA a structure parallel to that of NACE Rev.1.1 at all levels distinguished by NACE Rev.1.1.

However, the detailed linkage between products and activities could only be established to a certain degree. It should be noted that there are cases where products could be assigned to activities only at a higher level than the Class level (for example textile yarn and fabrics) and where the classification is based on certain conventions (for example waste and scrap).

Level	Number of headings
First level: 1-digit code (section)	2
Second level: 2-digits code (division)	6
Third level: 3-digits code (groups)	20
Fourth level: 4-digits code (class)	46

In order that CPA may serve as a "central" product classification, all other product classifications designed for special survey purposes have to be related to CPA in strictly defined ways. This is, for example, already the case for the Prodcom list, CN

and CC. In general, product classifications that are more aggregated than CPA consist of precise aggregations of CPA subcategories and classifications that are more detailed than CPA consist of subdivisions that are wholly contained within CPA subcategories. The same rules apply for national versions of CPA

CPA is a classification system with six hierarchical levels and one intermediate level. As CPA is aligned to the structure of NACE Rev.1.1, the first four levels and the intermediate level are similar in structure to the NACE Rev.1.1 levels.

The CPA will follow the revision after the revision of the NACE.

Level	Number of headings
First level consisting of headings identified by an alphabetical code (sections)	17
Intermediate level consisting of headings identified by a two-character alphabetical code (subsections)	31
Second level consisting of headings identified by a two-digit numerical code (divisions)	62
Third level consisting of headings identified by a three-digit numerical code (groups)	223
Fourth level consisting of headings identified by a four-digit numerical code (classes)	502
Fifth level consisting of headings identified by a five-digit numerical code (categories)	1146
Sixth level consisting of headings identified by a six-digit numerical code (subcategories)	2608

CC[3]

The CC has been developed based on the CPC. The CC is designed to serve different purposes such as statistics on construction activities, construction reports, building and housing censuses, price statistics on construction work and national accounts. In addition, CC is to be used for the definition of constructions that will be needed for the provision of information on specific variables concerning short-term indicators. The classification is a 4-level hierarchical system.

[3] For the latest and detailed version of Construction Classification see *Associated documents* of the Methodological Manual available on CIRCA site/Library/Methodology/STS Methodological Manual

The principal breakdown, at the Section level is between civil engineering and buildings. Below this level, the CC differentiates primarily according to the technical design which results from the special use of the structure and, in particular for buildings, according to the main use.

It should be noted that, unlike CPA and NACE, there is no legal basis for the CC. However, like CPA and NACE, the CC contains many introductory remarks that provide definitions and classification guidelines, essential for a clear and coherent implementation of the classification.

2.4.4. Use in business registers

Every statistical unit must be associated with variables that define its activities. These concern principal, secondary and auxiliary activities. The SBR-Regulation foresees that the principal activity should be recorded for enterprises and local units at the 4-digit level of NACE Rev.1.1.

For enterprises, the SBR-Regulation also foresees that any secondary activities should be recorded at the 4-digit level. It qualifies this provision on secondary activities by limiting this to significant secondary activities and defining this as those activities of an enterprise that represent over 10% of the enterprise's total activity in terms of gross value added or over 5% of national activity of that type. A second qualification is added that this requirement to register secondary activities is limited only to enterprises that are subject to surveys. In the recommendations manual for business registers this second qualification is interpreted as meaning those enterprises subject to the annual SBS surveys. Recording of secondary activities for local units is optional according to the SBR-Regulation. The recommendations manual for business registers proposes that this information be recorded for local units if local KAUs are not explicitly recorded.

To enable statistical analyses to reallocate the cost of ancillary activities to the activities for the benefit of which they are pursued, the SBR-Regulation requires a field to specify whether a local unit carries out an ancillary activity of the enterprise on which it depends.

The recommendations manual for business registers foresees other additional codes that can usefully be applied to distinguish, for example, continuous activity from seasonal activity or, within NACE Rev.1.1 Groups engaged in the manufacture of industrial equipment, to indicate units which are

classified under these headings because they actually manufacture it, as opposed to those which only carry out repairs or installation.

2.4.5. Use in short-term business statistics

The STS-Regulations refer to two classifications, namely NACE Rev.1.1 and the CC, as well as providing a legal basis for the development of the MIGS. Without reference to a classification, as such a distinction is made along geographical lines between domestic and non-domestic territorial areas.

NACE Rev.1.1

NACE Rev.1.1 is used to i) determine the scope of each of the Annexes ii) restrict this scope for specified variables iii) determine the scope of certain pilot studies and iv) specify the level of activity detail at which all indicators need to be provided.

It should be noted that the STS-Regulations require different levels of activity detail depending on i) the indicator ii) the activities covered and iii) the reporting country.

In general, the STS-Regulations follow the hierarchical nature of NACE Rev.1.1. The one main exception to this is in Annex C and D where the STS-Regulations lay down the following aggregations of Classes:

- sum of Classes 52.41, 52.42 and 52.43;
- sum of Classes 52.44, 52.45 and 52.46;
- sum of Classes 52.47 and 52.48;
- sum of Classes 74.11, 74.12, 74.13 and 74.14.

the following aggregations of Classes and Groups:

- sum of Class 52.11 and Group 52.2;
- sum of Class 52.12 and Groups 52.3 to 52.6;

and the following aggregations of Groups:

- sum of Groups 52.1 to 52.6;
- sum of Groups 74.2 and 74.3.

The impact of the 2007 revision of NACE on STS will be much greater than the one completed in 2002. The classification of service activities in particular will experience major changes, for example, there will be a new information activity including television, information technology, and telecommunications.

See also sub-chapter 3.3 for information on the activity coverage of the STS-Regulations and *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/ *"Requirements of the STS- Regulations"*.

CPA

The CPA, it is important for STS as some of the main indices such as production and prices are often compiled from data collected for products. Furthermore the CPA is the central classification to which is related the CC which is expressly referred to in the STS-Regulations.

CC

The CC is used in Annex B to i) split the production and new orders variables into two parts, one each for building and civil engineering ii) determine the scope of the construction costs and building permits variables iii) specify the level of detail at which building permits variables should be compiled.

Territorial coverage

Territorial coverage is an important aspect of the STS-Regulations. Several of the indicators, such as turnover, new orders and output prices, have to be subdivided between domestic and non-domestic. This distinction is extremely useful for analytical purposes as it provides valuable information on the short-term development of distinct markets, especially close to turning points.

3. Business populations

Populations can be determined with respect to statistical units and classifications. The Handbook on design and implementation of business surveys identifies four levels of populations:

A	Ideal target population
B	Intended target population
C	Frame population
D	Sample population

The population that fully meets the users requirements may be unrealistic given methodological and resource constraints and can therefore be regarded as the ideal target population. What users can expect to receive from a statistic can be regarded as the intended target population. This may deviate from the frame population that, in the case of STS, is normally the population in the business register. The difference between the frame and the intended target population is due to imperfections in the business register that it may or may not be possible to correct. Finally the sample

population consists of the units drawn from the frame population (the statistical business register) about which data are requested (see point 4.3.1 concerning sampling). Throughout this, manual references to the target population concern the intended target population.

3.1. Registers at the heart of business statistics - the frame population

Business registers are of fundamental importance to the compilation of economic statistics. Their coverage, comprehensiveness and quality have greatly progressed over a decade, but considerable differences between Member States still exist.

A statistical business register can be considered as a system transforming data from administrative sources into data suitable for statistical use[4].
In other words, business registers are designed to function as a bridge between administrative and statistical units.

Studies have shown that registers are used in various ways, amongst which the following:

- Detection and construction of statistical units - statistical units are often constructed units which do not always correspond to legal or administrative units. Administrative sources provide information on the creation and existence of legal units, including the address details.
- As tools for the preparation and coordination of surveys - this includes:
- providing a directory from which mailing lists can be assembled for the dispatch of questionnaires;
- providing a (frame) population of the business community for which efficient sampling schemes can be designed and panels monitored;
- providing the basis for grossing-up results from sample surveys to produce (frame or target) population estimates;
- helping to prevent duplications and omissions in the collection of information on enterprises;
- improving congruence between the results of different surveys;
- helping to improve coverage or reveal inaccuracies;
- allowing coordination between the departments conducting surveys, if a register is central and covers units from all activities;
- keeping the statistical burden on small enterprises under control by keeping track of the questions put to units in surveys and avoiding selection of the same units more than once.
- As a tool for mobilising administrative sources - the demand for economic information is constantly increasing, this can lead to statistical surveys imposing increased burdens on enterprises. Statistical surveys should avoid asking for information that the enterprise has already supplied to other authorities. One problem often encountered is that administrative units do not always correspond to statistical units. By correlating administrative units and statistical units, the register offers a partial solution to these difficulties.
- Source of information for statistical analysis of the business population and its demography. Business registers are used more and more as a source for statistics: the statistics on business demography are mainly based on the business registers.
- An infrastructure for globalisation statistics. With the inclusion of enterprise groups and the control links between units belonging to the groups, the business registers serve as a basic tool to harmonise the treatment of control and ownership data for many statistics related to globalisation, as well as they give some basic data on enterprise groups themselves.

The main users of business register data are business surveys and enterprise panels (groups of sampled units that are surveyed over several time points). Taking into account that business statistics should both observe and describe a country's total productive activity, the output of the ideal business register can be defined as an up to date file of all statistical units active within the country's territory and generating value added, as well as their relevant statistical and administrative attributes.

3.1.1. Council Regulation on business registers for statistical purposes

The SBR-Regulation was adopted on 21 July 1993. It is currently in the pipeline to be revised to take into account the development and the new requirements.
The SBR-Regulation required Member States to set up business registers for the enterprise and local

[4] An SBR does not rely entirely on administrative sources as they normally also incorporate statistical information from special register proving surveys and from the regular schedule of statistical surveys.

unit as statistical units and for the legal unit; the proposed new SBR- Regulation includes one additional statistical unit: the enterprise group. The SBR-Regulation also states which characteristics shall be recorded to these units.
The SBR-Regulation requires national statistical authorities to set up, for statistical purposes one or more harmonised registers. It should be noted that there is no obligation to have one register only, nor that the register(s) should be maintained centrally nor that one single authority should maintain the register. Finally, there is no obligation to use the register(s) for any particular function in the conduct of any particular survey.

3.2. Contents, coverage and maintenance of the SBR

3.2.1. Contents

The conceptual model of the information for registers implicitly defined by the SBR- Regulation is very simple. It explicitly comprises four units: the enterprise, the local unit, the legal unit and the enterprise group, and the relationships between the units. The list of information that needs to be recorded depends on the intended uses of the register. National business registers developed for statistical purposes clearly have to identify units with certainty in order to:

- permit the collection of information about them in administrative files;
- provide a sampling base for surveys;
- permit demographic analysis of the population of enterprise groups, enterprises and their units;
- provide control links between units for analysis related to globalisation.

This clarification of the functions of the register permits analysis of the "information" which it has to record in different "categories". The first four categories apply to all units:

1. identification characteristics;
2. demographic characteristics;
3. economic/stratification characteristics;
4. links with other units in the register;
5. links with other registers;
6. control of units;
7. ownership of units.

Links with other registers concern legal units and local units, which can be found in other registers. Control and ownership of units concern only the relationships between legal units.

For a full explanation of the contents of business registers see:
- Council Regulation No 2186/93 on Community coordination in drawing up business registers for statistical purposes.
- Business Register Recommendations Manual, Eurostat 2003

3.2.2. Coverage

In principle, every unit contributing towards Gross Domestic Product should be included in registers for statistical purposes. The Regulation applies to units that exercise wholly or partially an economic activity. Any activity consisting in offering goods and services on a given market is an economic activity. Non-market services contributing to the gross domestic product, as well as direct and indirect holding of active legal units are regarded as economic activity for business registers purposes. Economically inactive legal units are part of an enterprise only in combination with economically active legal units.
However, on cost grounds enterprises with less than half a person employed and resident enterprise groups of no statistical importance to the Member Stated can be excluded from the register.

3.2.3. Exclusions from the coverage

Harmonised national registers are essentially business registers. Thus, they take no account of institutional units that make an ancillary contribution to gross domestic product without constituting "an organisational unit producing goods or services". The registers do therefore not cover households producing goods or services for their own use; they are not regarded as enterprises. It does not matter whether that production is consumed by the household itself (for example production from domestic gardens) or even invested in the household.

Registers also exclude natural persons owning property (land, buildings for residential use or other buildings) whether they use that property for their own needs (or those of their household) or even rent them to third parties.

Since they do not contribute towards the Gross Domestic Product of the countries in which they are located, embassies and foreign government representations, whose activity falls within section “Extraterritorial organisations and bodies” of NACE, are not included in the national register of the country where they are located. On the other hand, embassies and government representations may be included in the national registers of the countries that they represent.

3.2.4. Size coverage

All enterprises must be included in the register, whatever their size. Entities that do not constitute an "organisational unit producing goods or services" should not be regarded as enterprises and need not be included in the registers. It will be deemed impossible to create an enterprise unit without a combination of factors of production involving a minimum amount of labour. Thus, an enterprise must provide employment, be it voluntary or paid. The only exception to this rule concerns holding companies, which must be recorded as enterprises since they control enterprises, even if they do not declare any employment. Inclusion of enterprises below the half a person threshold is optional for the Member States; there may be practical reasons for this.

3.2.5. Maintenance

Member States are increasingly using administrative sources of information to compile and maintain statistical registers. Some are integrating the information held in the two types of register with the aim of producing a multi-purpose register. The VAT register is one source of administrative information used by most statistical institutes while registers maintained by other taxation authorities, social security administrations and chambers of commerce are other generally used sources. Where these exchanges of information occur, the shape and content of the administrative and statistical registers can influence each other. The maintenance of statistical registers should not be regarded as an isolated operation but as part of a coordinated approach towards the joint development of statistical and administrative registers, although care must always be taken that the transfer to other authorities of information will not harm the interests of a unit it has given to the statistical institute.

Some countries carry out proving exercises on sections of their registers from time to time, by adding questions to an existing survey or conducting specific register surveys. For example, in the first case, information might be sought from enterprises - in conjunction with an annual survey (with perhaps few year intervals) - about the addresses of all their local units. An example of an ad hoc survey is one addressed to retailers asking them to tick which of a list of retailing activities (the list based on NACE) they consider their principal activity. Countries have found that surveys of this kind sometimes throw up quite marked gaps and inaccuracies in their registers. Verification surveys therefore need to be included as part of the normal maintenance of the register.
The SBR- Regulation requires the register to be kept up-to-date. In general, information obtained from administrative sources or annual surveys should be updated at least annually. Other information could be updated every few years.

3.2.6. Main characteristics according to the proposed new SBR- Regulation

Identification characteristics:
- Identity number
- Name, address
- VAT number
- Telephone and fax numbers, e-mail and web site addresses (optional)
- Information on enterprise group head and head office

Demographic characteristics:
- Date of commencement
- Date of cessation

Economic/stratification characteristics:
- Legal form
- Principal and secondary activities (NACE)
- Persons employed, employees and employees in full-time equivalent
- Turnover
- Institutional sector and sub-sector
- Geographical location code
- Country of enterprise group global decision-centre and countries where members of the group are located (optional)

Links with other units in the register:
- Generally a reference from lower to upper unit level (from local unit to enterprise, etc.)

Links with other registers:
- Links to Intrastat register and customs files, balance sheet data, balance of payments and foreign direct investment registers, farm registers

Control of units:
- Legal units: control links upward/downward, including first foreign parent and subsidiary

Ownership of units:
- Legal units: ownership shares from 10 % upward/downward, including the first foreign units owned/owning the unit (conditional: subject to the availability of the information in the administrative sources)

Section C: Collection to processing - general

4. National Data collection

4.1. Subsidiarity, national coverage

The statistical law lays down in very general terms the manner in which subsidiarity applies to all Community statistics. It states that the national authorities at national level and the Community authority at Community level shall be responsible for the production of Community statistics in compliance with the principle of subsidiarity. To guarantee comparability of results, Community statistics shall be produced on the basis of uniform standards and, in specific, duly justified cases, of harmonised methods.

In terms of data collection, this has two important consequences. The first is that it is the Member States who are responsible for the production of the national data - this has always been the situation in STS. Secondly uniform, Community standards such as definitions and classification shall be used by all Member States where they exist, but that the methods of data collection shall not be restricted without due cause.

Status	Statistical	Administrative	Mixed
Official or non-official	Compulsory or voluntary Regular or ad hoc Census or sample Postal, electronic or interview	Company register VAT declarations Social security declarations Tax declarations Permits Membership records	Statistical business register Estimations (synthesis)

The STS-Regulations acknowledge the principle of subsidiarity in paragraph (9) of the preamble.

In practice, in most Member States data collection and the compilation of the majority of the STS is done by the statistical office (national or regional) of the country concerned, although it is not uncommon to find the responsibility for the production of STS for certain indicators or certain activities (such as construction) in other parts of the public administration. In exceptional cases (part of) the production of the STS is done by some trade associations. Where this is done, attention should be paid to ensure that the basic principles laid down in the statistical law, such as impartiality, are respected.

Regardless of the responsibility for the production of STS, article 15 of the STS-Regulation requires one national authority to coordinate i) the transmission of variables ii) and the measurement of quality and the transmission of relevant information. in practice this role is normally played by the statistical office. In order to achieve this coordination all Member States have been asked to nominate coordination offices for the implementation of the STS-Regulations and Eurostat believes that this has improved communication significantly.

4.2. Combination of sources

The production of STS is normally based on the compilation of data from numerous sources. In chapters 6 to 9 the sources commonly used for each indicator are presented. The following table provides an overview of the main types of sources that are used for collecting information from the business community:

STS may be produced by combining data from several of these types of sources and possibly using data not originating within the business community; for example, data from household surveys may be used for labour input variables. The reasons for choosing different sources relate to the respondent burden and cost, the requirements of users and the validity of the possible source in terms of coverage and conceptual definitions.

The administrative or statistical information may be collected by many different parts of the public administration at national or regional levels. A prerequisite for comparable Community statistics is that they all apply common standards to the greatest possible extent. The degree to which comparable data are produced depends on the extent to which the national statistical authorities are able or willing to ensure that these standards are respected.

4.3. Sources

4.3.1. Statistical surveys

All national statistical authorities have statistical questionnaires used for compiling STS however, their content and style vary enormously, partly because of cultural differences and partly because

of the greater or lesser importance attached to respondent burden and cost. These influences as well as others determine what information the national statistical authorities think that they can observe. In most of the national statistical authorities, the surveys are rarely restricted to one standard questionnaire or form but tend to be a combination of forms, differentiated by major characteristics, namely:

- the activity, size, legal form and the type of variables asked on the form (output, prices, employment, other specialised variables);
- occasionally an extra characteristic, the geographical location of the unit, may influence the contents of a survey.

When considering statistical surveys size thresholds play an important point in determining the target population and, where relevant, the sample population (for information on sampling of products for production and price indices see sub-chapters 7.1, 7.3, 7.4, 8.1 and 8.2).

Size thresholds to determine the target population - cut-offs

Traditionally many statistical business surveys have been conducted for units above a certain size threshold. The reasons for this are diverse and include the desire to limit the size of the survey, to limit the response burden and also to take account of the problems of maintaining registers for smaller units. This practice leads to problems of comparability between the results for different activities where the importance of small units varies from one activity to another. In a similar manner, when making international comparisons cut-off thresholds distort comparisons between Member States. See also sub-chapter 3.3.

Sampling of statistical units

Statistical surveys may be exhaustive surveys (census) or sample surveys. The use of sampling is a method for easing the statistical burden; it may be used in conjunction with a cut-off or not. The STS-Regulations do not specify any sample size - the decision is left to the judgement of each national statistical authority and may vary between surveys on different subject matters and for different activities.

The construction of a sample is normally based on (an extract from) the statistical business register. If several separate surveys are used to compile STS, the use of a common register is recommended. If is also recommended that this should be the same register as used for other surveys with which STS may be confronted (see sub-chapter 5.4) or to which they may be benchmarked.

Samples are generally not drawn with the same frequency as statistical surveys used for STS and hence the sample is in some respects like a panel and needs to be updated. It may be necessary to have a reserve pool of units that can be used as needed, particularly in activities like retail trade where the number of enterprises start and ceasing operations in any period is proportionately large. Samples should be periodically reviewed.

When drawing the sample attention should be paid to the results to be compiled, the resources available and the accuracy and timeliness required. Some indicators are required at particularly fine levels of activity details and others only at a more aggregated level.
The sample should be constructed in order to provide representative results at the level of detail to be disseminated[5]. If necessary, the sample may need to be representative for certain size classes, regions or other sub-populations.

Samples may be simple in design, taking a number or proportion of units from the frame population, or they may be stratified samples where a variable number or proportion of units are taken from different non-overlapping sub-populations, each sub-population being a strata determined by one or more characteristics appropriate for the frame population.

If more precision is the reason for stratification, it is beneficial to form strata that are more or less homogeneous groups in the sense of the target variables. Activity is commonly used as a criterion for determining the strata for statistical surveys for STS. In business surveys, size is also a useful stratifying criterion as size is often highly correlated with most variables of interest. Given that the size characteristics needs to be available in the frame population for all units, the common size measures used in STS are employment and / or turnover.

It is quite common for the sample rate in the strata covering larger enterprises to be 100%. For units in strata representing smaller enterprises the proportion of units selected within each cell will

[5] Disseminated is used here in a broad sense to cover not only dissemination by national authorities, but also transmission of data to Eurostat; it is possible that Eurostat disseminates data that a national statistical authority has chosen not to disseminate.

normally decrease with size, with lower proportions for the smallest units, reflecting the correlation of the stratification criteria with the target variable. Where there are few units in the frame population for a cell it may be best to specify a minimum sample size and in some cases this may result in the frame population for that cell being totally enumerated (100% sample).

For construction, the split between building and civil engineering may also be a feature of the sample design.

In the case of distribution, it is particularly important to consider stratifying the population by turnover classes as well as by employment, in order to obtain better results because enterprises in distribution activities may have particularly high turnover per person employed.

The use of stratified sampling is important in most service activities because of the existence of very large numbers of units.

Response rates

In recent years, some national statistical authorities have noted that the increase in the number of statistical surveys has resulted in a decrease in response rates. Sufficient and timely response however is crucial for statistics. To try to get complete data and in the same time to avoid problems with sample designs the response must be as high as possible. If response to a survey can be increased within the time constraints of the survey, statistics would be more accurate and timeliness can improve. See also sub-chapter 10.3 that looks at timeliness in general.

4.3.2. Administrative sources / registers / declarations

For the purposes of business statistics a limited definition of administrative sources can be used - an administrative register is a systematic collection of data that can be related to individual unit in such a way that updating is possible. According to the purpose they serve, administrative registers can be subdivided into basic registers and specialised registers.

- Basic registers are maintained as a basic source for public administration in general or for serving several different administrations. These registers typically aim to keep stock of the business population and its dynamics. An important condition is that such registers maintain identification attributes also used by other administrations. Moreover, they should contain certain basic data of common interest to a number of administrations.
- Specialised registers serve one or an explicitly defined limited group of purposes only. The authority that is also the user maintains these registers. Basic registers often provide part of the input for these specialised registers, such as the basic attributes name, address, legal form, activity code and size class of legal and local units. Examples of specialised registers are the VAT register and the statistical business register.

Administrative sources can be used for statistical purposes in different ways: as a single source in their own right, as a frame for sampling, as a complementary source to complete existing statistics and to confront statistical data across time and space.

The use of administrative sources should be considered when producing STS in order to reduce the response burden. Using administrative data sources can bring some opportunities such as a low marginal cost, a high response rate, a high coverage of the target population (no sampling errors), edited data.

However, there are potential drawbacks with administrative data. The (frame) population covered by many administrative sources is often not the same as the target population for STS. Due to the primarily administrative purpose of an administrative source the concepts, definitions and units used will often differ from statistical norms and standards. A common and important difference is in the definition of the unit that may be defined on criteria other than the legal, activity and geographical ones used for statistics. Policy changes can lead to changes in the administrative source which may influence the frame population by exempting sub-populations on the grounds of activity, legal form or size, or they may change the definitions of the information recorded or simply stop recording some information altogether. This in turn threatens the continuity of the information used for statistical purposes. Information drawn from administrative sources may be slow in becoming available compared to statistical sources if the time given to comply with the administrative requirement is long and the processing of the administrative data slow. Units making non-statistical administrative declarations may have an interest in inaccurate filing (for example for tax evasion) which can lead to bias.

Weighing the advantages and the disadvantages, most national statistical authorities use administrative data for updating their business registers. Some also use these sources for STS to supplement or even replace statistical survey data, particularly in the case of small enterprises. Examples of such administrative data files are VAT declarations (containing sometimes very detailed breakdowns of current income and expenditure), social security declarations (employment and labour cost data) and building permits. The precise content of these files varies between Member States, as do the characteristics of units required to register or make declarations.

Finally, it should be noted that the access of national statistical authorities to administrative information is greater in some Member States than others.

4.3.3. Estimations

The STS-Regulations explicitly permit the use of statistical estimation procedures. For example, these may be used for item or unit non-response, grossing of sample results to the level of the frame population or to adjust results from surveys or administrative sources where the frame population does not match sufficiently the target population or the variables collected are not sufficiently close to those required. Either hence, this need for estimation may arise because of non-response or because the statistical authority has chosen not to collect directly the information required.

Under the principle of subsidiarity, the provisions of the STS-Regulations do not specify the methods employed to make estimations and hence these are left to the discretion of the national statistical authorities. In accordance with Article 14, the Commission can ask for methodological documentation.

The existing pressure to reduce the data collection burden adds to the need to invest in coordinating statistical surveys, administrative data and the development of estimation techniques.

Some national statistical authorities use techniques that may be classed as estimations, not because data is unavailable, but because conflicting data is available from different sources. In order to provide users with coherent data sets synthetic results may be compiled, for example labour accounts that reconcile data from the business population with data from individuals.

4.3.4. Non-official sources

There is a great variety of non-official data, much of it available from consultancies or research institutes. Trade associations and chambers of commerce also produce non-official data about the business community.

With only a few exceptions, private research institutions do not carry out regular surveys and tend to produce results from ad hoc surveys for clients.

The statistical capability of trade associations varies greatly. Some are capable of providing data within short delays on a regular basis. Their main disadvantage is that in most activities, they tend to be voluntary organisations and hence they may not cover all enterprises within their field of activity and hence, unless adjusted, their statistical data may not be representative of the target population.

5. Compiling national results

The starting point for the processing stage is the information as collected from respondents. The aim is to bring these data to the level of the intended statistical output. For various reasons, the act of processing comprises more than just aggregating questionnaire items:

1. some respondents will make errors while filling in the questionnaire and data entry errors may be introduced within the national statistical authority;
2. both at micro (a) and aggregated (b) level there will inevitably show inconsistencies with related items as obtained from other surveys;
3. some respondents will only partly complete the questionnaire (item non-response);
4. not all of the information collected is a perfect representation of the output concepts envisaged;
5. a sample rather than a complete enumeration (census) may have been used;
6. there will inevitably be non-response;
7. the frame population from which the sample was taken may not be an adequate representation of the target population;
8. certain variables require more complex combination than simple aggregation, for example to be presented as an index;
9. certain variables require more complex analysis, for example seasonal and / or working day adjustment.

Processing comprises a range of operations aiming to counter some or all of these complexities. The steps can be summarised as follows.

- After data entry, errors (1) and inconsistencies (2a) are detected and corrected during editing.
- Subsequently, item non-responses (3) as well as gaps between questionnaire concepts and output concepts (4) are dealt with by imputation.
- The resulting set of clean and complete micro data serves as the basis for weighting (5) and reweighting (6). During this stage, also frame errors (7) may be accounted for.
- The aggregated data may then be confronted with related data from other sources and possibly integrated (2b).
- Finally, where appropriate, statistical compilations (8) and analysis (9) are carried out, resulting in a non-public data set. Prior to dissemination, the one remaining stage is to identify and treat confidentiality (see sub-chapters 10.1 and 12.1).

A number of these steps are described in the following sub-chapters, particularly those that have some elements that are specific to STS.

5.1. Data control/editing

Editing involves studying data from respondents with the aim of identifying (and eventually correcting) errors. Not all errors can be identified and the aim is to detect the errors that have a significant influence on the results. Rules to assist in identifying errors may flag possible errors that require further investigation to determine where there really is an error as opposed to an unusual result or they may identify definite errors. Editing involves checks for completeness, that values are within given ranges and that values for related variables are coherent. Data editing may take place during or after data entry.

Responses can be compared to the response of previous months. Inconsistency or large deviations (outside of a pre-established range) indicate that a closer look is desirable. This may result in editing. In the context of timeliness, the editing process may be designed to give top priority to those outliers that are most in need of editing for the sake of reliable aggregates. By solving the worst cases, large improvements can be achieved.

5.2. Treating non-response

Non-responses are one of the main problems the national statistical authorities have to face when carrying out data editing. A non-response means that all (unit non-response) or part (item non-response) of the statistical information sought for an observation unit is missing.

Even though response to statistical surveys conducted by national statistical authorities is in general a legal requirement and non-respondents are liable to various levels of penalty, non-response remains a problem in virtually all statistical surveys, not least because of the impact on timeliness.

Reasons for non-response include lack of appreciation of the importance of the statistics, lack of funds, refusal, not knowing how to respond, difficulty in finding the items required by the data collector in time for the survey or the non-existence of the unit. Although some non-response is systematic (occurring repeatedly over a long period) such that enforcement measures have to be taken, others are sporadic but require action.
Although eliminating non-response is a desirable goal and national statistical authorities should take the necessary steps to reduce it, there are no definitive values for the level of non-response considered acceptable. For example, a non-response rate of 1% or 2% seems acceptable, but national statistical authorities often have to cope with values of the order of 20-30% or even higher.
There are many ways of trying to encourage response including reminders to the non-responding units by various media (post, fax, telephone or e-mail) before resorting to the enforcement measures laid down in national legislation.

Another approach is to offer statistical units rewards for their collaboration, thus motivating them to take part. It is recommended to use a selective respondent follow-up strategy whereby effort is focused on units that have a significant weight.

The existence of non-response means that certain measures have to be taken to reduce its effects on the results. Several methods of estimating for non-response and preventing bias in the results exist. These methods are varied and none stands out as being superior in all circumstances. The choice of method depends on the circumstances and the parameters they are to be estimated. For example, in a non-inflationary context, it may be appropriate to estimate non-responses for prices based on the previous month's price, the average price for the stratum or the price used in the equivalent month of

the previous year, but these will not always be acceptable.

5.2.1. General treatment of non-responses in STS

In the case of item non-response, the missing elements are usually imputed. In the case of unit non-response imputation or correction of the weights of the respondents in the sample are the usual methods.

5.2.2. Methods of imputing non-responses

As mentioned above the choice of a particular imputation method depends on the possible constraints on assigning an imputation value that most reliably reflects the value sought. Imputing non-responses consists of the allocation of plausible response values in order to obtain data for all elements of a sample.

5.2.3. Mean value imputation

This method consists of giving the non-response the mean value of the responses. It may be applied to the whole of the sample or, in the case of a stratified sample, to a specific stratum. The effect of this mean value method is to reduce the variance and standard deviations of the observations, which are far more centred to the mean.

Hot deck

Hot deck means giving a non-respondent a value(s) chosen from amongst the respondents values, whether or not this is selected at random. The respondent unit is called the donor, and all of its response values are allocated to the imputed unit. This method is particularly useful in that it gives the values for non-respondents some consistency as they are obtained directly from respondents. This can also be used for the whole sample or at the level of each stratum.

Cold deck

This method is similar to the last one, but differs in that the values obtained from the "donor" are taken from a source external to the statistical survey, such as administrative data or previous surveys.

Nearest neighbour matching / Distance function matching

This is another hot-deck procedure, consisting of giving the non-respondent the same value as the respondent regarded as being the most similar.

Regression

This method is based on the relationship between variables. The information provided by respondents is used to establish a regression relationship with the variable to be imputed or other available variables.

Imputation of historic data

Imputation based on historic data is used frequently and involves allocating values obtained in previous periods. The major advantage of this method is that it enables plausible values to be attributed to non-respondents. The allocation of historic data may include the use of update coefficients to make the imputation more consistent. For example, the previous response may be adjusted by a growth rate corresponding to that observed for respondents common to the two periods. This method is frequently used where variables are presented in the form of indices. This method cannot be applied to units that have been selected but have to send in their first response. Where a unit is known to exhibit a certain characteristic on a regular basis (for example the payment of an annual bonus in a particular month for wages and salaries), it may be necessary to override the computed estimate to ensure this knowledge is used in the calculation.

Multiple imputation

Multiple imputation means imputing different values for a single non-respondent. The estimate is then calculated based on one or more sets of values to be imputed. This method is rarely used.

For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources

5.3. Weighting samples / grossing up

If a level is required, a grossed (-up) value needs to be calculated for the frame population. Grossing will use returned or imputed data to calculate a value representative of all units. In its simplest form, it may be a factor based on the sampling fraction (or the factor using returned data) for each cell in a stratified sample. More sophisticated methods are often employed which use information on auxiliary variables both in the sample and the frame population. One area that needs careful treatment is the identification and handling of outlier values. In some cells, a returned value for

one respondent may be very different from others in the cell. For example, this may be due to the payment of a very large bonus, a special payment or some unusual circumstances. If the grossing factor is large and the unit included, the overall estimate will be substantial and unrepresentative since it will be driven by one extreme value. In these cases, the outlier unit should be given a lower weight that means it represents itself only or a more appropriate weight should be calculated by statistical techniques. The identification of outliers needs some care. Possible methods are:

- units showing substantial changes between periods (for example a factor greater than 3 or less than a third);
- as above but use gates based on per head or per hour measures;
- units whose absolute values per head, or per hour lie above or below certain thresholds;
- units having a particularly high impact on the aggregate. Where this is above a certain level, the unit may be treated as an outlier.

5.4. Confrontation

In the three preceding sub-chapters the references to micro data, the sample population and the frame population have treated statistical surveys as more or less isolated activities. In reality, the collection and processing of data from different surveys may be done separately or collectively, depending on the survey management decisions in each national statistical system. Regardless of which approach is adopted the results generated after the editing and weighting stages can be considered as a self-contained data set and at the same time a part of a wider arrangement of business statistics, both nationally and internationally. For this reason, it is important that all surveys fit conceptually within a common general framework, based on harmonised concepts. Nevertheless, even where concepts of variables and classifications are standardised to a large degree, confrontation of data drawn from different surveys will reveal discrepancies and inconsistencies.

5.4.1. Causes of differences

There are two major categories of difference:

- conceptual differences, referring to the use and definition of variables, units and classifications;
- operational differences, referring to the observation of concepts, in other words to methods of collection and processing.

The second of these categories may lead to inconsistencies, for example due to different dates of extracting data from a common frame population.

External consistency checks (confrontation with other data sources), first at the aggregated level and where necessary at the micro level may help to flag possible errors. The applicability of this type of checks depends heavily on the degree of coordination of concepts used among the sources compared.

It needs to be recognised that when comparing two different surveys the sampling errors associated with each will mean that exact congruence will not be achieved. The difference gates that are set to trigger detailed investigation should take into account these measures of accuracy. When undertaking comparisons with administrative data, allowances may need to be made for differences in concepts.

5.5. Compiling indices

This sub-chapter does not deal with the subject of how each index is compiled as this is dealt with on a case-by-case basis in chapters 6 to 9. Attention here is focused on a number of general aspects of index compilation that are common to nearly all indexes foreseen in the STS-Regulations. Before turning to these, it should be noted that the STS-Regulations do not always require national statistical authorities to provide indices. In fact, it is only for the production and prices (or costs) indicators that the provision of an index is obligatory and only for building permits that absolute numbers are required; for all other indicators either an index or absolute figures may be provided to Eurostat.

5.5.1. Base years and base year changes

Indices in STS are expressed with reference to a base value and this base value is representative for a base year (see terminology box below). For a monthly series, the base value is the monthly average during the base year and for a quarterly series, the base value is the quarterly average during the base year. By convention, the index value of 100 is assigned to the base value.

General criteria for suitable base years are that they should be a "normal" or "average" year, which has not shown very strong special influences. However, so that international data comparison and aggregation of national indices are not made more difficult through different nationally specified base years, the STS-Regulations have specified that base years should be updated every 5 years and that the base years should be those ending in a "0" or a "5".

The STS-Regulations require that rebasing should take place within three years from the end of the base year

The Handbook on price and volume measures in national accounts notes that a simple change in the base year should not affect the rates of change in the values of an index. It recommends that indices at each activity level (of NACE) should be rebased independently rather than recalculating indices for higher activity levels based on weighting the rebased indices at lower levels. The result of this independent rebasing is non-additivity between the levels.

5.5.2. Weights for activity aggregation of indices

As explained in chapters 7 and 8 indices such as production and prices may be compiled from product data. In these cases, it is common to aggregate the indices for products (or product groups) to the most detailed level of the activity classification (for example the 4-digit level of NACE Rev.1.1). From this most detailed level of activity, the activity aggregation of these indices is the same as for the indices of the other indicators. Activity aggregation combines indices at the most detailed level of activity available using weights to produce indices at successively higher and higher levels of the activity classification. The one exception to this general practice is the calculation of MIGS that are compiled directly from the 3-digit level of NACE Rev.1.1.

Each index requires its own specific weights based on a relevant indicator. The following table indicates for each indicator which variable is used for weighting. It should be noted that some national statistical authorities use other weights.

Index	Used weight
Production	Value added
Turnover	Turnover
Domestic turnover	Domestic turnover
Non-domestic turnover	Non-domestic turnover
New orders	Turnover
Domestic new orders	Domestic turnover
Non-domestic new orders	Non-domestic turnover
Number of persons employed	Number of persons employed
Hours worked	Hours worked
Wages and salaries	Wages and salaries
Output prices[6]	Turnover
Domestic output prices	Domestic turnover
Non-domestic output prices	Non-domestic turnover
Permits	Turnover

It should be noted that for any activity at any level (except the lowest) of the activity classification, the sum of the weights of all of the activities that are one level lower in the activity classification and derived from that activity, must be equal to 100%. The following general formula can be applied.

$$I_g(t) = \frac{\sum_{k=1}^{K} w_k(0) \,.\, I_k(t)}{\sum_{k=1}^{K} w_k(0)} \cdot 100$$

(w) is the weight, (I) is the index, (g) is the higher-level activity (for example a Group) made up of (K) lower level activities (for example Classes), (0) the base year and (t) the current reference period.

If for some reason an index is not available for one of the lower level activities (one of the k in the set K in the expression above), the weight of that activity should be distributed proportionately amongst the other activities that also contribute to the same activity one level higher in the activity classification (g in the example above). For example, if there is no index for Class 15.43, the weight of Class 15.43 should be distributed between Classes 15.41 and 15.42, not simply by assigning half of the weight to each of these two Classes, but by dividing the weight of Class 15.43 according to the relative weights of Classes 15.41 and 15.42. The index for Group 15.4 is then compiled from the adjusted weights of Classes 15.41 and 15.42.

Why revise weights?

Weights are revised because the structure of the economy changes over the course of time. For example, it is clear that the weight of activities related to information communication technologies has increased in recent times in the EU as a whole, and in some Member States in particular. The relative shares of some other activities by definition have decreased. If weights were not revised, the

[6] For construction costs and output prices, the domestic turnover may be used.

contribution to higher-level aggregates of activities growing in relative terms would be understated and the contribution of activities declining in weight would be overstated. The STS-Regulations require that weights are updated at least every five years and implies that this should be coordinated with changes in the base years (see terminology box below). The STS-Regulations leave open the possibility of updating weights more frequently.
The change of weights can be carried out only when reliable annual data for the year under consideration are available and hence changes to weights (and related changes to base years) happen retrospectively.

When weights are updated, there is a break in the series compiled under the previous system of weights and the series compiled under the new system. These series need to be spliced in order to maintain a coherent time series. In the standard case of a rebasing every five years, the indices relative to a new weighting system have to be calculated retrospectively for several years, so that the point where the two series are spliced is between the two base years. For example when the new base year 2000 was introduced, the index with the new system of weights should have been calculated back to January 1998. As a result, the indices for the reference periods from 1993 to 1997 have 1995 weights; from 1998 to 2002 have 2000 weights and so on. It is unknown to what extent this practice is actually followed.

Terminology box
Note that in the domain of STS weights have traditionally been adjusted at the time of transition to a new base year, although this is not always the case. As indicated above it is quite common for a long time series of an index to be compiled running over several consecutive years in which several sets of weights (specific to a different year normally five years apart) have been used to compile parts of the time series. The whole series will however have been compiled relative to one particular base year (set to 100). It would be common practice to refer to each of these different sets of weights by their year, for example 1995 weights or 2000 weights. In STS, there is no established collective term for the collection of different reference years for the weights that may be used in a single series. In contrast, the Handbook on price and volume measures in national accounts refers to these as the base years.

5.5.3. Length of time series

Users in many types of statistics often request long time series but this is particularly important for STS, for several reasons. To carry out statistical analysis such as seasonal adjustment it is generally considered necessary to have observations for a minimum of 5 years. The same is true for the correction of working days, insofar as regressions are used. Moreover, the use of time series (raw or adjusted) is delicate or even impossible if the series are too short. This concerns both the econometric aspects (stability and quality tests of the forecast are very relative on short series) and the direct use of the series for economic analysis, for example, in the search for turning points it is important to be able to have data available for several complete cycles.

The STS-Regulations lay down no provision on sending long series and only requires that data are sent from a particular starting period, generally January or first quarter 1998.Changes in weights require previous series to be spliced but there is no requirement foreseen in the STS-Regulations for the reconstructed time series to be transmitted to Eurostat.

See also data revisions in sub-chapters 10.4 and 12.5 and compiling EU indices in sub-chapter 11.2.

5.5.4. Treating register changes

In STS, the development of a variable is often measured by grossing-up the variable for the sample population for the reference period to the frame population and expressing it relative to the grossed-up value for the sample population for a previous period. The frame population is normally defined based on the activity classification in the SBR. In the real world, the population varies over time as new units are set up and others cease activities for one reason or another; units may be taken over, merged, hived off, or split up, they may expand, contract, or change their activity (ies). Ideally these changes are reflected in the SBR and can therefore potentially affect the grossed-up values of the variables and hence the development in the variables between two periods. Are all changes reflected in the development and should they be? What are the alternatives for the statistical treatment of these changes? The rest of this point concerns value and volume statistics; changes in the goods observed in price statistics are not covered - see sub-chapters 7.3 and 8.2 specific to price and cost indices.

The treatment of changes in the real world population depends partly on the purpose of the short-term statistics in question.

Register changes

A population does not consist of exactly the same units in different reference periods. The population may be defined based on a number of criteria and for STS the main one is the activity classification.

There are a number of reasons why a population does not always consist of the same units. First, a unit may change its activity and thus end up in a

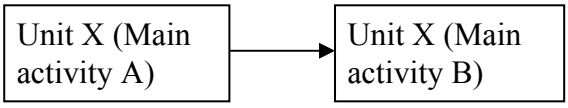
different (sub)population. A second reason is simply births and deaths of units. Finally, a population may change because units can change their structure through take-overs, mergers, hive-offs or split-ups. All these changes lead to changes in the register.

However, changes in the register are not always the result of actual changes in units.
Errors in the register may have been corrected, and units may have been combined or divided in the register to increase the descriptive capability of the statistics. When dealing with changes, therefore, we must distinguish between actual and apparent changes. What is the difference?

Actual change is a change in the SBR resulting from a recent event in the real world. For example, one unit splits in two along activity lines and this change is introduced into the SBR.

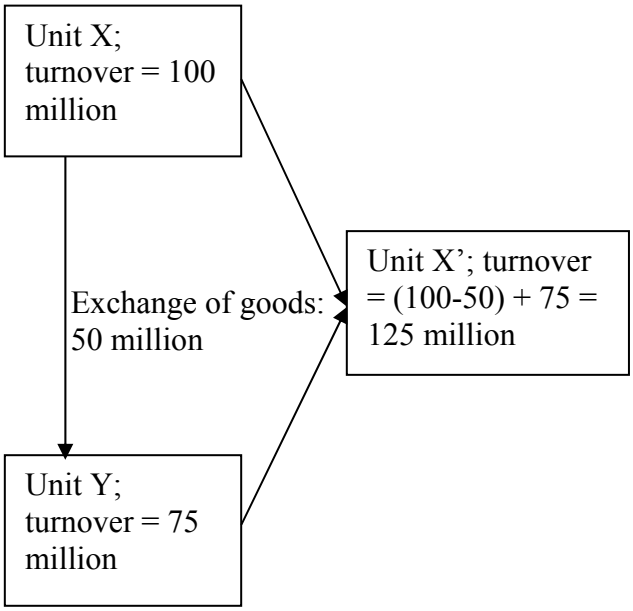
Apparent change is a change in the SBR resulting either i) from an event in the (distant) past or from the correction of an error, for example because the unit has always been classified incorrectly or ii) from an administrative change in the register.

Example 1: a unit that has always been recorded in the register with an incorrect NACE code.



Example 2: two legal units have been recorded separately in the SBR. In the course of time, the economic links between the two become increasingly strong and a point comes when it is decided that, for statistical purposes, it would be better in future to describe them as a single unit. The activities of one legal unit are exclusively geared to the other so that there is no longer any question of market orientation. The two units are combined in the SBR to form a single statistical unit, even though in reality there are still two closely linked legal units. The change in the SBR from two units to one does not, therefore reflect a change in the real world.

There is another aspect of changes that must be considered and that are the comparability of the unit(s) before and after the change. Frequently this can be assessed only after responses have been received from the units or by contacting them directly. In the following two examples, the concept of comparability is further illustrated.



Example 3. Unit X decides to take over unit Y. There was no economic link between the two before the take-over. Apart from the number of units, the situation before and after the change is comparable.

Example 4. Two units X and Y are closely linked through extensive exchange of goods. Unit X decides to take over unit Y.
Because the exchange of goods (50 million) has now become internal supplies in unit X', the turnover figure of unit X' has become smaller than the sum of the turnover of units X and Y. In this case, therefore, the situations before and after the change are not the same as witnessed by the total turnover figures that are not comparable before and after. Nothing has changed however in the combined value added (gross) output of
the units.

Treating changes

Obviously, changes in the register could be treated in several ways. We will discuss the most important ones and describe a number of advantages and disadvantages.

Grossing-up of independent samples

This method involves grossing-up the sample to the frame population for each reference period independently of other periods. The index is calculated as the break between two levels. The

register is followed in both periods and thus all changes are regarded as real (actual) and comparable.

The disadvantage of this method is that the indices are contaminated to the extent that some changes are in fact apparent, non-comparable changes and it is therefore difficult to obtain a picture of economic reality. The advantage is that the method is straightforward and does not require any extra work.

Index calculation on the basis of a panel

This method uses a panel of units that can be found in the same activity in both periods. The index is calculated by dividing the turnover of the panel in one period by the turnover in the other. Such a panel would tend not to include units that had been involved in a change, irrespective of whether it was actual or apparent. Even actual changes would not affect the index, therefore. Thus, in this case all changes are regarded as apparent. However, the index calculated in this manner does not relate to the development in an activity as a whole but rather to the development in the "average" active unit. In order to obtain a better description of the development in the activity, the development emerging from the panel may be multiplied by a population development. The latter is simply the development in the number of units in the population or in other words the number of units in the population in the current period divided by the number of units in the population in the previous period.

Instead, the units in the panel may also in each period be grossed-up to the population for the period in question. However, the development determined in this way may still be different from the development in the activity as a whole because the influence of start-ups and bankruptcies would be cancelled out. These units would tend to differ from the average in the initial and final phases respectively. However, since they are not included in the panel, they are regarded and estimated as behaving like an average unit during the period in which they were active. In activities with highly dynamic populations, this can lead to seriously biased results. Again, the advantage of this method is its relative simplicity.

Overlapping system whereby certain changes are transferred to the previous period

As with the first method, the sample is grossed-up to the frame population for each period. However, before this is done, the results of a number of changes are transferred back from the current period to the previous one so that the situations are comparable.

This yields an "overlapping system" when calculating the index. The level for a given period is calculated twice - once for the index for the same period and once when calculating the index for the following period after the transfers have been made.

How are the different changes dealt with?

Actual comparable change

In the case of actual comparable changes, nothing is adjusted: the calculations are simply based on the register in both periods.

Actual non-comparable change

In the case of actual changes that are not comparable, there are two possibilities. If there is enough information to permit a good estimate to be made for the previous period that is comparable with the current period, the situation in the current period can be transferred. If this information is lacking, the unit is simply omitted when calculating the current index. Obviously, the choice between these two possibilities partly depends on the size of the unit and the scale of the change. It is usually necessary to make an estimate for major units or changes.

All these points apply to units in the sample. In the case of units that are not in the sample, it is difficult to determine whether the situation is comparable. For these units the calculations in both periods are simply based on the register because an actual change is involved.

Reusing example 4 these points can be illustrated. The two units X and Y were closely linked through an extensive exchange of goods. Unit X decided to take over unit Y. In the previous period, units X and Y had been included in the sample with turnover of 100 million and 75 million respectively. In the current period, unit X' is observed with a turnover of 132 million (125 million plus 5% increase in turnover).

If it is clear that the total combined turnover of the two units, excluding exchange of goods, had been only 125 million in the previous period, unit X' can be transferred to the previous period with a turnover of 125 million and units X and Y can be removed from the previous period. If the value of exchange of goods is not known, making it impossible to make an estimate that is comparable with the

situation in the current period, units X and Y are omitted from the previous period and unit X' from the current period.

Apparent comparable change

In the case of apparent comparable changes, the situation in the current period is transferred to the previous period. If data are not available for the previous period, this can be backwards calculated from the value for the current period by adjusting for the development in the sub population between the two periods. In the case of split-ups, the old unit can also be divided based on the relationship between the new units. Obviously, units not included in the sample are simply transferred back to the population. No estimate is necessary because of the grossing-up.

Reusing example 1 this can be illustrated. A unit that has always been recorded in the SBR with the wrong activity code is corrected and is transferred to the sub-population for activity B and comes for the first time into the population to be described in the current period. Unit X records turnover of 110 million. If the turnover for the previous period is known, this turnover can be included under activity B in the previous period. If this turnover in the previous period is not known, the development for the sub-population can be determined, for example at 5% growth, and the turnover for unit X can be included under activity B in the previous period with a turnover of (110 million * 100/105) = 104.8 million.

Apparent non-comparable changes

In the case of apparent non-comparable changes, units in the sample are treated in the same way as in the case of actual non-comparable changes. If possible or required, these can be transferred back with an estimate, if necessary. Otherwise, the unit is not included in the calculation of the current index. Units not included in the sample are simply transferred back to the population of the previous period.

The advantage of this method is that the indices show the development in the activity as accurately as possible. The distorting effects of apparent changes are eliminated as far as possible. The disadvantage is that it is laborious. Transferring units takes a good deal of time. This disadvantage can be offset somewhat by regarding all changes to small units (below an arbitrary threshold of 10 employees for example) as actual. These changes would not as a rule has much effect at the level at which indices is disseminated.

The overlapping system is possible only if developments are published (using indices or growth rates). If levels are published instead, it is not possible to transfer certain changes in this way without breaking up the level already published for the previous period.

Irrespective of the method used, it is true to say that the further treatment moves the population away from the SBR in a given period because changes have been transferred, the greater the chance that STS developments will not correspond to annual developments that can subsequently be calculated on the basis of the SBS. Obviously, this also depends on the way in which various changes are dealt with in the SBS.

Conclusion

Using an SBR as the frame for sampling and grossing-up means that changes to the register must be dealt with in a consistent fashion. It is important to distinguish between the actual and the apparent and between the comparable and the non-comparable. In the case of indices that have to give a reliable picture of the economic reality of an activity, the effects of some changes can be corrected using the overlapping method.

The panel method is very suited to calculate the development in the "average" active unit. This is a very fast method, since no regard has to be paid to register changes. The method based on independent samples, in which all changes are reflected as actual and comparable is also very easy, but can lead to a loss of quality since the index can be polluted by administrative apparent changes.

5.6. Decomposition[7]

The most common justification for the use of decomposition is that it makes it possible to determine sub-annual growth rates that make sense and it provides a means to establish long-term developments uninfluenced by seasonal and sub-annual factors.

The normal breakdown of a time series makes it possible to identify the trend, the cycle, the seasonal variation and the erratic fluctuations.

- The trend is a slow variation over several years, generally associated with the structural causes of the phenomenon involved.
- The cycle is an almost periodic fluctuation characterised by alternating periods of higher

[7] For readability purposes, this sub-chapter refers to monthly data. However, in general, the methods explained can be easily transposed to provide quarterly data.

and lower rates of change (which may in fact be expansion and contraction); in the majority of cases, it is connected to the fluctuations of the overall economic activity. As regards decomposition of the series, the trend and cycle are often associated (they are not differentiated);

- The seasonal variation represents the effect of the climatic and institutional events which recur more or less regularly each year (for example, summer holidays or Christmas sales);
- The erratic fluctuations represent unforeseeable movements linked to any type of events. In general, they are of an unpredictable, stable nature but can in certain cases present extreme values. These extreme or aberrant values can have various origins. They may be economic, such as strikes or the impact of a harsh winter on electricity production. These may be referred to as the irregular component of the series.

Depending on the nature of the indicator, a time series may be decomposed in an additional component, which is determined by structural changes of the calendar in the period considered.

The adjustment of working days takes account of the calendar nature of a given month in order to adjust the index. Seasonal adjustment endeavours, more generally, to take into account the similarities in the same month (for example December) for all the years in the series. It should be noted that these two methods overlap. Indeed, the similarities from month to month that the seasonal adjustment seeks to adjust can often be connected to calendar effects. For example, public holidays may, systematically be concentrated in a particular month which reduces the number of working days. The adjustment for working days would then in theory increase indices such as the index of production. At the same time, if a seasonal adjustment is made to the basic series, in many Member States values for the month of May will be increased since it is generally low owing to calendar effects. Why should these two methods then be used together?
If the seasonal variation adjustment is more extensive (as it is not limited to the aspects of working days) it is not possible to take account of genuine, specific elements relating to the calendar. Continuing the example using May, if May 1st (a widespread public holiday) falls on a Sunday, the number of working days is not lower than a normal month. In this case, the number of working days is higher than that for most Mays when the public holidays fall during the week and the unadjusted index would, all other things being equal, also be higher. It is possible to take account of the specific structure of each month by adjusting for working days whereas this would not be possible through seasonal adjustment.

5.6.1. Adjustment of working days

The term 'working-day adjustment', as mentioned by the STS-Regulations, covers both calendar and working/trading day effect adjustments. The calendar effect is related to the fact that the economic activity varies around the special periods and dates in the year (Easter, moving holidays) while the working/trading day effect originates from the varying number of days of the week (Mondays, Tuesdays, Wednesdays,..., Sundays) in each month. Working-day effect causes deviations from the month specific 'average' values disturbing the comparability between the equivalent months in the consecutive years.

STS are often strongly affected by calendar issues. For example, there may be close connections between industrial production and the hours worked or between retail sales and the number of trading days. In order to ensure comparability of these statistics across time - usually months - the data need to be working day adjusted.
The STS-Regulations require the transmission of working-day adjusted figures for six indicators:

- industrial production
- production in construction
- hours worked in industry and construction
- retail trade turnover
- retail trade deflator of sales
- turnover in other services

Some Member States do not publish working-day adjusted figures at national level. Nevertheless, working-day adjustments are often included in seasonal adjustments. The STS-Regulations do not require, but allows Member States to transmit seasonally adjusted data.
Only if data are not transmitted in this form, then Eurostat may perform the seasonal adjustment itself.

Methods

All methods have the common assumption that part of the indicator varies with or even proportional to the number of working days.

However, in the proportional method, the factor is applied to the whole indicator whereas regression methods are usually only applied to the part of

production that varies with the number of working days.

It would be advisable to opt for the more elaborate methods of regression through modelling and analysis of chronological series, since they produce results that are closer to economic reality. It has in fact been demonstrated that the simple proportional method over-estimated the number of working days in the series, since business decision-makers may make plans that compensate for a low number of working days for example by using overtime or temporary workers. These methods are also preferable because they make it possible to take account of less intuitive aspects such as the exact breakdown of a month into the different days of the week. In fact not only the number of working days, but also the number of Mondays, Tuesdays, etc. may influence the variables.

The concept of working or trading days is dependent on specific national characteristics, in particular where calendars and holidays differ from one Member State to another. The concept of working days also depends on the indicator under consideration. A month with five weekends is a priori a poor month in terms of working days for the production index. On the other hand, it is a good month in terms of trading days for the retail trade index, given that Saturday is an important day for sales.
For certain indicators, this adjustment is not made and it may be worth a reflection on the use of this adjustment for more indicators than foreseen in the STS-Regulations.

Proportional method

The general approach for the proportional method is $z_t = C_t y_t$ for the periods $t = 1,...,n$, where y_t is the original series; z_t the working day adjusted series and C_t is the working-day correction coefficient. The calculation of the correction factor C_t may differ from approach to approach. Ideally, the correction should not change the levels of the series, in other words, the working day adjustment should not affect the annual average of a series. Following an additive model, the sum of the correction coefficients should be close to 0 for a year as the structure of a year in terms of working days does not vary greatly except for leap years.
Regression methods
Regression methods generally work as follows:

$y_t = \beta_{it} x_{1t} + ... + \beta_{nt} x_{nt} + \varepsilon_t$ for the periods $t = 1,...,n$, where the β_{it} are the pre-defined regressors for effect i and period t and ε_t are the error terms of the regression equation (the errors are in effect the time series without the working day component).

Depending on the structure of the error term ε_t several types of regression are distinguished. Very popular are RegARIMA models with a stochastic ARIMA model ε_t. The two programs TRAMO/SEATS and X12-ARIMA use this approach.
Furthermore, the number and definition of the regressors β_{it} need to be determined. In general, two types of weekday regressors are possible:

- distinguishing only between weekdays and weekends (1 regressor)
- distinguishing between all days of the week (6 regressors)[8]

In addition to these weekday regressors, further regressors for the leap year, Easter effect or other calendar effects are possible.
The determination of the number of working days in a reference period is a country-specific task.
Eurostat has proposed to the Member States recommendations for working day adjustments. These recommendations have been periodically revised and submitted for approval to the members of the STS-Working Group[9].

5.6.2. Seasonal adjustment

Seasonal adjustment, or the adjustment of seasonal variations, aims, after adjusting for calendar and working/trading day effects, to take account of the impact of the known seasonal factors that have been observed in the past. For example, in the case of the production index, annual summer holidays have a negative impact on industrial production.

The level of this impact depends on the countries and whether or not observation units close. It also depends on the area of activity concerned. In addition, the situation is complicated as these practices/habits/traditions change over time. This changing seasonal variation is particularly hard to manage because it is difficult to identify early on

[8] Alternatively it can be considered that there are 2 or 7 regressors if Sunday is distinguished.
[9] For the latest version of Recommendations for working day adjustments in STS see *Associated documents* of Methodological Manual available on CIRCA site /Library/Methodology/STS Methodological Manual

whether this involves a real change or an unusual event.

To adjust seasonal variations properly, it is vital to manage the seasonal adjustment parameters in a judicious and practical manner. A good approach may be to find an ARIMA model that makes it possible to understand the series appropriately and it is advisable to take account of possible aberrant points, the breaks in the series, the impact of the pace of the moving average used, and the fact that an additive or multiplicative model is used, and so on. This management of the parameters must be implemented regularly for all chronological series since the addition of new points can change the nature of the series, and therefore the parameters used for its seasonal adjustment. [This is particularly true for the EU series that are very dynamic by nature and therefore frequently revised.]

Seasonal adjustment methods in the EU

It appears that two methods are mainly used within the EU: TRAMO/SEATS and the methods of the "Bureau of Census", X11 and X12 ARIMA. Some countries use both methods, according to the indicators. It seems that the program used (which is inseparable from the parameters used) has a strong impact on the series as well as the manner in which it is applied. This can be seen by diverging results compiled from the same basic data by different institutes in the same country.

One question that often returns as regards seasonal adjustment is whether or not seasonal variations should be adjusted for all indicators. For example, is it normal not to seasonally adjust the indexes of output prices? The answer is clear: before carrying out a seasonal adjustment, the seasonal nature of the series should be determined. It should be noted that it is not always the case that, if the presence of a seasonal variation is rejected by the test, the seasonal coefficients will be weak. Indeed, the seasonal variation test can be negative owing to an overly strong presence of fluctuating seasonal variations in relation to the stable seasonal variations, while both seasonal variations are strong. In this case, strong coefficients may be achieved while at the same time the test was negative.

Certain statistical institutes only calculate the seasonal factors once a year. These factors are then applied throughout the year to all the monthly data. Another approach involves making a concurrent adjustment in other words calculating the seasonal factors each time they are received from new data. Lastly, certain countries adopt an intermediate solution by calculating the seasonal coefficients once every quarter.

Although this increases the workload, it is obvious that the most recent data are much more precise. However, this practice also results in slight revisions to the figures each month.

Eurostat has proposed to the Member States recommendations for seasonal adjustments. These recommendations have been periodically revised and submitted for approval to the members of the STS-Working Group[10].

5.6.3. Trend-cycle

The trend is a slow variation over a long period of years, generally associated with the structural causes of the phenomenon in question. In some cases, the trend shows a steady growth, in others, it may move either downwards or upwards. The cycle is a quasi-periodic oscillation characterised by alternating periods of higher and lower rates of change possibly, but not always, involving expansion and contraction. In most cases, it is related to fluctuations in overall economic activity.

If the irregular component of the time series is relatively important, the trend-cycle series generally offers a better series for analysis of longer-term past developments. However, this advantage is less clear when analysing very recent developments. Trend-cycle values for recent periods may be subject to greater revisions than the equivalent seasonally adjusted values and hence the latter may be more appropriate for the analysis of very recent developments. This is particularly true around turning points.

Trend-cycle series may however converge to stable results more quickly than seasonally adjusted series.

[10] For the latest version of Recommendations for seasonal adjustments in STS see *Associated documents* of Methodological Manual available on CIRCA site/Library/Methodology/STS Methodological Manual

Section D: Collection to processing - index specific

6. Common indicators

6.1. Employment

6.1.1. Introduction

Name, synonyms and code numbers

The STS-Regulations require short-term statistics on the number of persons employed (210) for all four Annexes. It also foresees that the number of employees (211) on a temporary basis may approximate this.

Purpose of the indicator - theoretical concept

The variable persons employed are an important requirement for each of the Annexes in the STS-Regulations; in fact, it is the only variable that figures in all four Annexes.

Employment is a variable that is important in both economic and social statistics. Labour input is one of the main costs of production. Employment, in its own right, is an important short-term indicator in monitoring the economy. The proportion of the working population in employment, the type of job they do and their working patterns are social variables of interest.

The collection of short-term information on employment has a number of important uses:

- to evaluate the economic situation to help monitor the economic cycle;
- to calculate measures of productivity;
- to help calculate income from employment in national accounts.

The collection of information in all the Annexes of the STS-Regulations give a broad economic picture and shows the balance between services and industry.

Definition and reference period

Before considering the specific definitions there are a number of important concepts to understand.

Persons v jobs

Business surveys collect the number of persons employed in each observation unit. They are in effect measuring the number of jobs. For example consider a person, employed in a factory during the day who then works in a bar a few evenings a week. The individual will be counted as an employee in the manufacturing activity but will separately be included in the estimates for the services activities. Thus one person is being counted in two different places in the persons employed estimates demonstrating that this is a measure of jobs (though not necessarily full-time ones) rather than persons. Conversely, the Labour Force Survey is a survey of individuals. It counts people and therefore provides a measure of the number of people employed. However it also collects information on second jobs and is therefore able to provide a jobs measure.

Employees v persons employed

The number of employees is defined as those persons who work for an employer and who have a contract of employment and receive compensation. The definition of persons employed is wider and, as well as covering all employees, also includes persons who are engaged in the observation unit during the reference period irrespective of whether they are paid or not.

The following groups should be included in the persons employed variable.

All paid employees, including:

- homeworkers (they should only be included if on the payroll of the unit -self-employed homeworkers who sell to the unit for example on piece rates should be excluded);
- apprentices/trainees (but should only be included if on a contract of employment);
- paid working proprietors and family members;
- persons on temporary leave (for example maternity, sickness, leave, strike, lock-outs) for a definite period;
- part time workers;
- temporary workers;
- seasonal workers.

Unpaid persons employed:

- unpaid working proprietors (owners);
- unpaid family workers.

Agency workers

The treatment of agency workers often is a cause of confusion. An agency worker is treated as an employee of the agency although the individual

may be working at a different location. The observation unit should exclude from the number of persons employed workers it has hired from an agency unless it has a direct contract of employment with the worker. Persons carrying out repair and maintenance for an observation unit should be included if they are on the payroll of that unit; if they are on the payroll of another unit they should be excluded. Persons on indefinite leave should also be excluded where there is no continued receipt of wage or assurance of return nor agreement of date of return.

Reference period

Employment should be determined as a representative figure for the reference period.

6.1.2. Population

Classifications & coverage

Solely NACE Rev.1.1 limits the coverage of this indicator. Across its 4 Annexes the STS-Regulations require coverage of Sections C to I and Divisions 72 and 74.

Units

The STS-Regulations require the use of the KAU as the observation unit for this indicator under the provisions of Annexes A and B and the enterprise under the provisions of Annexes C and D.

6.1.3. Collection

How to measure - alternative methods

The Regulations allows Member States the freedom to obtain the necessary data from a number of possible sources that include compulsory surveys, administrative sources and synthetic estimation. The measurement of employment may be successfully accomplished in a number of different ways:

- in a specific business survey set up to collect employment figures;
- in a survey collecting other business variables;
- in a survey collecting other labour input variables;
- by the Labour Force Survey;
- from administrative sources;
- from a balanced system of labour accounts.

Specific business survey to measure employment

Advantages: sampling and estimation procedures may be set up to be optimal for the employment variable; data collection staff builds up expertise in this variable; response time may be quicker than for a multi-variable survey.

Disadvantages: separate surveys may be more costly to NSIs and respondents; lack of consistency with other business or labour input variables.

Survey collecting other business variables

Advantages: consistency with other output variables likely to give improved productivity measures; ability to cross check at data validation checking stage with other business variables; will identify and provide a useful diagnostic tool for measuring discontinuities due to structure changes for business variables; may be cheaper for NSIs and respondents.

Disadvantages: response time may be greater, particularly if the number of variables in the survey is large; methodology may be sub-optimal if shared with other variables.

Survey collecting other labour input variables

Advantages: provides a strong coherent basis for the wages and salaries component of a labour costs index; may be cheaper for national statistical authorities and respondents than separate surveys.

Disadvantages: response times may be greater than if employment were to be separately collected - hours worked may be difficult to provide; methodology may be sub-optimal if shared with hours worked and wages and salaries.

Labour Force Survey

In the LFS, households are asked by direct interviewers to provide the appropriate information.

Advantages: covers the whole working population with the exception of communal establishments; overall employment figure likely to be more accurate; allows analyses by sex, age, hours worked, education and training and provides information on those without jobs or with more than one job.

Disadvantages: activity classification is often poor; may be inconsistent with other business variables and therefore not well suited to productivity.

Administrative sources

Advantages: may be comprehensive; no extra burden on respondents; cheap for NSIs if the raw data is of satisfactory quality.

Disadvantages: NSIs have no control over these sources; there may be timeliness or quality

difficulties; may be inconsistent with other business variables.

Balanced system of labour accounts

Advantages: a comprehensive system that balances a range of input sources.

Disadvantages: system is complex and will take time to develop; the balancing makes the measurement less timely than using the results of a sample survey.

Data collection difficulties

Some elements of the definition may be difficult to measure. In particular, it may be hard to obtain good information from business surveys on working proprietors and their families, on home workers and on voluntary workers. These figures could be estimated with the aid of the Labour Force Survey.

6.1.4. Compilation of the index

Methods to combine the raw data

For index compilation, it is recommended to use a current weighted method.

$$I(t) = 100 \times \frac{EMP(t)}{EMP(0)}$$

EMP (t) is the value of employment at time (t)
EMP (0) is the average value of employment in the base year.

Data confrontation

Benchmarking

The best statistical practice is to benchmark the data to the latest information from the SBS. When SBS data is compiled from annual surveys, they are generally more comprehensive than the surveys used for the STS. Benchmarking, whilst introducing revisions, will improve other aspects of the quality of the estimates. After the benchmark period, the estimates of changes in the level of employment derived from the short-term statistics should be linked to the benchmark levels. For example if the unbenchmarked level at time (t) is EMP(t) and the benchmarked value is BEMP(t) then the benchmarked value of EMP^b (n) reference periods beyond time (t) is given by:

$$EMP^b(t+n) = BEMP(t) \times \frac{EMP(t+n)}{EMP(t)}$$

Thus, the rate of change since the benchmark point is applied to the benchmarked level.

Additionally when a new benchmark becomes available, it is necessary to recalibrate during the benchmark year. Suppose the initial benchmark value is BEMP (t). The next benchmark relates to the time (t+bp) and is given by BEMP (t+bp). The points between (t) and (t+bp) need to be rescaled to the new benchmark. The number of periods between t and t+bp will normally be 4 for a quarterly series and 12 for a monthly series.
The benchmarked value $EMP^b(t+n)$ is given by:

$$EMP^b(t+n) = \left(BEMP(t) \times \frac{EMP(t+n)}{EMP(t)} \right) + \left(BEMP(t+bp) - \left(BEMP(t) \times \frac{EMP(t+bp)}{EMP(t)} \right) \right) \times r(t)$$

where:

$$r_t = \frac{1}{bp}, r_{t+1} = \frac{2}{bp} \quad \text{etc.}$$

Comparisons with other Statistics

A number of sources of employment data have already been presented: monthly and quarterly surveys; SBS; LFS; administrative data. The routine comparison of alternative sources provides important plausibility checks. For short term and structural business statistics these can be carried out at the level of the respondent when data are being validated for structural business statistics.

The aggregate results can also be compared and differences investigated. This is best undertaken initially at high levels of aggregation, for example, starting at Section level and then exploring reasons for differences at lower levels and it could be considered useful to investigate and explain differences down to the Division (2-digit) level. This work might lead to changes being made to estimates in either the STS or SBS.
Care needs to be taken when making comparisons with the LFS since the classification in that survey may not be of good quality. It is recommended that where business surveys are used to produce estimates for the whole economy this work is undertaken on overall figures as a matter of routine. However, classification problems may make more comparisons that are detailed less revealing.

Details of the compilation required

The precise description of the series to be compiled for the persons employed indicator as well as the deadlines varies between the Annexes of the STS-Regulations can be seen in *Associated documents* of

the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/ "*STS-Requirements"*.

However, the indicator is always provided gross, either as an index or as absolute figures, at least on a quarterly basis and within 2 months from the end of the reference period.
For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources.

Special note on frequency
The supply of employment data is required at least on a quarterly basis. Where countries undertake monthly surveys Eurostat would like to receive the monthly data.

Special note on absolute values and indices
For the persons employed indicator there is a lot of interest from users in the absolute figures, particularly when they rise below or above important thresholds. In most Member States, manufacturing employment has fallen over recent years; conversely, services employment has risen and is achieving new record levels in most economies.

6.1.5. Approximation/alternative indices
The STS-Regulations permit the persons employed indicator to be approximated by an indicator of the number of employees. This approximation is permitted for a 5 year period (from July 1998) which will be extended by a further 5 years unless a decision is taken otherwise.

6.2. Hours worked

6.2.1. Introduction

Name, synonyms and code numbers
The STS-Regulations require short-term statistics on hours worked (220) under the provisions of Annexes A and B.

Purpose of the indicator - theoretical concept
The measurement of hours that people work is important when analysing a variety of economic and social phenomena. The number of hours worked is a measure of labour input which can be used to derive key indices of productivity and labour costs or labour prices. The patterns of hours worked and the changing activity or occupational breakdown give important evidence when studying lifestyles, the labour market and social changes.

In recent years, there have been important changes in the jobs market. Part-time employment has become more common, there is a greater flexibility with regard to possible working patterns, which allows more women with families to work. Conversely, for many managerial jobs, employees are often expected to work substantially longer than the contracted hours. A per head measure of labour input is a blunt measure as it misses these changes in the labour force over time.

Moreover, the hours worked measure is one of the first to pick up turning points in the business cycle. It is therefore well placed to help decision makers.

For example if there is a sudden increase in demand, a unit will normally respond firstly by offering overtime to meet the delivery date. If this situation continues and appears to be sustainable in the medium term, the unit may take on further employees. Thus, the rise in hours will be seen first; the increase in employment will lag the improved production.

Conversely if there is a reduction in demand leading to lower production overtime hours will be reduced; if the situation becomes more serious short-term working would be introduced or extra holidays taken. Restrictions of employment laws and the cost of redundancy mean that reductions in employment tend to be implemented only once the reduction in demand is seen to continue and thus it will again lag the lower production.

The STS-Regulations require hours worked to be provided only for industry (Annex A) and Construction (Annex B). Although the STS-Regulations do not require hours worked for the retail or service sectors, it is likely that Member States will calculate this information for other demands.

The collection of short-term information on hours worked has a number of important uses.

As an economic indicator in its own right
Hours worked can often be a good indicator of movements in the economic cycle - a unit's first response to adverse operating conditions, before it considers reducing employment, will often be to decrease the hours worked by existing staff. The reverse procedure tends to be followed in period of increased demand.

To obtain better measures of productivity and labour costs

In recent years, the concept of working time has been changing rapidly. With the introduction of flexible working and home working, combined with significant variations in working time, the per head measure is less suitable for productivity and labour cost measures. For an example if a full time person were to be replaced by two job sharers, the per head measure would fall but the per hour measure would be unaltered reflecting the status quo on labour input. ESA, therefore, recommends that total hours should be the preferred measure of labour inputs to the system and the basis on which productivity should be calculated.

National accounts

Requirements for hours information are based on ESA 95 definitions. These ask for total actual hours broken down by 31 activities.

Industrial production index

For compiling the IPI in some branches.

Definition and reference period

Before discussing methods of collection, it is necessary to understand a number of concepts of hours worked and the differences between them.

Basic or Normal Hours

These hours are the hours that the employer and employee have agreed and have been imposed by contract. It may be related to a basic hourly rate for an agreed number of hours.

Overtime Hours

These hours have been worked above the basic hours that are required. They may be split up into paid and unpaid overtime.

Total Hours

These are all hours that have actually been worked during the period.

The ESA definition asks for total actual hours including both employees and the self-employed. The definitions within the STS are based on the ESA.

Total actual hours include:

- basic or normal hours;
- overtime hours (hours worked in addition to basic hours - whether paid or unpaid);
- hours worked during nights, Sundays or public holidays;
- time spent on tasks such as work preparation, preparing, maintaining and cleaning tools and machines and the making out of receipts, invoices and reports;
- time spent at place of work during which no work is done owing to for example, machine stoppage, accidents or occasional lack of work for which payment is made in accordance with the employment contract;
- short periods of rest at the place of work including tea and coffee breaks;

Total actual hours exclude:

- hours which are paid but not worked such as paid annual holidays, public holidays, sick leave, or due to accidents, strikes, lock-outs or slack time;
- time spent for meal breaks;
- time spent commuting between home and place of work. However, such travel organised in employer's time is included in hours of work.

In order to provide harmonised measures of hours work there are two areas which need to be considered:

- the definition of actual hours with the inclusions and exclusions above;
- the employment measure used should be consistent with the definitions set out in the sub-chapter on employment.

6.2.2. Population

Classifications & coverage

The coverage of this indicator is limited solely by NACE Rev.1.1. Across Annexes A and B the STS-Regulations require coverage of Sections C to F.

Units

The STS-Regulations require the use of the KAU as the observation unit for this indicator.

6.2.3. Collection

How to measure - alternative methods

There are two main methods by which hours data may be collected:

- business surveys;
- the Labour Force Survey.

Business surveys

The requirements of the labour cost index that ask for an hourly measure have led a number of countries to run surveys which collect on the same form employment, hours and wages and salaries.

This approach brings the strong advantage of consistency in measures of labour costs by using the same questionnaire and methodology. However, the business community will only have records of basic hours and overtime. They will not normally have records of unpaid overtime unless specifically kept to ensure working time regulations are met. Similarly, records of sick leave may not be available or of holiday leave (unless there are factory or plant closures).

Labour price index approach

The labour price index approach conducts a survey of the business community that tracks the remuneration of a basket of occupations. The concentration on individual jobs makes it easier to collect information on hours worked since the detailed information may be more easily provided for a specific post.

Labour force survey

The Labour Force Survey is a quarterly survey of households that collects information about the personal circumstances and work of everyone in them. In most countries, households are interviewed five times, generally at three monthly intervals. Each quarter's sample is made up of roughly equal groups of people receiving their first interview, second interview and so on. People receiving their first interview replace the group of people receiving their fifth (final) interview in the following quarter. Thus 80% of the sample will be common to any two successive quarters, allowing more accurate measures of change to be compiled.

The questions asked on hours worked per week include:

- basic hours;
- paid overtime;
- unpaid overtime;
- actual hours.

This allows the ESA definition to be followed and extensive analyses to be undertaken. As the survey goes to individuals, it allows hours worked but not actually paid to be recorded.

The following points summarise the main advantages and disadvantages of the two approaches of business surveys and the LFS.

Business surveys

Advantages: consistency with other related variables for example labour costs can be achieved by direct collection; sampling and estimation procedures may be set up to be optimal; good activity classification.

Disadvantages: sample deficiencies - may not cover small units - sometimes includes only manual workers; cannot in some instances meet the definition (for example collection of unpaid overtime).

LFS

Advantages: meets international standards and the required definitions; includes potentially all the population aged 16 or more (with the exception of communal establishments); includes a wide range of data related to the details of people's jobs giving a well-rounded picture.

Disadvantages: sampling variability can be large; population estimates for grossing may be out of date; activity classification is based on self-classification and is poorer than the register information used to classify business surveys; proxy response is likely to be inaccurate for hours.

Data collection difficulties

As already noted one of the disadvantages of business surveys for collecting hours is that it may be difficult to follow strictly the definition, notably with respect to unpaid overtime.

6.2.4. Compilation of the index

Methods to combine the raw data

The previous point described two principal methods - the LFS or business surveys. The LFS provides directly the information required by the STS, albeit with some restrictions outlined earlier.

Business surveys are generally limited to the collection of hours paid since the employer is unlikely to have a record of hours worked but not paid (equivalent of unpaid overtime - which for many managers may be undertaken in their spare time at home). In this case, it is recommended that the measure be adjusted to the required definition. This change can be estimated by using the comparable data collected in the Labour Force Survey for each occupation group although it is unclear whether any country does this in practice.

Data confrontation

Benchmarking

A number of possibilities exist for benchmarking.

The SBS-Regulations requires the provision of the number of hours worked by employees. Where this is provided by direct collection rather than synthetic

estimation, it may be used to benchmark short period estimates.
Time Use Survey. Each respondent is asked to complete:

- a household questionnaire;
- a one-day diary which will collect time use data in 10 minute intervals over a 24 hour period;
- a one-week diary for work and education purposes; this is to record the time they are in work and time spent travelling to and from work; extra work that has been brought home is also recorded.

Comparisons with other Statistics

Where business surveys are undertaken, the results may be compared with the LFS. However some caution needs to be taken to allow for known differences in definition and the deficiencies in activity classification in the LFS. Moreover, since both are sample surveys exact congruence will not be achieved; allowance needs to be made for the confidence intervals based on the sampling errors in the separate surveys. Similarly, comparisons may be made between the STS and SBS for the hours worked variable where NSIs have confidence in the annual data because it has been separately collected.

Details of the compilation required

The precise description of the series to be compiled for the hours worked indicator as well as the deadlines can be seen in *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/ *"STS-Requirements"*.

For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources

6.3. Wages and salaries

6.3.1. Introduction

Name, synonyms and code numbers

The STS-Regulations require short-term statistics on gross wages and salaries (230) under the provisions of Annexes A and B.

Purpose of the indicator - theoretical concept

The measurement of wages and salaries is important when analysing a number of economic and social issues. Labour input is one of the main costs of production. A change in the level of wages and salaries can come from a number of causes. For example, a rise may be due to:

- increased output needing more labour (either people or hours);
- higher wages but no increase in employment;
- changes in composition of the workforce (more skilled jobs).

The decomposition of wages and salaries, particularly if individuals can be tracked may be of economic or social interest:

- differences between men and women;
- differences by age;
- analysis by activity;
- regional analysis;
- occupational analysis;
- longitudinal information.

The STS requires wages and salaries to be provided only for industry (Annex A) and construction (Annex B). Within the Annexes, specific requirements on the level of detail, timeliness, form and frequency may be found. Although the STS do not require wages and salaries for the retail or service sectors, it is likely that Member States will calculate this information for other demands.

The collection of wages and salaries has a number of important uses.

As an indicator in its own right

Normally with a strong economy, one would expect to see rises in this variable to finance increased production in the business cycle. Similarly, difficulties in trading are likely to result in less overtime and possibly short time working and hence fall in remuneration. However, care needs to be taken in interpretation to consider the impact of extraordinary payments (bonuses, redundancy etc) and the impact of higher settlements.

As part of national accounts

Compensation of employees is an important component of the income account. It appears in both the generation of income of account (as a "use" for the (institutional) sectors which pay it) and in the allocation of primary income account (as a "resource" for the households and rest of the world (institutional) sectors, which receive it).
Compensation of employees is defined as the total remuneration payable by enterprises in cash or in kind, and comprises not only wages and salaries but also the value of social contributions payable by the employer (including imputed contributions for unfunded benefits), but not taxes paid by the employer. It is recorded on an accrual basis, in

respect of entitlement arising out of work done during the accounting period whether paid in advance, simultaneously, or in arrears. It does not cover unpaid work (including that done by household members within their own households) or the earnings of the self-employed. Although wages and salaries is a component of this measure, for most countries it dominates the variable.

To monitor inflationary wages pressure

The use of wages and salaries in calculating unit wage costs, labour cost or labour price indexes will give indicators of wage inflation. Historically these have been calculated on a per head basis but increasingly a per hour formulation is felt to be more useful. With the introduction of flexible working and home working, combined with significant variations in working time the per head calculation is a blunt instrument. For example if a full time person were replaced by two part timers the per head measure would fall. However the per hour measure would largely be unaltered, reflecting the status quo and labour input.

Definition and reference period

The compensation of employees is defined as the total remuneration in cash or in kind payable by an employer to an employee in return for work done by the latter during the accounting period. This can be broken down into:

- wages and salaries;
- employers' social contributions.

The STS is only interested in the first component. The second tends to be relatively stable and moves significantly only when the rate of social contributions changes or there are shifts in the composition of the labour force.

Gross wages and salaries are defined as the total sum of remuneration in cash and in kind, payable to all persons employed in return for work done during the reference period irrespective of whether this remuneration is paid regularly or not and whether it is based on working time, output or piecework. Income taxes and social security contributions payable by the employee should not be deducted, even if they are actually withheld by the employer and paid directly to Social Security schemes, tax authorities and the like.
The following should be included in wages and salaries:

- all basic wages and salaries payable at regular intervals;
- enhanced rates of pay for overtime, night work, weekend work, disagreeable or hazardous circumstances;
- cost of living, housing, local or expatriation allowance;
- allowances for travelling to and from work (excluding reimbursement of employees for travel, separation, removal and entertainment expenses.);
- bonuses based on productivity or profits;
- holiday bonuses, 13th month pay;
- holiday pay for official or annual holidays; and allowances paid for annual holidays not taken;
- extra allowances for extreme working conditions like dust, dirt, temperature, smoke, danger etc.;
- commission, tips attendance and directors fees paid to employees;
- payments made by employers to employees under saving schemes;
- allowances paid to employees for purchases of tools, equipment and specialist clothing needed for their work;
- wages and salaries, or parts thereof, which the employers continue to pay directly to the employee in cases of sickness, maternity, industrial accident, invalidity, etc.;
- any payment in kind.
-

The following costs are excluded:

- statutory social contributions, paid by the employer;
- imputed social contributions (social benefits paid directly by the employer);
- taxes paid on total wages and salaries paid;
- recruitment costs.

6.3.2. Population

Classifications & coverage

The coverage of this indicator is limited solely by NACE Rev.1.1. Across Annexes A and B the STS-Regulations require coverage of Sections C to F.

Units

The STS-Regulations require the use of the KAU as the observation unit for this indicator.

6.3.3. Collection

Difficulties with the theoretical concept/definition

The definition is long and detailed and will need refinement and updating since reward systems are complex and are evolving over time. A number of areas cause concern and difficulty.

- The stipulation that the wages and salaries should relate to work done in the reference period. This prescription is important for components such as basic pay and overtime. However, some elements such as 13th month pay and bonuses, whilst paid in the reference period, are a reward for work carried out over a longer period. The surveys should collect all pay pertaining to the reference period - however, some components will be facets of longer-term rewards.
- Bonuses are an important part of wages and salaries. In many activities they make up a regular and substantial part of pay - it is not uncommon for the annual bonus to be equivalent to ten per cent of annual pay. In this case, if data were to be collected monthly, pay for the "bonus" month would be at least double that of the previous month. The bonus element is very erratic and this makes collection and estimation more difficult. In particular, in business surveys care needs to be taken on outlier detection so that very large bonuses to small companies do not distort the overall position.
- The treatment of redundancy pay is controversial. This is included within the definition since it is counted as part of compensation for employees under ESA. It is certainly a labour cost but, on the other hand, it does not represent income from employment. In particular, redundancy pay is not a payment for work done by the employee during the reference period. Moreover, the collection of redundancy pay would make the wages and salaries variable harder to interpret. For example, during a downturn one would expect the variable wages and salaries to be lower. However, if this lack of demand were to lead to lay-offs, the resulting redundancy payments would boost the wages and salaries variable. Hence, the increase in this case would be a sign of a deteriorating economy!
- The payment of shares is increasingly common and harder to collect and interpret. Where bonus shares are distributed free, they should be included. However, share options are to be excluded. From a practical perspective, it is not possible to value share options at the time of the reference period; the full worth will only be apparent some time later.

How to measure

There are three main methods by which wages and salaries may be collected: business surveys; the Labour Force Survey; administrative sources.

The proposed Regulation for a labour cost index has led a number of countries to run surveys that collect employment, hours, wages and salaries in the same form. In some countries, a separate survey is undertaken.

Specific business survey to measure wages and salaries

Advantages: sampling and estimation procedures may be set up to be optimal for the wages and salaries variable; data collection staff build up expertise in this variable; response time may be quicker than for a multi-variable survey.

Disadvantages: separate surveys may be more costly to national statistical authorities and respondents; lack of consistency with other business and labour input variables.

Survey collecting other business variables

Advantages: consistency with other labour input or output measures. In particular, the collection of wages and salaries and hours on the same form will assist the provision of data for the Labour Costs Regulation which asks for a per hour measure; ability to cross check returned figures at a data validation stage with other business variables; will identify and provide a useful diagnostic tool for measuring discontinuities due to structure changes for business variables; may be more cost effective for NSIs and respondents.

Disadvantages: response time might be greater, particularly if the number of variables in the survey is large; sampling and methodology may be sub-optimal if shared with other variables.

The Labour Force Survey

The Labour Force Survey is a quarterly survey for households that collect information about the personal circumstances and work. In some countries, this survey also collects information on earnings. Although the Labour Force Survey is used by many countries to supply hours data, it is not the direct or preferred source for wages and salaries information.

Advantages: covers the whole population with the exception of communal establishments; allows analysis by sex, age, hours worked, education and training.

Disadvantages: activity classification is often poor; may be inconsistent with other business variables.

Administrative Sources

Wages and Salaries information is available from administrative sources in some countries, particularly tax and social security information.
Advantages: may be comprehensive in coverage of population and all types of remuneration; no extra burden on respondents.
Disadvantages: NSIs have no control over these sources; there may be timeliness or quality difficulties; may be inconsistent with the definition; may be inconsistent with other business variables.

Other

Whilst the Netherlands does conduct a quarterly survey into earnings and employment, a balanced system of labour accounts is used to produce a fully reconciled picture of the labour market. Whilst this approach gives a comprehensive system that balances a range of input sources, it is complex and would take time to develop. The balancing process may also make the measurement less timely than using the results of a simple sample survey.

Conclusions

The preferred measure is business surveys, since this will bring coherence with other short-term statistics. In particular, it is advantageous to use the same surveys for wages and salaries in the STS as for the provision of information to comply with European requirements for a labour costs index. Where separate surveys are used the coverage of the survey for wages and salaries should be the same as for the employment variable.

Data collection and validation

Employees may receive their remuneration in a number of different ways. Some may be paid weekly, others monthly, or for a four week period (which will necessitate a 13 month payment at some point) or even occasionally over five weeks. The processing of the data will need to be able to deal with the possible periodicity of data. One way of achieving this is to ask for weekly and monthly pay separately on the questionnaire. Where pay is provided for a four or five week span, the weekly average should be calculated. For weekly paid staff either the average of the weeks of the month should be taken or a specific week chosen. In the latter case this should always be at the same time in the month. Many countries pick the last week in the period.

Many types of remuneration will make the wages and salaries data for a unit volatile. For example, where an annual bonus is paid, this might amount to 10% of the annual basic wage and so would double the normal pay. To help check and explain these large variances, it is suggested that bonus data are collected separately, Where any other component of pay is known to be significant and volatile, it is suggested that NSIs collect it separately. One possibility for this could be overtime pay. Where information is collected with employment and hours on the same form, it is recommended that data checks be made on wages and salaries per head, or per hour. These should be consistent over time for a particular unit. They would also be expected to lie in a certain range with upper and lower bands to be credible.

In the payment of wages and salaries there are often special circumstances, changes in pay and workforce, annual updates and back pay (arrears). It is suggested that the questionnaire includes a comments box to be added to the form to allow respondents to explain any significant movements or changes to the figures. This information should be held where it is easily available for future use.

Data collection difficulties

Payments in kind are to be included in the indicator but are difficult to collect. Wages and salaries in kind consist of goods and services or other benefits provided free or at reduced prices by employers. Employees or other members of their households may use these. The most common include:

- meals and drinks provided free or in subsidised canteens or luncheon vouchers;
- housing or accommodation services;
- uniform or special clothing;
- vehicles;
- goods and services produced as outputs from the employer's own production range, for example free travel for airline or railway employees;
- provision of sports, recreation or holiday facilities for employees and their families;
- transportation to and from work; car parking;
- crèches for children of employees;
- cheap loans provided by employers.

The long list of inclusions and exclusions means that in some countries a number of categories will be insignificant. Where it is difficult for a Member State to strictly collect based on a specific inclusion or exclusion, this may be waived if the impact is insignificant. Where such a deviation is made by a Member State, it should be reported and the impact of non-compliance approximately estimated.

6.3.4. Compilation of the index

Methods to combine the raw data

Information on wages and salaries can be compiled as absolute values or as indices. The methods are essentially the same for industry and for construction.

Data confrontation

Comparison can be made with a number of sources of earnings data.

SBS-Regulation

The SBS-Regulation asks for information on wages and salaries. This can usefully be compared with information collected in the sub-annual surveys. If the SBS-Regulation is thought to be comparable and of higher quality due to large samples benchmarking could be undertaken.

Labour Costs Index

The Labour Costs Regulation asks for an index of wages and salaries. This should be consistent with the variable in the STS.

LFS

Where earnings data are collected in the LFS, this provides another possible area of comparisons. However, care needs to be taken when interpreting results at detailed activity levels since there may be problems with LFS due to poor classification.

Comparisons with administrative sources

Tax or social security systems may provide another source - one that is comprehensive in coverage - though final data may be late in being available.
It needs to be recognised that when comparing two different surveys the sampling errors associated with each will mean that exact congruence will not be achieved. The difference gates that are set to trigger detailed investigation should take into account these measures of accuracy. When undertaking comparisons with administrative data, allowances may need to be made for differences in definition.

Details of the compilation required

The precise description of the series to be compiled for the wages and salaries indicator as well as the deadlines can be seen in *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/ *"STS-Requirements"*.

For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources

6.4. New orders and alternative leading indicators

6.4.1. Introduction

Name, synonyms and code numbers

The STS-Regulations require information on new orders under the provisions of Annexes A and B. In both cases, new orders (variable 130) are the main new orders indicator. For industry the STS-Regulations require information on domestic new orders (131) and non-domestic new orders (132) and for construction it requires information on new orders for building construction (135) and new orders for civil engineering (136).

The STS-Regulations also foresee that alternative leading indicators on a temporary basis may approximate these indicators.

Purpose of the indicator - theoretical concept

The index of new orders makes it possible to measure the trend in the orders received from domestic and non-domestic customers. While the production index shows the trend in the volume of output and gives an indication of the trend in value added, the data on new orders allow us to calculate a very important indicator that forecasts, albeit only in the short term, future production and future turnover. Orders received appear subsequently in production and then in turnover, and they are therefore the first indication of what is going to happen in the short term.

Apart from indicating future production and turnover of branches that work based on orders, the orders indicator also provides information about the future development of the branches making orders. One example would be the manufacture of textile machines: if there is a healthy inflow of orders in this branch, it means that the manufacture of such machines will increase and since such machines are sold to textile manufacturers it can be deduced that

the production of textiles is likely to increase once the new machines are installed.
Concerning new orders in construction, it is important to bear in mind the special features of this activity, both from the administrative point of view and with regard to how the production process is organised. Most notably the sequence linking orders, production and turnover gains another element - building permits. The administrative details concerning orders vary significantly between countries and hence the position of permits in the sequence of events varies but in some cases permits can provide similar information to orders and hence act as a leading indicator.
In conclusion, the index of orders is a forecast indicator that provides information on the economic cycle that is particularly useful at times when the cycle is changing. Series based on new orders may figure among the series included in composite leading indicators for the economic cycle.

Definition and reference period

The orders recorded for a particular reference month represent the value of contracts agreed during that month that connects a manufacturer with a third party for the supply of manufactured goods and services.

The definition of orders has the same headings as turnover, and hence excludes:

- VAT and other similar deductible taxes linked to turnover;
- reductions in prices, rebates and discounts when they are given at the moment of order;
- the value of packaging that is expected to be returned after the delivery;
- taxes and duties on goods and services (for example excise duty) that will be invoiced by the unit;
- sales of the KAU's capital assets.

Orders include:

- all other charges such as packaging and transport that are passed on to the customer, even if these are listed separately on the invoice;
- subsidies from public authorities or the institutions of the EU;
- orders for goods and services provided by the unit, including those originating from sub-contractors - this includes goods not processed by the unit and the provision of services and work carried out for third parties using raw materials provided by them.

Orders arriving in one reference period but cancelled in another (later) one must not be subtracted, neither from the value of orders in the reference period in which the order was originally received, nor from the value of orders for the reference period in which the cancellation was received.

Special note on sub-contracting in construction

With regard to construction a significant amount of work is subcontracted to other KAUs. It is a very common practice for units in construction (especially larger ones) to agree a contract and then entrust the work to a number of smaller units that specialise in particular types of work (for example electrical installation, masonry). As for new orders in industry, the value of subcontracted work in construction must be included in the new orders of the client[11] (that received the order from the final customer and sub-contracted it on) and by the contractor (receiving the subsequent order from the client). This double counting of orders is necessary as it is particularly difficult to define subcontracting in construction in a manner that is comparable for all EU Member States.

6.4.2. Population

Activity coverage

Mainly NACE Rev.1.1 (see details below) limits the coverage of these indicators.

The sub-indicators of new orders in Annex A of the STS-Regulations are also limited by their geographical market between domestic and non-domestic markets. Besides the STS-Regulations require also the split into euro-zone and non-euro-zone for the non-domestic market. The distinction is to be applied by the Member States, being part of the euro-zone market.

The two sub-indicators of new orders in Annex B are limited not by NACE Rev.1.1 but by CC. The coverage of the indicator of new orders received for building construction is CC Section 1 and the coverage of the indicator of new orders received for civil engineering is CC Section 2.
Not every unit works on the basis of orders, and those that do tend to be concentrated in specific activities where the production process is lengthy or where goods are manufactured that will then be re-used by other units to make other goods - capital goods or consumer

[11] For an explanation of the terms contractor, client and customer used in construction, see the diagram in point 8.2.1.

durables and also sometimes intermediate goods.

For industry

The STS-Regulations list which activities are to be covered and these are the ones that normally work to order:

- textiles (NACE Division 17);
- wearing apparel (NACE Division 18);
- pulp, paper and paperboard (NACE Division 21);
- chemicals and chemical products (NACE Division 24);
- basic metals (NACE Division 27);
- fabricated metal products (NACE Division 28);
- machinery and equipment (NACE Division 29);
- office machinery and computers (NACE Division 30)
- electrical machinery and apparatus (NACE Division 31);
- radio, television and communication equipment and apparatus (NACE Division 32);
- medical and precision instruments (NACE Division 33);
- motor vehicles (NACE Division 34);
- other transport equipment (NACE Division 35).

For construction

The STS-Regulations require new orders only for Groups 45.1 and 45.2 of NACE Rev.1.1.

Minimum and maximum coverage

Both of these lists are the minimum subsets of NACE Rev.1.1 Divisions and Groups those national statistical authorities should cover. It is nevertheless possible that in various countries the lists covered may be more extensive for national purposes, and in fact, the STS-Regulations require expressly that the validity of the list for industry should be regularly checked.

To establish whether a unit classified to a particular branch works to order, it is useful to study the graphs of the time series of the indices for turnover and orders: if the graphs match, or if there is only a slight variation, it means that orders are equivalent to turnover each month and that the unit therefore works in accordance with its own production plan and not in response to orders.

Observation units

The STS-Regulations require the use of the KAU as the observation unit for these indicators.

6.4.3. Collection

How to measure

In order to measure the development in new orders it is normally necessary to conduct a statistical survey of the branches that work to order. In order to calculate the variable for new orders arriving in month t, there are two options for the design of the questionnaire:

- details of new orders arriving in month t;
- details of the stock of orders (unfulfilled orders) at the end of month t, cancellations during month t of orders received in previous months, turnover in month t.

In the latter case, the orders are calculated by subtracting from the stock of orders at time t the stock at time t-1 and adding any cancellations of previous months' orders and adding the turnover during month t (this includes goods manufactured in month t and previously). In order to validate respondents' data, it is better to ask for details of the monthly turnover and stocks of orders on the same questionnaire (turnover may come from another source, for example another survey or an administrative source).

Measurement difficulties

Unknown prices

Sometimes it can be difficult for respondents to provide the information requested. In cases in which a KAU receives orders indicated only in quantities (for example tonnes or number of pieces), they need to be converted into value terms of the basis of the average current selling price. Should this operation be impossible because the quantities of the goods ordered is not known with sufficient precision (for example an order for "at least" a certain amount when the final amount is confirmed some weeks later), the orders should be reported in the month in which they can be correctly expressed in value terms.

Price revision in construction

One problem that is a feature of construction is price revision. It often happens that prices are revised during the course of work, and this naturally affects the orders of previous months. It is very difficult to take account of this when conducting statistical surveys and compiling indices.

Alternative methods/variables

For the compilation of new orders in construction it may be possible to use information from building permits. It should be noted that if new orders are calculated using building permits, it is possible to calculate only domestic orders. Furthermore, strictly speaking, permits normally only concern buildings. For public civil engineering work alternative administrative information is often available as may also be the case for private civil engineering work.

The registration of building permits is strongly connected to each Member States administrative organisation. If this is done in a much-decentralised manner, it may be possible to sample the administrative units that collect building permits.

6.4.4. Compilation of the index

Methods to combine the raw data

Information on new orders can be compiled as absolute values or as indices. The methods are essentially the same for industry and for construction.

If the survey is exhaustive, the final figures will be the sum of the data reported for the individual units. In the case of a sample survey, the data from the sample will need to be grossed up to the frame population. The grossing-up of the results of a sample survey uses coefficients that represent the weight of the sample in relation to the frame population. This weight should be based on orders but can be estimated, preferably from turnover or alternatively from employment.

In order to calculate the basic index of new orders for a branch, the amount of the orders received in month t by respondents of that branch is divided by the average monthly amount of orders in the base year (the base value) for the same respondents. This index, which is neither seasonally adjusted[12] nor deflated, incorporates any price variations.

Weights

To calculate aggregate indices up to the industry total, the Laspeyres index can be used. This involves weighting the basic indices (for each branch) based on their economic significance. The determination of the weights to be used for the Laspeyres formula is done in two stages and is based on turnover data from SBS or an alternative source (for example an administrative sources such as the VAT register). Turnover is used for the weights because data on new orders for all units in the frame population is generally not collected in any survey and new orders in one reference period generally lead to turnover in a future reference period.

First, the total turnover of all units[13] in branch k is calculated. This figure is then adjusted by the ratio, for the base year, between the amount of the new orders of the units in the sample in branch k and their turnover. Weights for branch k can then be calculated as the share of this adjusted turnover value for branch k in the total adjusted turnover for all activities covered by new orders.

The STS-Regulations state that activities have to be included in the index of new orders, but the countries can, for national purposes, consider others. In the case that one country includes more activities, it has to calculate two sets of aggregate indices:

- one set that includes only the activities that are considered in the STS-Regulations in order to have comparable data for calculating the European indices;
- one set including all the activities required for national purposes.

The possible discrepancies between the two sets of indices have to be explained to the users of the data.

Further calculations

The following further calculations can in principle be used for industry and for construction.

Volume of orders received

The STS-Regulations and its implementing Commission Regulation do not foresee the deflation of the new orders index. However, if the aim is to calculate an index of the volume of orders in order to be able to compare it with the industrial production index, the basic index has to be deflated by dividing it by the corresponding price index (total, domestic market, non-domestic market).

Guaranteed work

The manufacturing processes of individual products vary in the time they take, ranging from less than a month to several months. If a unit's average production capacity (calculated on the basis of its average monthly turnover) is known, the stock of

[12] At least in industry, this generally has little impact on the new orders variable.

[13] In some cases a cut-off is used as the population used for calculating the weights may only reflect units above a certain size, for example 20 persons employed.

orders can be used to calculate guaranteed work expressed in time, in other words the number of months of production guaranteed by orders received.

Index of cancelled orders

It has already been indicated that the data on orders received in previous periods and subsequently cancelled must not be subtracted from the amount of the new orders received in the reference month (t), nor must they be used to revise the index of new orders for the months in which the order was originally received.

However, they can be used to calculate an index of cancelled orders. This is an index that yields interesting information concerning the short-term development because it reveals a change in the economic decisions that clients have made and this will have an effect on future production and, consequently, turnover.

Details of the compilation required

The precise description of the series to be compiled for new orders as well as the deadlines can be seen in *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/*STS-Requirements"*.

6.4.5. Approximation/alternative indices

It can be assumed that the STS-Regulations require the new orders indicator to be calculated using quantitative data. The STS-Regulations permit the new orders indicator to be approximated by an alternative leading indicator compiled from data from opinion surveys on short-term developments. This approximation is permitted for a 5 year period (from July 1998) which will be extended by a further 5 years unless a decision is taken otherwise. Using the opinions of respondents (increase, reduction or no change) and applying the consolidated methodology for opinion polls on short-term developments, it is possible to arrive at an index.

For construction

The STS-Regulations permit the new orders indicators to be approximated using building permits information and this has been presented earlier in this sub-chapter as a standard method

For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources

6.4.6. Technical annexes

In the case that new orders are not directly surveyed, the following equation can be used to calculate orders using data on the stock of orders:

$$NO(t) = SO(t) - SO(t-1) + OC(t) + T(t)$$

where

$NO(t)$ = new orders arriving in month t;

$SO(t)$ = stock of orders at the end of month t;

$OC(t)$ = orders cancelled in month t relating to orders received in previous months;

$T(t)$ = turnover in month t.

A significant check to test the consistency of the data provided by respondents is given by the following equation:

$$SO(t) = SO(t-1) + NO(t) - T(t) - OC(t)$$

These equations apply to basic data supplied by respondents.

The calculation of the value indices is based on the basic indices for each branch that are separate for the domestic and non-domestic markets. For the basic information at the most detailed level of activity, for example the Division (2- digit level of NACE Rev.1.1), this gives an index of orders for the domestic market (I^D) for a branch (k) for reference period (t):

$$I_k^D(t) = \frac{NO_k^D(t)}{NO_k^D(0)} \cdot 100$$

and an index of orders for the non-domestic market (I^{ND}) for a branch (k) for reference period (t):

$$I_k^{ND}(t) = \frac{NO_k^{ND}(t)}{NO_k^{ND}(0)} \cdot 100$$

where

$NO_k^D(t)$ = domestic orders arriving in month t from respondents in branch k;

$NO_k^D(0)$ = average domestic orders from respondents in branch k in the base year;

$NO_k^{ND}(t)$ = non-domestic orders arriving in month t from respondents in branch k;

$NO_k^{ND}(0)$ = average non-domestic orders from respondents in branch k in the base year.

To obtain the total index (I) for new orders for a branch (k), the domestic (I^D) and non-domestic (I^{ND}) market indices have to be aggregated using their relevant weights. Since there are no data on orders for the population, the weights are calculated using turnover and adjusting this for the ratio

between orders and turnover of the sample for the base year. The weighting of domestic orders of class k can then be calculated:

$$w_k^D = T_{k,tot}^D(0) \cdot \frac{NO_{k,s}^D(0)}{T_{k,s}^D(0)}$$

where

$T_{k,tot}^D(0)$ = domestic turnover of all units (tot) of branch k in the base year;
$NO_{k,s}^D(0)$ = domestic new orders of the sample units (s) of branch k in the base year;
$T_{k,s}^D(0)$ = domestic turnover of the sample units (s) of branch k in the base year.

Similar equations are used for calculate the weights of non-domestic new orders.

Applying these weights to the indices gives the total index of new orders (I) of a branch (k) for the reference period (t) (expressed by the Laspeyres formula):

$$I_k(t) = \frac{I_k^D(t)\, w_k^D + I_k^{ND}(t)\, w_k^{ND}}{w_k^D + w_k^{ND}}$$

It is then possible to aggregate the indices by activity to obtain indices for higher groupings up to the industry total. For the domestic and non-domestic orders this is shown by the following Laspeyres formulae:

$$I^D(t) = \sum_{k=1}^{K} I_k^D(t)\, w_k^D$$

$$I^{ND}(t) = \sum_{k=1}^{K} I_k^{ND}(t)\, w_k^{ND}$$

The index of new orders for the industry total is obtained by aggregating the indices for domestic and non-domestic new orders:

$$I(t) = I^D(t)\, w^D + I^{ND}(t)\, w^{ND}$$

The value indices also include variations occurring in prices. If they are deflated, they give volume indices that can be compared with the production indices.
Applying the price index (calculated according to the Laspeyres formula) to the value indices ($_V$I) of orders is the same as calculating a volume index ($_{VOL}$I) in accordance with the Paasche formula:

$$_{VOL}I_k^D(t) = \frac{_V I_k^D(t)}{_P I_k^D(t)} \cdot 100$$

where

$_P I_k^D(t)$ = price index of the domestic market of a branch (k) in reference period (t).

If the price indices for the non-domestic market and the total market are available, it is possible to apply similar formulae to use them to calculate the volume indices of non-domestic and total orders.

7. Industrial indicators

7.1. Production

Production determines the use of resources and labours and hence influences growth, income generation, and prosperity. The production index is regarded as one of the most important measures of economic activity. Developments in the industrial production index describe the economic cycles of industry, and this can be used to assess the development of GDP as a whole. For STS this index is the reference indicator for economic development and it is used in particular to identify turning points in economic development at an early stage. The major advantage of the production index compared with other indicators is its combination of fast availability (relative to GDP for example) and at the same times its detailed activity breakdown.

7.1.1. Introduction

Name, synonyms and code numbers

The STS-Regulations require short-term statistics on production (110) under the provisions of Annex A (and B).

The production index is also known as an output index or a production volume index. In fact, as will be seen below, the theoretical purpose of the index is not to reflect production but value added. In practice, however the index is not referred to as a value added index, very few (if any) national statistical authorities produce an index using value added, and they rely instead mainly on production or turnover data.

This index is referred to hereafter as the IPI (industrial production index).

Purpose of the indicator - theoretical concept

The purpose of the IPI is to measure the price-change-adjusted own-output of a branch (and the

total for industry) and to do so normally on a monthly basis.

Monthly measurement is common in order to detect changes in economic developments at the earliest possible stage. Only an up-to-date index is suitable for short-term observation of economic developments.

The IPI aims to identify volume changes in output. Values are affected by volume and price changes. Whenever values are used to compile the production index, they must be adjusted by removing pure inflationary price changes in order to isolate pure volume development (including quality changes).

The branches own output should be measured. In other words, there is a shift from a gross to a net analysis of output (from production value to value added). All the inputs that are not produced by the observation unit itself but are obtained or purchased from other units (and hence make up intermediate consumption) must be deducted from the unit's gross output. This ensures that the output of a branch (and the total for industry) is presented without double counting and irrespective of changes in vertical integration.

Definition and reference period

As already noted above, the theoretical aim of the IPI is to reflect developments in value added. Value added at basic prices[14] can be calculated from turnover (excluding VAT and other similar deductible taxes directly linked to turnover), plus capitalised production, plus other operating income plus or minus the changes in stocks, minus the purchases of goods and services, minus taxes on products which are linked to turnover but not deductible plus any subsidies on products received.
Income and expenditure classified as financial or extraordinary in company accounts is excluded from value added.
Hence, subsidies on products are included in value added at basic prices, whereas all taxes on products are excluded.
Value-added is calculated "gross" as value adjustments (such as depreciation) are not subtracted.

[14] Output and hence value added at basic prices is the valuation adopted in ESA95. The basic price excludes all taxes on products, but does not attempt to exclude other taxes on production as in the former concept of value added at factor cost. If value added at basic prices is not available, for instance from the Structural Business Statistics, gross value added at factor cost may be used as a proxy.

Dependent on the method used to compile the index, account should be taken of:

- variations in type and quality of the commodities and of the input materials;
- changes in stocks of finished goods and work in progress on goods and services;
- changes in technical input-output relations (processing techniques);
- related services, such as the assembling of production units, mounting, installations, repairs, planning, engineering, creation of software.

7.1.2. Population

Population

The coverage of this indicator is limited solely by NACE Rev.1.1. The STS-Regulations require coverage of Sections C and D and Groups 40.1 and 40.2.

Units

The STS-Regulations require the use of the KAU as the observation unit for this indicator.

7.1.3. Collection

Difficulties with the theoretical concept

The greatest difficulty in drawing up a production index is finding a useful measure of economic activity and measuring it in a way that is as precise and up-to-date as possible. In economic terms, the most appropriate measure of the activity of an observation unit or a branch is value added. The concept of an ideal IPI follows this approach. This theoretical requirement - short-term measuring of the development of value added - justifies, at a conceptual level, the use of the IPI as a short-term variable in assessing the development of GDP in volume terms.

In practice, however, value added is not available on a monthly basis in most countries. Therefore data is generally collected for variables other than value added in order to compile the IPI. Given the difficulties with the theoretical concept of the IPI, it is unsurprising that there are many ways that it can be compiled. In general, it is impossible to say that one approach is better than another is as the choice depends largely on the specific situation in a branch, and may differ from country to country. In every case, the key is to develop a "good" economic indicator of the business cycle. Possible alternatives for the compilation of an IPI are: (gross) output quantities, gross production value, turnover, raw material consumption, labour input and energy use.

The choice of basic information is a complex task and of fundamental importance for the quality of IPI. The decision depends on numerous factors, so it is difficult to make general recommendations; the expertise and experience of survey statisticians are crucial along with professional advice from the business community or their representatives.

The term "production" can be used to describe the production process and it can be used for the results (gross output) of the production process, in other words the products (goods and services). The key variable in terms of resource consumption, the use of labour and income generation is the production process. In practice production process data cannot be collected and so the analysis is restricted to gross outputs and, to some extent, the input factors.

In industry, the outputs are the goods produced, as well as the directly related industrial services (for example assembly, maintenance). In the case that outputs are used the decision as to precisely which measure / definition of gross output is selected as the basis of an IPI largely depends on three factors:

- the gross output should be recorded as precisely as possible and should be representative of the economic development in the branch concerned;
- the data should be as up-to-date as possible;
- the costs (for companies and statistical offices) of recording the statistical data should be borne in mind.

How to measure

Below, the basic compilation of an IPI is described using the value of gross production as the basic information. However, this does not imply that this method is preferred. The IPI compiled in this way is essentially a gross output index. Against this background, the IPI - at least at the level of the individual branches - is a measure of the development of the volume of gross output, which is a key economic variable in itself. Only with the aggregation of the IPI across branches does the net aspect play a part using value added data for weighting. It is important to be aware of both the conceptual and the theoretical approach, in other words the theoretical IPI as an index of value added (net output), and the practical outcome, in other words the IPI mainly as a gross output index.

The most accurate production information on products is obtained from specialised surveys on output. In the EU Member States the Prodcom survey is carried out annually. The Prodcom list describes between 5,000 and 6,000 products and/or product categories assigned to NACE Rev.1.1 Sections C, D and E. To calculate an IPI, however, sub-annual and preferably monthly production information is required. For this reason, the best theoretical basis for an IPI is a representative monthly production survey[15]. Production statistics ascertain the quantity and/or value of goods and their related industrial services. These products are assigned to branches at an appropriate level of NACE Rev.1.1, in practice at the 4-digit level[16].

The question arises if quantities or value of products should be used to compile the index. At first, output quantities would appear to be most suitable (for example number of items, kg, litres) in order to track the development of production. However, this only applies to very homogeneous products. In cases where there are significant quality differences or heterogeneous products (for example high-technology machinery, personal computers or cars), declared values are the suitable observation variable. Here, the use of suitable price deflators must ensure that the quality component is reflected in the production volume.

The precise definition of production to be used in a survey of outputs must also be clarified. The Prodcom-Regulation differentiates between "sold production", "production intended for sale" and "total production". The appropriate variable for an IPI is total production, since the entire economic activity of the unit is to be measured. Total production is the sum of production intended for sale and production for further processing within the same unit. It should be noted however that there might well be problems collecting data on total production as this information may not be easily available within an observation unit's records.

Measures of production
Total production = production for sale + production for further processing
Production for sale - net increase in stocks of finished goods and work in progress = production sold

Looking at the part of total production concerning production intended for sale, for the IPI it makes no difference whether the production is initially stored by the observation unit or is sold immediately (within the same reference period that it was

[15] Note that, even if production surveys are only carried out on an annual basis and hence cannot be used to compile an IPI, they are useful in order to examine and, if necessary, to adjust the indices.

[16] The 8-digit Prodcom list conforms, with its first 6 digits, to the CPA product classification system, and with its first 4 digits to the NACE Rev. 1.1 activity classification.

produced). The difference between sold production and production intended for sale is significant as these two values are separated by the storage interval.

Looking at the other part of total production, namely production for further processing within the same observation unit, if this plays an important role within a particular branch it must also be adequately reflected in the IPI. The value for total production can be estimated by multiplying the amount (quantity) for further processing with the average value (unit value) of the sold production of the same product. If sold production, as a percentage of total production, is very small, the uncertain basis for the average value of sold production could give rise to implausible results; in these cases, it may be appropriate to compile the IPI by using quantities of total production instead of values.

Sampling

As the aim is to show in a representative manner, the short-term development of individual branches and of industry as a whole, it is not necessary to include all products and/or all observation units. Rather, a selection of products and/or units can take place. The quality of the selection can be verified based on a comprehensive production survey which takes place at least once a year. It must also be ensured that the selection does not become too outdated and that actual structural changes and technical progress are reflected in the IPI.

Alternative methods/variables

Above, the collection of data for compiling the IPI based on gross production values was described. In fact, as previously noted, a range of options for compiling the IPI is available. These are based on different output or input variables. The most suitable variable depends on the specific situation in a branch and the basic conditions (availability of statistical data) in a country. Therefore, it is not unusual for different types of basic information to be used in parallel in any given country, and for differences to exist between countries in the type of basic information used for any given branch.

Output quantities as the basic data

The output quantity is at first sight the most obvious variable to use in order to construct an IPI (in the sense of an output index). However, as already noted, this is only true in the case of homogeneous products. The more heterogeneous the products, the more problematic it is to aggregate the quantities for individual products to product groups. In these cases, updating with gross production values (as already described) is preferred. A further problem in practice is the choice of the correct physical unit (for example number of items, weight, volume, surface, length). Here, it should be examined which series correlates most closely with the development of value added. Changes in the quality of a good over time must also be taken into account.

It is a major problem that it is not possible to say in which way quality changes will influence the change in quantity from one period to the next as quality changes may influence the quantity produced in different ways. In the case of significant quality changes, the only option is to form a new series for the different qualities of the product[17].

The major advantage of using quantities as the basic information is that quantity relatives are obtained in the first stage of index computation - see point 7.1.4.

The appropriate variable for observation of the output quantities is the quantity of total production - thus the sum of production for sale and production intended for further processing in the same observation unit. As with the value of production, it is helpful that the quantities for the individual products can be assigned to the KAUs (via product groups).

Turnover as the basic information

In the case of compiling the IPI from turnover, there is an important methodological difference compared to the use of quantities or production values. Here, the process starts not with the individual products, but at a higher level, in other words the turnover of observation units. As already noted the observation unit for the IPI is the KAU.

The turnover for each NACE Rev.1.1 Class is normally available from monthly surveys. In order to exclude pure price effects, a deflation with the appropriate price indices is necessary. Subsequently, relatives can be formed as the deflated turnover of the reporting period t is set in relation to the turnover of the base period 0 (the average monthly turnover in the base year) - see point 7.1.4.

[17] When compiling using production values, this quality difference is reflected in the development of the value of production and is taken into account by deflating with price indices that show pure inflationary developments only.

Important advantages of the index updating with turnover are:

- to some extent, production data may not be available monthly, because there is no appropriate statistical survey, but turnover data are usually available based on their own survey;
- turnover data need not be collected in a highly disaggregated way and, especially in branches with very heterogeneous and extensive production ranges, can be collected more easily and more economically (above all if one is content with turnover for enterprises instead of KAUs);
- current turnover is frequently available more quickly than collecting a large number of production quantities or values on a differentiated basis.

However, further methodological/substantive problems also arise:

- turnover actually measures production sold on the market in the reference period and this can differ substantially from the target of measuring the production process as produced goods can first go into stock, or products are sold ex stock. If this effect is significant, it can lead to a misinterpretation of the IPI as regards economic cycles as, with this type of basic information, it is actually a pure turnover index. This applies also if an overall index consists partly of series based on turnover;
- the intermediate production of finished/semi-finished products for further processing in the same observation unit are not taken into account.

The first of these obstacles might be overcome by using information on the change in inventories. Hence, it is possible to calculate the volume relatives with adjusted turnover data.

For example for changes in stocks it would be necessary to add the value of products going into stock and to subtract the value of products sold ex stock (valued with prices of the reference period) in the reference period. To do so, fast and reliable data on stock movements and finished/semi-finished products has to be available. This might be difficult for observation units that produce a wide range of products because the information has to be aligned to the turnover of KAUs.

From a methodological point of view, the use of gross production values or quantities[18] is to be preferred to turnover. Nevertheless, the practical advantages of a turnover based IPI can outweigh these doubts. In the end, the indices for each branch and the index for the industry total must be examined to establish whether the production and turnover series correlate closely enough and whether there is reason to believe that this correlation will exist in future, particularly with respect to cyclical turning points.

Raw material consumption (inputs) as the basic information

In principle, updating with output variables is simpler than with input variables, since the number is usually smaller and the products are more homogeneous than the necessary inputs. If, however, only a few very homogeneous inputs are needed for production or clearly some input factors dominate, inputs can be a good alternative to compile the IPI. Substitutive relationships between input factors should be as small as possible, so that input sizes are suitable for the construction of the IPI. Furthermore, the functional relationship between the input (as a value or quantity) and the production process (measured in terms of output) must be taken into account (for example observation units tend to try to decrease raw material consumption in the production process). If an increase of a certain input leads to a less than proportional increase of production and output there is a risk of misinterpreting an IPI constructed from input series. It is also important to take account of the raw materials actually used in the reference period, not the raw materials purchased; here lies a special difficulty, because respondents usually only have an approximate idea of the quantities of the inputs processed in a particular reference period.

When using input values, similar difficulties arise to those described for using turnover, namely deflation. The problem of significant quality changes has to be checked for carefully when updating the index with quantity or value input data. There is no general rule how an increase of the quality on an input factor will influence the target of production or value added and the IPI.

If the necessary data are available on a monthly basis and the consumption of a particular raw material or a group of raw materials are considered as representative of production in a branch, the

[18] Although updating with quantities causes problems with quality changes.

index construction can take place in exactly the same way as described for the value of production. The indices of the branches are then included in the calculation of the overall index for industry.

Two important input factors are dealt with separately - labour input and energy consumption.

Labour input as the basic information

A production process - the stages from the beginning of production of a product up to its completion - needs a certain period that can in some cases be longer than the reference period. The general problem with compiling the IPI from output or raw material consumption is that these must closely correlate, in terms of time scale, with the production process. A serious difficulty arises, however, with long production cycles and if the output, turnover or raw material consumption only occurs in large quantities at given times (for example shipbuilding).

One solution here is to examine labour input that is continuously used during the production process and, in terms of time, is very closely linked to the production process. An advantage of the labour input series is that these are generally easily available on a monthly basis. The working hours actually performed during the reference period (taking into account overtime or short time work) are a good approximation to the actual production process. The number of persons employed is not suitable as basic information as this is a more or less constant monthly variable.

Of substantial importance when using the labour input as the basic information for compiling the IPI is the change in productivity, in other words the ongoing changes in the volume of the labour factor input needed to achieve a fixed amount of output, caused for example by changes in technology and organisation.

Failure to take changes in productivity into account would lead to a misinterpretation of the IPI as regards production output, growth and income generation. When using labour input as the basic information it is necessary to include this productivity development via appropriate factors. Both the purely technological approach can be taken into account (in which case the change of the productivity is normally positive) and the cyclically determined aspect, which can also lead to negative change rates in certain cyclical phases.

Branches which are suitable for the use of the labour input due to the long manufacturing processes include the manufacture of railway and tramway locomotives and rolling stock, building and repairing of ships and boats, manufacture of aircraft and spacecraft as well as construction (see sub-chapter 8.1 for more information on the index of production in construction).

Energy use as the basic information

to An input that may be closely linked, in terms of time, with the production process and is rather homogeneous is energy consumption. These can normally be measured easily in quantity units, at least for the purchases, which make deflation in the later index computation unnecessary. An advantage of energy input series is that they can be surveyed quite easily, economically and quickly; however, such data are not always available monthly.

It is important to ensure that the energy actually used in the production process during the reference period is measured. Accordingly, respondents should indicate not only the amount of purchased but also the amount of own-generated energy. For respondents, it may also be difficult to assign the energy use more or less correctly to kind-of-activity units (in other words the different branches in which an enterprise is active).

The main problem is the possibility of a short-term change in energy use efficiency (for example because of technical progress or new production procedures). Thus, an increase in efficiency could lead to a lower level of the IPI although, all things being equal, production had remained unchanged. When compiling the IPI from basic information on energy use it is therefore also necessary to constantly monitor the technical conditions of production regarding energy consumption and, if necessary, to adjust the IPI this has been calculated from it. There should be a general connection between energy inputs and production process and/or output quantity in order to be able to interpret the IPI of a branch correctly. This is of course a general problem whenever input measures are used to approximate output measures. Benchmarking to annual data based on output measures allows this to be adjusted for, although this adjusted series only becomes available after a longer delay.

In practice energy input is only used for a very small range of branches and often in conjunction with other indicators.

7.1.4. Compilation of the index

For an explanation of the compilation of the index, it is again assumed that the gross production values are used as the basic information. At the appropriate stages the compilation based on output quantities and turnover is introduced.

Due to the large number of products, it is appropriate to group similar products together into homogeneous product groups. Each product group must be assigned to a branch at an appropriate level of NACE Rev.1.1 normally the 4-digit-level. It should be noted that each product group is assigned to only one branch (k). The production value (v) of a product group (j) is derived from the sum of the production values for the products (i) belonging to this product group (p = price, q = quantity):

$$v_j = \sum_i v_{ij} = \sum_i p_{ij}\, q_{ij}$$

This aggregation must be carried out for all product groups for the reference period. The same approach is also adopted when using other basic information to compile the IPI. For quantity data, several products within a product group can of course only be added together if the same physical unit is used to determine quantity.

First stage of index compilation: calculation of value relatives[19]

After all the gross production value series have been calculated for the product groups, the value relatives can be formed. The value of the reference period t is set in relation to the value of base period 0. It should be noted that each value relative can only be assigned to one branch (k).

The value relative ($_V$R) is derived for each product group (j) for the reference period (t) with respect to the base period (0):

$$_V R_j(t) = \frac{v_j(t)}{v_j(0)} \cdot 100$$

The value relatives must be calculated for all the product groups.

Deflation of value relatives

For an IPI, Laspeyres indices and chain indices are suitable in principle. The following is based on a Laspeyres-type IPI, which redefines the weighting structures every five years and refers the basic information for a particular reference period to this base year. In the case of a chain index, the same process steps are to be used, but with the fundamental difference that the weights for the aggregation of the relatives are updated annually.

To isolate the volume developments, values must be deflated with suitable price indices. In order to obtain a Laspeyres-type IPI, price adjustment using Paasche price indices should be carried out. However, these indices are normally not available, because it is practically impossible to obtain monthly updated weights for Paasche price indices. Therefore as a substitute, Laspeyres price indices are used with the weighting structure of the base year. This procedure can also be justified methodologically, since for the duration of the base year of an index, the difference between Paasche and Laspeyres price indices are generally only small. Moreover, the more detailed the basic information at which the deflation begins (for example at the 8-digit-level of the Prodcom list), the smaller are the distorting effects resulting from the use of Laspeyres prices indices.

The price indices should be defined as closely as possible to the respective product groups used for the value relatives, in other words they should measure the average price development of the goods in the product group that they are to be used to deflate. The quality of the price indices used is of great importance for the calculation of the IPI - see point 7.1.5 for the equation for a Laspeyres price index.

When deflating the value relative ($_V$R) of a product group (j) with the relevant Laspeyres price index ($_P$I), a volume relative ($_{VOL}$R) of the Paasche type is obtained as a result. For the reference period (t), the following equation applies:

$$_{VOL}R_j(t) = \frac{_V R_j(t)}{_P I_j(t)} \cdot 100 = \frac{\sum_i p_{ij}(t)\ q_{ij}(t)}{\sum_i p_{ij}(t)\ q_{ij}(0)} \cdot 100$$

Calculation of quantity relatives based on output quantities at the basic data

Deflation is not necessary when output quantities are used - this is an important aspect if price indices are not available at a suitable level of breakdown or

[19] The term "relative"is used here to express the ratio of a variable in the reference period to the same variable in the base period. This might also be called an index but here the term index is reserved for expressions that are more complex.

are not of good enough quality. The quantity relatives ($_{Q}R$) for each product group (j) in period (t) are calculated as follows.

$$ {}_{Q}R_j(t) = \frac{\sum_{i \in j} q_i(t)}{\sum_{i \in j} q_i(0)} \cdot 100 $$

q_i = quantity of product i
j is the product group to which i belong

Problems of quality changes

Sometimes it is difficult to get suitable price indices. In such cases, the problem can be avoided by using quantity relatives instead of value relatives. With quantity relatives deflation is not necessary but the problem of quality changes occurs. Quantities ignore quality changes of a product and the index may be influenced in different ways (assuming that the product is considered to still be the same).

Quality changes of a product are incorporated in the value of that good and consequently in the indices that are based on value series. Of course, this is true only to the extent that the price indices used to deflate the production values actually measure purely inflation driven price changes - see sub-chapter 7.3 on treating quality changes in output price indices. It is the incorporation of quality changes that mean that an IPI based on production values is closer to the idea of a value added index.

Second stage of index compilation: IPI for branches

After the volume (or quantity) relatives for all product groups have been determined, the IPI can be calculated at the 4-digit (Class) level of NACE Rev.1.1. Each product group (j) is always assigned to just one branch (k), in other words one or more product groups represent a branch's economic cycle. The IPI should describe the average economic development of the entire branch; if several product groups are assigned to a branch these must be combined. To arrive at this average, the weighted arithmetic mean should be used.

In line with the Laspeyres model, the weights are calculated for the base period 0. It is thus assumed that the structure of production will remain more or less constant within each branch up to the next rebasing[20]. When compiling the IPI from production values, the weights for the product groups for the base year are derived from the share of gross production value of the product group in gross production value of all product groups assigned to the same branch. To determine the gross production values, the Prodcom products needed for compiling the IPI in the base year are all taken into consideration.

The weighting factor (w) of a product group (j), which is assigned to a branch (k), is calculated from the gross production value (PV) and is thus:

$$ w_j = \frac{PV_j(0)}{\sum_{j \in k} PV_j(0)} $$

$$ where: \sum_{j \in k} w_j = 1 $$

If other basic information is used to compile the IPI (for example output quantities), the weights are also to be calculated based on gross production values.

With the weighting factors (w) and the volume (or quantity) relatives ($_{VOL}R$), the production index ($_{VOL}I$) for a branch (k) in the reference period (t) can be calculated:

$$ {}_{VOL}I_k(t) = \sum_{j \in k} w_j \cdot {}_{VOL}R_j(t) $$

Calculation of volume relatives for Classes based on turnover at the basic data

In order to exclude pure price effects from turnover a deflation with the appropriate price indices $_{P}I_k$ is necessary. Subsequently, relatives can be formed as the deflated turnover of the reference period t is set in relation to the turnover of the base period 0 (the average monthly turnover in the base year)[21]. As a result, a volume relative $_{VOL}R$ of the turnover for branch k is obtained:

[20] Through constant updating of the weighting structures, which is undertaken de facto in respect of chain indices, the danger of the ageing of weighting is reduced. On the other hand, these structural variations make the inter-temporal comparisons more difficult. Strictly speaking, for a chain index only a comparison to the previous period is correct because otherwise price and quantity structure change at the same time.

[21] An alternative option is to form the value relatives for turnover and then to deflate them. Mathematically, this gives the same result. The sequence of the procedure depends on the data-processing structure of the index computation programme.

$$_{VOL}R_k(t) = \frac{T_k(t)}{{}_P I_k(t)\ T_k(0)} \cdot 100$$

The results of this (second) stage of index computation are volume relatives for the branches. The problem of correct deflation arises with turnover as it did with gross production values. Since Paasche price indices are not available, deflation is undertaken with Laspeyres price indices; as a result, a Paasche-type volume index is obtained instead of the desired Laspeyres index. The problem of the inadequate price indices is more serious when compiling the IPI from turnover than with the gross production values, since deflation takes place at a higher level and the difference between the two types of price index tends to be more serious. On the other hand, price indices at the 4-digit level of NACE Rev.1.1 are more likely to be available than for special detailed product groups of the Prodcom list. According to the underlying data (turnover for the internal market or external market), appropriate price indices (for the internal or external market) should be used.

Quality differences and changes in the quality of individual products are reflected in turnover, as higher quality will normally lead to higher prices and higher turnover. This is an advantage when compared to compiling the IPI from quantities. A precondition for this is the availability of output prices that isolate pure inflation driven price changes.

Third stage of index compilation: IPI at higher aggregation levels

IPIs for the branches at the 4-digit level (or the volume relatives in the case of deflated turnover) can be aggregated according to the hierarchical classification structure of NACE Rev.1.1 to IPIs at higher aggregation levels and to main industrial groupings. The share of value added of each Class in the base year is used for the calculation of the aggregations. The greater the value added of a branch (k) compared with others, the greater, too, is its weight in the higher-level indices. Gross value added is used for this weighting of the branches. Gross value added is normally available at the 4-digit level of NACE Rev.1.1 from SBS[22]. In order to have a representative IPI it is important to measure the distribution of value added between the branches as exactly and comprehensively as possible. In line with the Laspeyres model, the weights (w) of the individual branches (k) for the base year (0) are calculated as follows (VA = gross value added):

$$w_k = \frac{VA_k(0)}{\sum_{k=1}^{K} VA_k(0)}$$

Using these weights, the IPIs (or volume relatives) for each branch ($_{VOL}I_k$) can be consolidated to the overall index for industry for the reference period t:

$$_{VOL}I(t) = \sum_{k=1}^{K} w_k \cdot {}_{VOL}I_k(t)$$

The aggregation of the sub indices to the total index takes place regardless of which type of basic information was used in the compilation of the sub indices.

Details of the compilation required

The precise description of the series to be compiled for the IPI as well as the deadlines can be seen in *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/*"STS-Requirements"*.

For the latest version of overview of national methods see STS Sources available on CIRCA site/Library/Methodology/STS Sources

7.1.5. Technical annexes

Value (v) of production of product group (j) for products (i) with price (p) and quantity (q):

$$v_j = \sum_{i \in j} p_i\, q_i$$

Calculation of value relatives ($_VR$) for gross production value (v) for product group (j) in period (t) compared to the base period (0):

$$_V R_j(t) = \frac{v_j(t)}{v_j(0)} \cdot 100 = \frac{\sum_{i \in j} p_i(t)\, q_i(t)}{\sum_{i \in j} p_i(0)\, q_i(0)} \cdot 100$$

Laspeyres price index ($_PI$) formula for product group (j) in period (t):

[22] Note that the SBS requires turnover, production value and value added for the enterprise, but only turnover and production value for the KAU.

$$ {}_{P}I_{j}(t) = \frac{\sum_{i \in j} p_i(t)\, q_i(0)}{\sum_{i \in j} p_i(0)\, q_i(0)} \cdot 100 $$

Calculation of volume relatives ($_{VOL}$R) by deflation of value relative ($_{V}$R) by a price index ($_{P}$I):

$$ {}_{VOL}R_j(t) = \frac{{}_{V}R_j(t)}{{}_{P}I_j(t)} \cdot 100 = \frac{\sum_{i \in j} p_i(t)\, q_i(t)}{\sum_{i \in j} p_i(t)\, q_i(0)} \cdot 100 $$

7.2. Turnover

7.2.1. Introduction

Name, synonyms and code numbers

The STS-Regulations require short-term statistics on turnover (120) for Annexes A, C and D. For industry it requires information on domestic turnover (121) and non-domestic turnover (122).

It should be noted that turnover is sometimes also referred as "sales", "shipments" or "deliveries". In the context of this manual, these terms are used as synonyms.

Purpose of the indicator - theoretical concept

In general, turnover gives a global idea of the sales development including the sales of goods, merchanted goods and services provided to other units. It can be seen as an important indicator of activity in general, namely in terms of the demand for industrial output. It is the objective of the turnover index to show the development of the market for goods and services. For short-term analysis, turnover information is of particular significance.

While the IPI provides information on trends in volume concerning value added, turnover is used in industry to assess current developments in sales. By contrast, in many of the distribution and service activities, the concept of production cannot be easily defined and turnover is the best proxy for the analysis of the short-term development of these activities. Therefore, for industry, turnover can be seen as a complement to production information in short-term analysis.

Turnover is a fairly elementary concept in accounting[23], which hence exists not only in industry but also in other market-oriented activities like construction, distribution, transport, communication, hotels and other services. Hence, the turnover indicator can provide a common link for short-term comparisons of business cycle movements in various parts of the economy.

In normal circumstances, the most important part of the income of a unit is its operating income; it is here that the receipts coming from the non-financial ordinary activity are included. Within operating income turnover normally accounts for the highest share.

Turnover is a measure of the market growth and provides information useful for those activities supplying inputs and for those activities using a unit's output for further manufacturing processes. The business community itself calculates market share based on turnover.

It is sometimes believed that the turnover index and the IPI are quite similar but in reality, the differences are considerable:

- turnover includes sales of merchanted goods (resale) which is not considered in the IPI;
- services provided to other units are included in turnover, but usually are not included in production notably when the IPI is compiled from physical quantities;
- goods produced (or purchased) and stocked before sale are included in both production and turnover, but are considered at different moments in time;
- sales data will often include the output of secondary activities, while the IPI, if based on a list of products, is more homogeneous.

Nevertheless, there is still a strong connection between these two indicators and in some cases deflated turnover is used as proxy for the IPI.

[23] The concept of turnover is to some extent defined by the Directive 78/660/CE, of 28th July 1978 (4th Directive), in article 28.

Definition and reference period

The definition of turnover for STS follows the definition of SBS and in this respect follows largely the ESA 95.

The definition of turnover is relatively straightforward. In the case of industry, the most important components of turnover are invoiced services provided by the unit and the sales of products i) produced by the unit, ii) produced by third parties with raw materials of the unit or iii) purchased for resale by the unit. However, some other items can be included in turnover.

In case of doubts concerning the eventual inclusion or not of any item in turnover definition "items may be included if they generate turnover in the principle field of operation of the observation unit".

Turnover comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties. Turnover also includes all other charges (transport, packaging, etc.) passed on to the customer, even if these charges are listed separately in the invoice. Subsidies received from public authorities or the institution of European Union are also included.
Turnover excludes VAT and other similar deductible taxes directly linked to turnover as well as all duties and taxes on the goods or services invoiced by the unit. Reduction in prices, rebates and discounts as well as the value of returned packing must be deducted. Price reductions, rebates and bonuses conceded later to clients, for example at the end of the year, are not taken into account.
According to this definition, the items generally included are:

- sales of manufactured products;
- sales of products manufactured by subcontractors;
- sales of goods purchased for resale in the same condition as received;
- invoiced services provided;
- sales of by-products;
- invoiced charges for packaging and transport;
- hours worked invoiced to third parties for labour only subcontracting;
- invoiced mounting, installations and repairs;
- invoiced instalments (stage payments);
- invoiced development of software and software licences;
- sales of supplied electric power, gas, heat, steam and water;
- sales of waste and scrap materials;
- subsidies on products.

Subject to the treatment of income classified as "other operating income, financial income and extraordinary income "in company accounts, the items generally excluded are :

- commissions;
- leases and rentals;
- leases for own production units and machines if used by third parties;
- leases of company-owned dwellings;
- receipts for license-fees;
- receipts from staff facilities (for example from a factory canteen);
- the supply of products and services within the observation unit;
- sales of own land and fixed assets;
- sales or leases of own properties;
- sales of shares;
- interest receipts and dividends;
- other extraordinary income.

National statistical authorities should use this definition, but accounting rules in force in each country should be used as guiding principles of what to include and to exclude. The reality of each activity should be taken into account when measuring turnover, for example in some activities with large products with long production cycles turnover is likely to be more volatile.

Subcontracting

In industry, it is very common, when a unit has insufficient capacity to completely fill an order, to subcontract part or all of the work to another unit. The subcontracting concept is difficult to define and various references can be found in business statistics, notably in the explanatory notes of Prodcom and NACE Rev.1.1 and in the definitions adopted for the SBS. The definitions used for STS do not explicitly define sub-contracting. Nevertheless in industry, a large part of subcontracting comes from i) work done by third parties on raw materials belonging to the unit and ii) from a unit providing an industrial service to another.

As noted above, the sales of products manufactured by subcontractors should also be included in turnover of the main contractor. Equally, the

subcontractor should consider as turnover the invoiced services provided.

Hence, the services and the sales of this production are included in turnover by units, the contractor and the subcontractor. This means that turnover double counts the sales of some products, which is correct when measuring the market size (which is a function of the structure of industrial activities) but causes difficulties for analysis if this is used as a proxy for production.

VAT

The treatment of VAT in turnover is another controversial issue, some consider that VAT should be included in the definition of turnover. The definition adopted for STS excludes VAT that is consistent with the definition adopted for SBS. There are some reasons for not including VAT in the turnover definition:

- the aim of STS is to follow developments over time and VAT does not have any impact on the tendency unless the rate of the tax is changed. In fact, if there is a change in the tax of different products this could introduce an artificial element into the development of the turnover indicator;
- if VAT is included in the weights, it can distort the share of each activity; bearing in mind that the tax differs from product to product, the impact of VAT on these weights can have a negative impact on the quality of the index;
- the tax for domestic or non-domestic markets may differ;
- the tax differs between Member States.

7.2.2. Population

Classifications & coverage

The coverage of these indicators is mainly limited by NACE Rev.1.1. The STS-Regulations require coverage of Sections C and D. The sub-indicators of turnover are also limited by their geographical market between domestic and non-domestic markets.

Besides the STS-Regulations require also the split into euro-zone and non-euro-zone for the non-domestic market. The distinction is to be applied by the Member States, being part of the euro-zone market.

Units

The STS-Regulations require the use of the KAU as the observation unit for this indicator.

There are arguments in favour of the enterprise and the KAU as observation unit. If future investment prospects are to be analysed based on present income, enterprises are the correct observation units. Additionally data from enterprises is much easier to obtain than from KAUs. This is a particularly valid argument if administrative sources like the VAT register are used. Comparisons between turnover indices in other activities (for example distribution and services) only make sense for data following the sector approach, in other words collected for enterprises, since short term statistics in these parts of the economy use that approach. If the main purpose of the turnover index is to be compared with the IPI, employment and PPI in the same activities, KAUs should be the observation unit. In this case, the index will also be valid for updating quarterly national accounts, which is a further important role of short-term turnover information.

It should however be noted that even if the KAU is used, the comparison with the IPI will not be perfect because of other methodological problems, such as the differences in the definitions noted above.

7.2.3. Collection

How to measure

Traditionally the main method of collecting information on turnover is using a statistical survey.

Sampling of units

In the case of statistical surveys, either a sample survey or a census can be used. Usually if a sample is selected for turnover, the distinction between domestic and non-domestic markets is not considered in the stratification plan as most SBR do not have information concerning this. Therefore, the sample may not be representative for these sub-indicators.

Alternative methods/variables

Bearing in mind the aim of the turnover indicator, it should be decided whether it is possible or preferable to use administrative data or conduct a statistical survey instead. As turnover is recorded in accounts by all units, information concerning turnover does not need to be collected through a statistical survey and administrative sources can be used. The main administrative source for turnover is the VAT declarations made by enterprises regarding their purchases and sales.

Nevertheless, some attention should be paid to the definition used by the administrative authorities compared to that used in the implementation of the STS-Regulations - some consistency problems may arise. The use of VAT registers may also lead to difficulties concerning the respect of delays as, for some enterprises, VAT authorities concede a delay for making declarations that is incompatible with the delay required under the provisions of the STS-Regulations. It should also not be forgotten that each Member State determines the levels of turnover below which VAT declarations do not need to be made and may also allow different frequencies for declarations (monthly, quarterly or annually) according to enterprise size.
The main advantage of the use of administrative sources is that it reduces the burden of data collection on enterprises.

7.2.4. Compilation of the index

Methods to combine the raw data

The STS-Regulations require this indicator to be transmitted to Eurostat either as an index or as absolute figures. The turnover index is a simple value index (price multiplied by quantity/volume), and is a direct index in that it compares the current period
with the fixed period in the base year. The same compilation is used for the sub-indicators for the domestic and non-domestic markets.
In order to compile turnover indices at higher levels of NACE, the indices at the lowest level have to be aggregated. This aggregation is done by using weights based on the turnover share of each activity in the base year. For the sub-indicators the weights are based on the turnover shares of each activity in the two separate markets, domestic and non-domestic.

It is recommended to use SBS data for the weights in order to provide the maximum of consistency between different indicators. There are other sources that can be used, however attention must be paid to the consistency of the basic data, notably the definition of turnover used. From SBS it should be possible to obtain turnover data for KAUs. If this is not available in practice enterprise data is used.

Details of the compilation required

The precise description of the series to be compiled for the turnover indicator as well as the deadlines can be seen in *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual /*"STS-Requirements"*.

For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources

7.2.5. Technical annexes

The calculation of value indices I for a given activity (k) are based on the turnover (T) of all observation units (h) of the reference month (t) compared with the monthly average of turnover of the base period (0):

$$I_k(t) = \frac{\sum_{h \in k} T_h(t)}{\sum_{h \in k} T_h(0)} \times 100$$

The turnover can be broken down by different activities and by different markets. Considering the distribution by (k) activities and (x) markets, each elementary index is determined in two dimensions (turnover T of activity k for market x) and the weights (w) assume the following composition:

$$w_k^x(0) = \frac{T_k^x(0)}{\sum_{k=1}^{K}\sum_{x=1}^{X} T_k^x(0)}$$

$$w_k(0) = \sum_{x=1}^{X} w_k^x(0)$$

$$w_x(0) = \sum_{k=1}^{K} w_k^x(0)$$

$$\sum_{k=1}^{K}\sum_{x=1}^{X} w_k^x(0) = 1$$

The turnover index is a value index (development in volume and prices of transactions). Thus, the index corresponds to the development of the turnover (value) of the activity (k) market (x) in the reference period (t) in comparison with the base period (0):

$$I_k^x(t) = \frac{T_k^x(t)}{T_k^x(0)}$$

The elementary index for total turnover in an activity (k) is defined from the aggregation of the elementary indices of the markets:

$$I_k(t) = \sum_{x=1}^{X} w_k^x(0) \cdot I_k^x(t)$$

Similarly, for an elementary aggregate limited to market (x), the index is defined from the elementary index of activity (k):

$$I_x(t) = \sum_{k=1}^{K} w_k^x(0) \cdot I_k^x(t)$$

Considering a certain activity aggregate or the completely industrial activity the index should respect the aggregation consistency of the index for each aggregation. In other words, the index for all markets for all activities should be the same whether obtained from the aggregation of the index of each activity or of each market. Thus, the index for total turnover can be obtained from elementary indexes of activities or of markets:

$$I(t) = \sum_{k=1}^{K} \sum_{x=1}^{X} w_k^x(0) \cdot I_k^x(t)$$

or from the elementary aggregation of activities or markets:

$$I(t) = \sum_{k=1}^{K} w_k(0) \cdot I_k(t)$$

$$I(t) = \sum_{x=1}^{X} w_x(0) \cdot I_x(t)$$

On the other hand, total turnover for reference period (t) corresponds to the index of turnover between (t) and (0). From the above it can be concluded that:

$$I(t) = \frac{\sum_{k=1}^{K} \sum_{x=1}^{X} T_k^x(t)}{\sum_{k=1}^{K} \sum_{x=1}^{X} T_k^x(0)}$$

As the turnover index is an aggregate index obtained from the weighted average of elementary indices or elementary aggregates, the development of total turnover corresponds to a weighted mean of the development of elementary indexes or elementary aggregates. Thus:

$$\Delta I_{t/t-1} = \frac{I(t)}{I(t-1)} - 1 = \frac{1}{I(t-1)} \cdot \sum_{k=1}^{K} \sum_{x=1}^{X} w_k^x(0) \left(I_k^x(t) - I_k^x(t-1) \right)$$

7.3. Output prices

7.3.1. Introduction

Name, synonyms and code numbers

The STS-Regulations require short-term statistics on output prices (310, hereafter PPI) under the provisions of Annex A (and D). It also requires an output price index of the domestic market (311, hereafter PPI for domestic market) and of the non-domestic market (312, hereafter PPI for non-domestic market). Output prices are also known as producer prices. Input prices can also be considered as producer prices. The STS-Regulations do not require input prices for Annex A and producer prices and output prices are often used as synonyms in the domain of STS.

Purpose of the indicator - theoretical concept

Output price indices seek to measure the gross monthly change in the trading price of products/services on the domestic market and the non-domestic market. In combination, the sub-indices for these two markets give the change in the PPI for a given product/service, and through aggregation, groups of products/services and activities.

Monthly measurement of output prices meets a need for information on the short- and medium-term economic activity of the Member States and the EU. They permit monthly monitoring of prices at different stages of the manufacturing process, and they are also a means of distinguishing effective growth of the activity from price changes (the national accounts and IPI deflator) and provide information to the business community on particular markets of interest to them.

Non-domestic-price indices

Just as the PPI for domestic market, the PPI for non-domestic market meets a need for short-term economic analysis can be used as a deflator or for the purposes of analysis (calculating the terms of trade, for example); they are also useful for the business community in the evaluation of certain markets.

Definition and reference period

It is essential that all price-determining characteristics of the products/services be taken into account, including quantity of units sold, transport provided, rebates, service conditions, guarantee conditions and destination. The specification must be such that in subsequent reference periods, the observation unit is able uniquely to identify the product/service and to provide the appropriate price per unit.

The following rules apply for the definition of prices:

- the appropriate price is the basic price that excludes VAT invoiced by the unit vis-à-vis its customer and similar deductible taxes directly linked to turnover as well as all duties and taxes on the goods and services invoiced by the unit whereas subsidies on products received by the producer, if there are any, should be added;
- if transport costs are included, this should be part of the product/service specification;

- in order to show the true development of price movements, it should be an actual transaction price, and not a list price;
- the output price index should take into account quality changes in products/services;
- the price collected in period t should refer to orders booked during period t (moment of order), not the moment when the commodities leave the factory gates;
- for output prices of the non-domestic market, the price should be calculated at national frontiers, FOB (free on board).

A price index should in principle reflect the average price level during the reference period. In practice, the information actually collected may refer to a particular day in the middle of the reference period that should be determined as a representative figure for the reference period.

The indices of domestic and non-domestic prices require separate output price indices to be compiled according to the destination of the product/service. The residency of the third party that has ordered or purchased the product/service determines the destination. The domestic market is defined as third parties resident in the same national territory as the observation unit.

Non-domestic-price indices - definition of "price"

In the case of trade between a unit and another unit abroad of the same enterprise group, the invoiced price may well be a transfer or disposal price whose development may not always reflect the price changes for a client not within the same enterprise group. For this reason preference may be given to the collection of prices paid by more representative clients (for example local importers) or a system may be set up with the enterprise monitoring an indicator based on disposal prices but whose development does indeed reflect that of prices on the local market.

Because there may not have been a transaction for a given product/service on a given date in the middle of the month, it may be preferable to measure a mean transaction price over the reference month for the product/service in question. This is, moreover, coherent with the mean monthly conversion rate for the transaction currency used; for the PPI for non-domestic market the development of prices of products/services is in national currency and the price of a transaction made in another currency must be converted on this basis by the national statistical authority. Price changes thus partially reflect exchange rate fluctuations.

7.3.2. Population

Classifications & coverage

The coverage of these indicators is limited mainly by NACE Rev.1.1. The STS-Regulations require a coverage of Sections C to E excluding Groups 12.0, 22.1, 23.3, 29.6, 35.1, 35.3, 37.1, and 37.2 . The sub-indicators of output prices are also limited by their geographical market between domestic and non-domestic markets. Besides the STS-Regulations require also the split into euro-zone and non-euro-zone for the non-domestic market. The distinction is to be applied by the Member States, being part of the euro-zone market.

Units

The STS-Regulations require the use of the KAU as the observation unit for this indicator. As has been noted elsewhere this is in fact not practical.

As the information used is based on products/services, it could be considered that there is no observation unit in the sense foreseen by the STS-Regulations. However, the weights used for aggregating indices from the most detailed activity level should be based on KAU data.

7.3.3. Collection

How to measure

The monthly monitoring of changes in prices of products/services sold by domestic producers is done by means of a statistical survey of the producers in the activity in question. Regular collection of prices data normally flows from a sample of units and a sample of their products/services.

Sampling of units/products/services

The basic sampling method used varies between national statistical authorities. It may involve a two-stage sampling process of observations units and products/services. Alternatively, if an appropriate frame is available a single sample is made of "pairs of observation units and products/services".

The sampling frame used may vary depending on the market under study (domestic or non-domestic). On the domestic market, the sample of enterprises is normally drawn from the SBR. A probabilistic method (usually proportional to size) or reasoned selection is used to ensure a sufficient coverage. Once an observation unit has been selected, a qualified field officer may visit the firm to:

- gain some understanding of the enterprise and its prices policy;
- decide the practical aspects of the survey;
- select with the firm products/services that are representative of its activity.

Rather than using a field officer to collect this information, some Member States undertake this work by telephone or by post.

For each of the product/service groups of the observation unit, a choice must be made of the products/services (or transactions) which are most representative of changes in the observation unit's prices. In some cases, an estimate of their level of representativeness may be made and this subsequently reflected in an intra-enterprise weight used for the basic index of the product/service being monitored.

The use of a detailed level of the product/service classification to select the products/services ensures greater accuracy of the index at CPA 4-digit level. In most countries, product/service data is gathered at CPA 6-digit level or even finer.

Every product/service selected for monthly monitoring needs to be described in great accuracy, together with its price and all characteristics of the transaction.

Non-domestic-price indices

Observation units selected for non-domestic output price monitoring are the units that produce the products/services concerned.

In practice, the flow of goods between the producer and the non-domestic customer may pass through an intermediary. This means that there may be some justification for measuring price changes in commercial transactions. In this case, the result is an index of non-domestic prices (rather than non-domestic output (producer) prices) since the observations are not restricted to producers. But the ideal indicator is still that which measures changes in output (producer) prices of products/services for delivery to non-domestic markets, and thus of the price of domestic production directly delivered to non-domestic markets.

The observation units for the PPI for non-domestic market are selected either by reasoned choice (normally applying a cut-off) or by sampling proportional to size, from external trade data.

Samples for the PPI for non-domestic market are generally much smaller than those for the PPI for domestic market and a probabilistic method is thus very rarely used.

The products/services are selected in a similar manner to those for the PPI for domestic market except that products/services selected must be representative of the observation unit's sales to multiple destinations. At the same time, the number of products/services followed must be representative of a group of products/services.

Data collection difficulties

Unique products/services and computers

The evaluation of the price of unique products/services is problematic. Although no work has been done at an international level on this problem in the context of STS, attention is drawn to the work by a Eurostat organised task force on large equipment goods in the context of the Handbook on price and volume measures in national accounts.

Similarly, the evaluation of the price of computers is problematic. The problems here relate to the bundling of software with hardware and the rapid technological change in these goods - other goods also pose problems due to rapid technological change.

Quality changes

Three distinct difficulties can be identified: an observation unit ceases to be active, a product/service ceases to be produced, the price determining characteristics of a product/service change. The first of these is treated in a general manner under point 5.5.4.

A product/service ceases to be produced

If a product/service ceases to be produced or a new product/service appears on the market it is impossible to directly compare the price between a period in which the product/service exists and one in which it does not. This situation is essentially an extreme case of a quality change in a product/service and the methods of treating it can be considered to be the same as those where a product/service has changed.

These are described below. New products/services should be introduced into the compilation of the index as soon as possible.

Changes in the product/service

A change of product/service is defined as when product/service i' replaces product/service i, both

being representative of the same family (or group) of products/services but being sufficiently different to distinguish them one from the other from an economic point of view. The price level of products/services i and i' is such that they should in theory offer the buyer the same service in terms of utility. In practice, a change of product/service becomes known if the observation unit (the producer) advises the national statistical authority of the fact, or if the price seems to change too much (or too little) for the activity in question[24].

The variation in price between p_i (t-1) and $p_{i'}$(t) results from the difference between the two in nature, composition, market positioning and so on.

A breakdown of the change between p_i(t-1) and $p_{i'}$(t) must therefore be made, with one component, the "quality effect" measuring the price change attributable to changes in the product/service and a second "pure price" component. Market prices do not always properly reflect quality differences. The closer the market for a product/service is to perfect competition the better the quality evaluation from market prices. As such the appropriateness of a particular method depends in part on the characteristics of the market for the product/service.

The Handbook on price and volume measures in national accounts proposes the following measures for accounting for quality changes in price indices.

If products/services i and i' coexist at the time of replacement in period t:

- overlap (or market) approach - the price difference recorded on the market measures the quality effect. In this case, product/service i alone figures in the computation of the index up to the reference period t and product/service i' in the computation of the index for reference period t+1 onwards;
- unadjusted price comparison (or direct price comparison) - the price difference recorded on the market measures the pure-price component and it is assumed that there is no quality change;
- automatic linking (or link-to-show-no-price-change) - the products/services i and i' are regarded as non-comparable and the price level is considered to be unchanged; the price difference recorded on the market is assumed to measure the quality effect; this gives a similar result to the overlap approach but it can also be used whether or not the products/services i and i' coexist at the time of replacement in period t;
- option prices - if the difference between products/services i and i' is the inclusion of an extra option this option can be valued at its price if purchased separately and this used to derive an estimate of the price or the product/service without the option; care has to be taken with the estimation as separately purchased options may however be more or less expensive than bundled options;
- production costs (or manufacturer) approach - the quality effect is represented by the difference in manufacturing costs (production costs) between the two products/services at time t; this method can be improved by not only looking at differences in production costs but also producers' profit margins that should also be reflected in producers' prices.

Estimate the price of product/service i at time t or the price of product/service i' at time t-1:

- matched models only (imputation or imputed price change-implicit quality adjustment) - estimate the price change of product/service i (more often than not) from the mean price change of similar products/services between t-1 and t which themselves are unchanged - however these may well differ from the price change of the new product/service; note that this can be done whether or not the products/services i and i' coexist at the time of replacement in period t;
- judgmental approach - subjective estimates may be made by the observation unit or an analyst with specialist knowledge using an overlap price or production costs method;
- by a hedonic econometric method which seeks to estimate $\hat{p}_{i'}(t-1)$. It assumes that the price of products/services of different qualities will depend on measurable characteristics. From a large number of observations of market prices and characteristics of various models a regression is carried out to investigate which characteristics are the determinants of price differences between the models. Either i) implicit prices of each characteristic are estimated and applied to predict the price of products/services offering the same characteristics but absent from the market at time t-1 or ii) a price index is directly calculated from the regression. This method

[24] Most Member States have set up a price change monitoring method. The range (for example +/- 5%) may be parameterised according to the activity or the market. For example, on the non-domestic market, changes can be much wilder on account of exchange rate fluctuations.

requires not only special processing and expertise but also a substantial volume of data, which can prove difficult to bring together in a recurrent data production process. The method is recommended for products/services whose technological development is very rapid, such as computer hardware.

Non-domestic-price indices - changes in the product/service

Any product/service change must be quantified in terms of pure price development. In the case of products/services monitored on the non-domestic market, the additional destination factor can also lead to a change in product/service external to all the other characteristics of the selected product/service.

When a product/service i' replaces product/service i, both should be representative of the same family of products/services, and thus of the same (group of) destination. A change in price between the two products/services i and i' may be due to no more than a change in the product/service's destination. For this reason, every effort must be made to quantify the pure price effect of this change of destination.

Non-domestic-price indices - no transaction

The absence of a real transaction is not perceptible when the price being followed is only an invoice price because the product/service takes time to manufacture or is a one-off. However, for any other product/service, the additional dimension of the destination multiplies the risk of there being no sale of the product/service in the month in question. One solution is to maintain the price at its last level until the next sale period; an alternative is to apply the price change of other products/services (matched models approach to changes in the products/services described above).

7.3.4. Compilation of the index

Methods to combine the raw data

Output price indices are constructed from successive aggregations in which each level of aggregation uses the arithmetic mean of indices at the level below, duly weighted. The weights of the lower level indexes (below the Class level) are mostly given by the Prodcom survey. This survey does not always distinguish the domestic and non-domestic market and the system of weights is obtained normally from the sample of units in the domestic market.

The formulas used for the aggregations correspond to Laspeyres indices, either chained from the last month of the year or computed with a fixed structure of weights that is that of the base year.
PPIs for levels of aggregation higher than NACE Rev.1.1 Classes (4-digit) are defined as the weighted arithmetic mean of the price indices for the Classes, with the value of sales on the domestic or non-domestic markets[25] in the base period as the weights.

The computation formulae are set out below *(see 7.3.6 Technical annexes)*

Non-domestic-price indices - weights

PPI for non-domestic market are destined for dissemination at the 4-digit level, at least in manufacturing for larger Member States. For data at a more detailed level, there exists an aggregation procedure allowing the change from products/services to NACE 4-digit level. The weights then used may be intra-enterprise and/or extra-enterprise data.
The observation units for each selected product/service normally provide Intra-enterprise weights. They correspond to non-domestic deliveries of the family of products/services represented by the monitored product/service.

Extra-enterprise weights within the same group of products/services (assigned to a NACE Class) may be taken from external trade statistics or from Prodcom. In either case, care must be exercised: the first source (customs) also comprises sales of goods abroad by wholesalers, and thus does not correspond to direct non-domestic sales by producers; the second does not always distinguish between sales on the domestic market and non-domestic sales.

Details of the compilation required

The precise description of the series to be compiled for the output price indicators as well as the deadlines can be seen in *Associated documents* of the Methodological Manual available on CIRCA site /Library/ Methodology/STS Methodological Manual/ *"STS-Requirements"*.

For the latest version of overview of national methods, see STS Sources available on CIRCA site/Library/Methodology/STS Sources

[25] The production sold variable from Prodcom is also used.

7.3.5. Approximation/alternative indices

If the indicator of output prices for non-domestic markets is not available, the STS-Regulations permit this to be approximated by an indicator of the unit value, only if this does not imply any significant deterioration in quality compared to specific price information.

The unit value is the ratio of the value of non-domestic deliveries and their volume. Changes in unit value thus reflect both price changes and changes in volumes.

Any quality adjustment in the products/services monitored is thus totally masked from estimation. The unit value index nevertheless offers three benefits vis-à-vis output price indices for the non-domestic market: they use an (almost) exhaustive source since the basic data are from external trade data; they are very cheap to produce, and the mean values are calculated from prices invoiced in real transactions. For this reason, the UVI can give a good estimate for an index of non-domestic output prices in as much as the product/service is relatively stable in both quality and volume of sales.

7.3.6. Technical annexes

Lowest level of aggregation

Consider a (NACE) Class[26] (k) consisting of H observation units. A single member of this Class is denoted by h. The set of all products/services produced by observation unit h for the domestic or non-domestic market is denoted by C_h. A product/service is defined as having a precise specification together with a specified kind of transaction[27]. In fact, the basic economic units are the individual transactions. However, for statistical purposes some aggregation of these basic units is unavoidable.

It can safely be assumed that for two different observation units h and h' the sets C_h and $C_{h'}$ do not overlap. A single product/service will be denoted by i. The domestic or non-domestic output price index for a single observation unit will be calculated by the Laspeyres formula[28]. Thus, the price index ($_PI$) for period t relative to period 0 for observation unit h is given by the following expression:

$$(1) \qquad {}_P I_h(t) \equiv \frac{\sum_{i \in C_h} v_i(0) \times (p_i(t) / p_i(0))}{\sum_{i \in C_h} v_i(0)}$$

where:

$v_i(0)$ = base period value of the sales of product/service i;

$p_i(0)$ = base period price of product/service i.

$p_i(t)$ = reference period price of product/service i.

The summation is over all products/services produced by observation unit h for the market.

Notice that:

$$(2) \qquad v_h(0) \equiv \sum_{i \in C_h} v_i(0)$$

is the base period value of the total sales of products/services by the observation unit h to the market.

An output price index for the Class (k) of observation units H can now be obtained as a weighted average of the output price indices for each observation unit. If the base year sales values $v_h(0)$ are used as weights, the output price index for Class k is defined as:

$$(3) \qquad {}_P I_k(t) \equiv \frac{\sum_{h \in k} v_h(0) \times {}_P I_h(t)}{\sum_{h \in k} v_h(0)}$$

If we define C_k as the set of all products/services produced for the market by the observation units in Class k, we can rewrite this as:

$$(4) \qquad {}_P I_k(t) \equiv \frac{\sum_{i \in C_k} v_i(0) \times (p_i(t) / p_i(0))}{\sum_{i \in C_k} v_i(0)}$$

Thus $_PI_k(t)$ is also a Laspeyres price index. The domestic output price index includes the transactions between a $h \in k$ and any other $h' \in k$, since the domestic market for observation unit h includes all other observation units belonging to k. Thus, this index follows the so-called gross concept.

The following approach is proposed as a basis for estimating the Laspeyres output price index given above (4).

[26] For the purposes of this manual, it is assumed that the indices are calculated first at the Class level of NACE and then aggregated to higher levels. The explanation given below is equally true if the indices are calculated first at a higher NACE level, such as the Group.

[27] Thus, products for the non-domestic market are according to this definition per se different commodities than domestic sales. In this case, the kind of transaction is an important specification of the commodity.

[28] In fact, the domestic and the non-domestic output price indices are sub-indices of the (total) output price index. Within the micro-economic theory of the firm, the output price index is based on the revenue function (or restricted profit function). Under appropriate conditions, it can be shown that the Laspeyres output price index is a lower bound of the (true) output price index.

Assume that all products/services can be classified into disjoint product/service groups[29] $G_1,...,G_J$. Notice that:

$$(5) \qquad C_k \subset \bigcup_{j=1}^{J} G_j$$

The intersection of C_k and G_j is the set of all products/services belonging to product/service group G_j and produced by observation units within Class k. Notice that this set can be empty. The corresponding product/service group price index is

$$(6) \qquad {}_P I_{kj}(t) \equiv \sum_{i \in C_k \cap G_j} \frac{v_i(0) \times (p_i(t)/p_i(0))}{v_{kj}(0)}$$

We can therefore rewrite the Laspeyres output price index given above (4) as:

$$(7) \qquad {}_P I_k(t) = \frac{\sum_{j=1}^{J} v_{kj}(0) \times {}_P I_{kj}(t)}{\sum_{j=1}^{J} v_{kj}(0)}$$

Thus, the output price index for the Class k can be written as a weighted average of product/service group price indices. The same is true for each observation unit h within Class k. We can therefore rewrite (6) (the product/service group price index for Class k) as:

$$(8) \qquad {}_P I_{kj}(t) = \frac{\sum_{h \in k} v_{hj}(0) \times {}_P I_{hj}(t)}{\sum_{h \in k} v_{hj}(0)}$$

Thus, each product/service group price index for Class k can be written as a weighted average of the product/service group price indices for each observation unit h.

The proposed strategy for estimating ${}_P I_k(t)$ runs as follows. Usually ${}_P I_j(t)$ is estimated from a sample of observation units from Class k. Ideally this should be a stratified sample. For each observation unit in the sample the estimation of ${}_P I_{hj}(t)$ is based on a sample of products/services. Ideally, the set of all products/services belonging to product/service group G_j and produced by observation unit h must be decomposed into Hicksian aggregates, in other words groups of products/services show the same price behaviour. From each of these groups it is sufficient to select only one representative product/service. The values $v_i(0)$, or the sums of these values for the Hicksian aggregates, must be obtained from the selected observation unit.

In the above model it was assumed that the set of observation units H within Class k and the set of products/services C_h ($h \in k$) are fixed during the time interval from 0 to t. In reality observation units appear and disappear, the output mix of observation unit's changes, some products/services disappear from the market, and new products/services are introduced. Especially in areas with frequent technological changes this will have the effect that a direct Laspeyres price index is unable to track current price changes adequately. In some cases, it is even impossible to construct such a price index because products/services existing in the base period are no longer produced in the comparison period. In order to take account of these phenomena the calculation of the product/service group price indices entering (7) as chained indices[30] is encouraged. Thus, expression (8) is replaced by:

$$(9) \qquad {}_P I^c_{kj}(t) \equiv \prod_{\tau=1}^{T} \frac{\sum_{h \in k(\tau)} v_{hj}(\tau) \times {}_P I_{hj}(\tau, \tau-1)}{\sum_{h \in k(\tau)} v_{hj}(\tau)}$$

where we define:

$$(10) \qquad v_{hj}(\tau) \equiv \sum_{i \in C_{h(\tau)} \cap G_j} v_i(\tau)$$

and:

(11)

$$ {}_P I_{hj}(t, t-1) \equiv \sum_{i \in C_h(t) \cap G_j} \frac{v_i(t) \times (p_i(t)/p_i(t-1))}{v_{hj}(t)}$$

In these expressions $v_i(\tau)$, $v_{hj}(\tau)$, $k(\tau)$ and $C_h(\tau)$ correspond to a certain period prior to τ. This period can be the same for a number of "chains". Expressions (9) and (11) form the starting-point for sampling. They enable the sample of observation units and products/services to be refreshed, and the associated weights (value shares) to be updated whenever necessary. Samples and weights can be kept fixed as long as they are considered to be "characteristic" for the Class.

Expression (9) is known to suffer from upward drift (overestimating bias) for mathematical reasons.

The domestic (and in parallel the non-domestic) output price index for a Class can be calculated as a weighted average of product/service group price indices. The weights are the base period domestic (or non-domestic) sales values. The product/service group price indices are calculated as fixed based or preferably chained price indices, based on samples

[29] The CPA can be used as a product classification or the more detailed Prodcom list.

[30] It is assumed that during the time period between base year revisions there is no need to introduce new product groups into the output price index or to delete product groups from it.

of observation units and samples of representative products/services. These samples and the associated weights should be adapted whenever necessary.

Higher levels of aggregation

Suppose a Group consists of K Classes (k = 1,...,K). The base period domestic or non-domestic sales value of each k is defined as:

$$(12) \qquad v_k(0) \equiv \sum_{h \in k} v_h(0)$$

Then the domestic or non-domestic output price index for the Group (g) is defined as:

$$(13) \qquad {}_P I_g(t) \equiv \frac{\sum_{k=1}^{K} v_k(0) \times {}_P I_k(t)}{\sum_{k=1}^{K} v_k(0)}$$

that is a weighted arithmetic average of the Class price indices.

7.4. Import prices

7.4.1. Introduction

Name, synonyms and code numbers

The amendment of STS-Regulation requires short-term statistics on import prices (340, hereafter MPI) under the provisions of Annex A. Member States that have adopted the euro as their currency are required to distinguish import prices from the euro-zone and from the non-euro-zone, but at a lower level a detail.

Purpose of the indicator

Import price indices seek to measure the gross monthly change in the import price of products coming from the Rest of the World. This gross monthly change corresponds to a given product, and through aggregation, groups of products, up to main industrial groupings (MIGs).

Monthly measurements of changes in import prices meet a need for information on the short- and medium-term economic activity linked to external trade of the Member States, the EU and the euro-zone. They permit monthly monitoring of prices for different categories of products, and they are a means of distinguishing real growth of imports from price changes in the foreign trade statistics and the national accounts. They can provide information to the business community on particular areas (euro-zone / non-euro-zone split) and different product categories of interest to them.

7.4.2. Definition

Scope and coverage

The scope of the import price index is defined in terms of products imported, institutional sector of the importer and flows covered:

(a) Products. The product coverage is limited the CPA C, D and E products. Related services are excluded. The STS-Regulations require coverage of Sections C to E of the CPA excluding Groups 12.0, 22.1, 23.3, 29.6, 35.1, 35.3, 37.1 and 37.2.

(b) Institutional sectors of the importers. According to ESA 95 definition [3.129], all transactions in goods and services from non-residents to residents are import flows, whatever the institutional sector or industry of the importer. However, it has been agreed to exclude imports by households, government units and non-profit institutions. As a result, importers to be covered include all other producers of goods and services - including traders - irrespectively of their classification according to NACE Rev.1.1.

(c) Trade regimes. The underlying trade regimes and statistical procedure are the special trade system and normal imports as well as imports for inward processing are included. Imports for repair are not to be covered.

Rules

The following rules apply for the definition of import prices:

- *Cost,Insurance, Freight (C.i.f.) excluding import duties and taxes*. The appropriate price is the c.i.f. price at the national border excluding all duties and taxes on imports to be shouldered by the reporting unit. This is in conformity with the ESA 95 recommendation to use basic prices.

- *Actual transaction price.* In order to show the true development of price movements, it should be an actual transaction price, and not a list price, therefore discounts should be deducted from the price; list prices may be acceptable only if actual transaction prices cannot be obtained.

- *Transactions in foreign currencies***.** The MPI displays the development of prices of products in national currency. The price of a transaction made in another currency must be converted on this basis by the national statistical authority. Price changes thus partially reflect exchange rate fluctuations.

- *Specification/quality***.** It is essential that all price-determining characteristics of the

products transactions be taken into account, including (if relevant) the quantity of units imported, transport provided, rebates, service conditions, guarantee conditions and country of consignment. The specification must be such that in subsequent reference periods the observation unit is able uniquely to identify the product and to provide the appropriate price per unit. If transport costs are included, this should be part of the product specification. The price index should take into account quality changes in products [see below for the methods to be use to take quality changes into account].

- *Time of recording.* Following ESA 95 recommendations, the time of recording for the "import transaction price" must be understood when the ownership of the goods is transferred (i.e. when the parties record transaction in their books or account). The price collected for period t should therefore refer to transactions involving a change of ownership realised during period t.

- *Collection period.* A price index should reflect in principle the average price level during the reference period. In practice, the information actually collected may refer to a particular day in the middle of the reference period that should be determined as a representative figure for the reference period.

Special issues

- The transfer of ownership of *boats and aircraft* or similar products from a person established in a non-member country to a person established in the Member State in question is counted as import. This follows directly from the definition of imports.

- *Intra-firm trade and transfer prices.* Intra-firm trade should be taken into account as long as these transfers are based on prices, which are market based or market influenced; transfer prices, i.e., prices used to value international transactions between enterprises belonging to the same enterprise group, may behave as market prices between unaffiliated units in a pure competitive environment. They may also be used as a means to effect a hidden income payment or receipt between the enterprises involved. Such transfer prices should be avoided, where possible, and replaced by market prices. If no market prices are available (or if their share is not significant) non-market transfer prices can be used. If indices for transfer prices actually differ from indices for arm's length prices, care must be exercised in using the resulting index as deflator of trade flows, since the resulting volume index would be biased. The total value of imports includes goods exchanged through market prices as well as goods using non-market transfer prices, and should not be deflated by a "purely market" import price index to get volume data. However, the latter import price index can be used –at least in theory – to deflate imports values after adjustment for the part corresponding to hidden subsidies (received or given) among affiliated enterprises. Therefore, the weights used for the MPI do not need to be restricted to arm's length transactions but should include as well intra-firm trade value data properly adjusted.

- *Euro / non-euro indices.* The euro-zone and non-euro-zone price indices will be compiled or estimated according to the country of consignment of the product. The residency of the third party that has sold the product determines the country of consignment. The non-euro-zone area is defined as third parties non-resident in one of the euro-zone-Member States territories. As indicated in the Annex to the Regulation, the Commission may determine in accordance with the Committee procedure[31] the terms for applying European sample scheme[32], which may limit the scope of the import price variable to the import of products from non-euro-zone countries.

7.4.3. Collection

How to measure

The monthly monitoring of changes in prices of products imported by national importers[33] is done

[31] STS-Regulation: article 18

[32] STS-Regulation: article 4

[33] It is not strictly possible to define uniformly a "national importer" in the EU. Regulations mention "external trade operators", which can be enterprises, KAUs, local KAUs, etc., depending on Member State concerned.

by means of a statistical survey of the importers in the product in question. Regular collection of prices data normally flows from a sample of products, reporting units and representative commodities.

Sampling of products/units/commodities

The basic sampling method used varies between national statistical authorities. It generally involves a three-stages sampling process of products, enterprises or similar units and specific representative commodities to be priced.

- The first stage consists of selecting a sample of product groups - import headings.
- The second stage consists of selecting a sample of enterprises (or similar units) under each import heading.
- The third stage is the selection of specific commodities (items) to be priced. This third stage may be done by the enterprise (or similar unit).

For import prices, the import headings and the surveyed units may be selected beyond a cut-off point if they are deemed representative for the overall import values for concerned (group of) product(s)[34] .

The sampling frame used may vary depending on quality of external foreign trade information (mainly Intrastat and Extrastat databases). A probabilistic (usually proportional to size) or a judgmental (purposive) method is used to ensure a representative sample.

For each of the product groups of the enterprise (or similar unit), specific commodities (or transactions) are selected for re-pricing. Selected items should ideally be available for monthly re-pricing and account for a significant share of imports within the commodity group and/or be broadly representative of the commodity group.

Rather than using a field officer to collect this information, most of Member States undertake this work by telephone or by post or by email.

The use of a detailed level of the product classification to select the commodities ensures greater accuracy of the index at CPA 4-digit level. In most countries, commodity data is gathered at CPA 6-digit level or even finer.

Every commodity selected for monthly monitoring needs to be described in great accuracy, together with its import price and all price-determining characteristics of the transaction.

[34] Concerning sampling issue, the relation between external trade registers (when they exist) and business registers is not always clear.

Data collection difficulties

A number of difficulties may arise: a reporting unit may cease to be active; a product may cease to be imported by the reporting unit; the price determining characteristics of a product may change…

Absence of transaction

When there is no import of a product according to the selected specification in a given month, a solution is to maintain the price at its last level until the next period when an import takes place. An alternative is to apply the price change of other products (matched models approach to changes in the products described below).

Appearance and disappearances of products

If a product ceases be imported, or if a new imported product appears in the economy, it is impossible to directly compare the price between a period in which the product exists and one in which it does not. This situation is essentially an extreme case of a quality change in a product and the methods of treating it can be considered the same as those where a product has changed.

These are described below. New products should be introduced into the compilation of the index as soon as they have achieved a significant share of the value of imported goods.

Changes in the specifications of the product

A change of product specification is defined as when product i' replaces product i, both being representative of the same family (or group) of products but being sufficiently different to distinguish them one from the other from an economic point of view. In practice, a change of product becomes known if the importer advises the national statistical authority of the fact, or if the price seems to change too much (or too little) for the product in question. Most Member States have set up a price change monitoring method. The acceptable range (for example +/- 5%) may vary according to the product or area. For example, for product coming from the non-euro zone area, changes can be much wider because of exchange rate fluctuations.

The variation in price between p_i (t-1) and $p_{i'}$(t) results from the difference between the two in nature, composition, market positioning and so on. A breakdown of the change between p_i (t-1) and