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# COMPILATION MANUAL FOR AN INDEX OF SERVICE PRODUCTION

2nd Draft Version

OECD STESEG Task Force on Services

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# Contents

# Section A: INTRODUCTION

## A.1 Needs and aims for indicators of short-term services production

Monthly indicators for the industrial sector, e.g. index of industrial production (IIP), have traditionally been considered as a principal tool to evaluate the production performance of an economy in the short-term, i.e. normally monthly. Analysts and policy makers, however, have been arguing for some time that IIPs alone are not adequate to evaluate the performance of an entire economy and need for IIPs to be complemented by similar information for the services sector. This is primarily because, over the few past decades, the shares of services sector in total GDP of most OECD Member countries have been increasing, and differences in the evolution between industrial and services sectors have become larger.

Graphs A-1 and A-2 and Table A-1 below show the shares for the industrial and service sectors expressed in total value added in 1995 constant prices for five OECD Member countries, i.e. Canada, France, Japan, the United Kingdom (UK), and the United States (US), for the period 1970 to 2002. The shares of industry, i.e. Categories C, D and E[1] of the International Standard Industrial Classification of All Economic Activities, Revision 3.1 (ISIC Rev. 3.1), have fallen in all five countries during the reference period except for Japan whose share has remained more or less constant for the period.

The contributions of the service sector (i.e. Categories G to P[2] of ISIC Rev. 3.1), on the other hand, increased about nine percentage points on average during the reference period, in particular, the share of the Japanese service sector increased by about eleven percentage points. Thus, increases in the shares of the service sectors in five OECD countries since early 1970s can be explained by decreases in shares for both the agriculture, hunting, forestry and fishing sector, and industrial sectors.

Table A-1 Contributions of industrial and services sectors to total value added during 1970-2002

(%, 1995 constant prices)

| | Canada | | France | | Japan | | UK | | US | |
|---|---|---|---|---|---|---|---|---|---|---|
| Years | IND | SER | IND | SER | IND | SER | IND | SER | IND | SER |
| 70-74 | 29.4 | 62.2 | 22.9 | 61.6 | 25.9 | 55.7 | 29.4 | 61.4 | 25.0 | 65.9 |
| 75-79 | 27.5 | 63.1 | 23.2 | 64.3 | 25.1 | 58.9 | 29.0 | 63.6 | 24.2 | 68.0 |
| 80-84 | 25.7 | 64.7 | 22.1 | 67.3 | 25.5 | 61.1 | 27.6 | 65.1 | 22.2 | 71.6 |

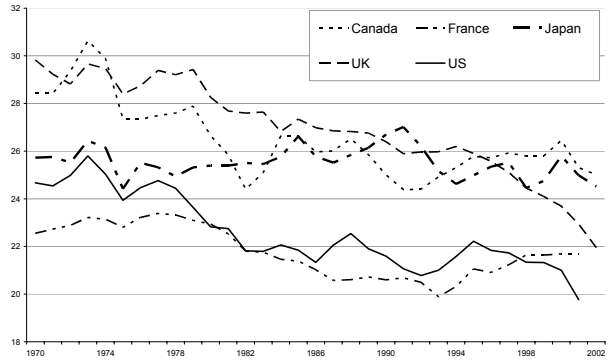
[1] C: Mining and quarrying; D: Manufacturing; E: Electricity, gas and water supply.

[2] G: Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; H: Hotels and restaurants; I: Transport, storage and communications; J: Financial intermediation; K: Real estate, renting and business activities; L: Public administration and defence; compulsory social security; M: Education; N: Health and social work; O: Other community, social and personal service activities; P: Activities of private households as employers and undifferentiated production activities of private households.

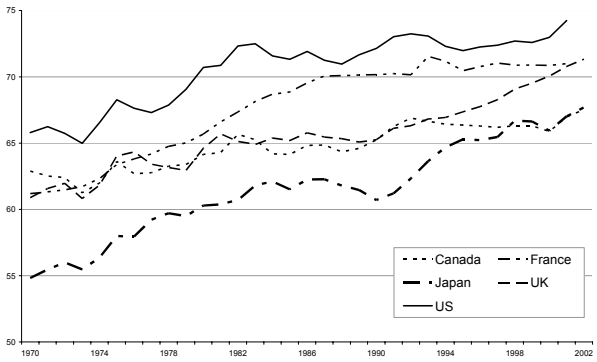
| | Canada | | France | | Japan | | UK | | US | |
|---|---|---|---|---|---|---|---|---|---|---|
| Years | IND | SER | IND | SER | IND | SER | IND | SER | IND | SER |
| 85-89 | 26.2 | 64.6 | 20.9 | 69.8 | 26.0 | 61.9 | 26.9 | 65.4 | 21.9 | 71.4 |
| 90-94 | 24.8 | 66.3 | 20.4 | 70.7 | 25.9 | 62.5 | 26.1 | 66.3 | 21.2 | 72.7 |
| 95-99 | 25.8 | 66.3 | 21.3 | 70.8 | 25.0 | 65.9 | 25.0 | 68.4 | 21.7 | 72.4 |
| 00-02 | 25.6 | 66.8 | 21.7 | 70.9 | 25.1 | 66.9 | 22.8 | 70.7 | 20.4 | 73.6 |

Note: IND: industry; SER: services sector.

Graph A-1: Share of Industry (ISIC Rev.3.1 C to E) to Value Added (1995 constant prices)




Graph A-2: Share of Services (ISIC Rev.3.1 G to P) to Value Added (1995 constant prices)

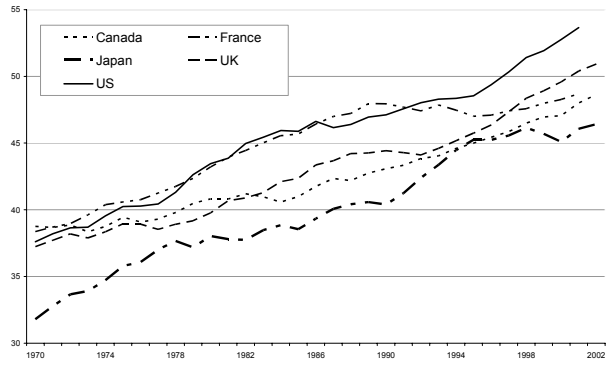



Graphs A-3 and A-4 below present estimated changes in the shares of the market and non-market services sector to total value added in 1995 constant prices for the same reference period. For the purpose of this comparison, ISIC Rev. 3.1 Industries L to P[3] are classified as non-market (although in reality this is really made up of industries L, M, N and Q[4] due to data availability), as for most countries the majority of activity within these industries is non-market. Conversely, Categories G to K of ISIC Rev. 3.1 are included in market services as for most countries the majority of activity within these industries is market based. As the tables show, for all countries, the shares of market services have increased by ten percentage points on average between 1970 and 2002; while those of non-market services have shown a decreasing trend. Thus, the increase in the services sector is mainly due to increases in market services.

[3] L: Public administration and defence; compulsory social security; M: Education; N: Health and social work; O: Other community, social and personal service activities; P: Activities of private households as employers and undifferentiated production activities of private households.

[4] L: Public administration and defence; compulsory social security; M: Education; N: Health and social work; Q: Extraterritorial organizations and bodies.

Graph A-3: Share of Services (ISIC Rev.3.1 G to K) to Value Added (1995 constant prices)




Graph A-4: Share of Services (ISIC Rev.3.1 L to P) to Value Added (1995 constant prices)

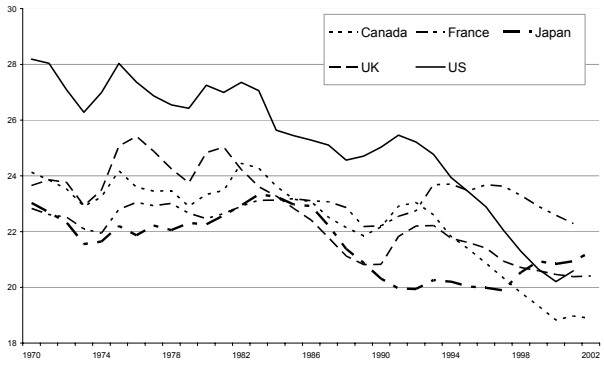



Table A-2 below shows value-added growth rates in 1995 constant prices for the industrial and services sectors and total economy for the five OECD Member countries for the same period referred to above. Value added growth rates in the industrial sector show significant differences from total value-added and for the services sector for all OECD Member countries used in the analysis over the whole period. For most countries, growth rates in the industrial sector are lower but more volatile than those for total value-added and for the services sector. Also, growth rates for industry in some instances move in the opposite direction from those of total value-added which are synchronised with those of services. Moreover, this difference became larger after 2000. For example, the industrial sector showed negative average growth rates, i.e. -1.1%, for the period between 2000 and 2002, in the US, while their services sector and total value-added grew positively at 3.8% and 2.7%, respectively. A similar pattern was shown for the UK over the same period.

Table A-2 Year-to-year growth rates of industry and services sectors and total economy during 1970-2002

(%, 1995 constant prices)

| | Canada | | | France | | | Japan | | | UK | | | US | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Years | IND | SER | TOT | IND | SER | TOT | IND | SER | TOT | IND | SER | TOT | IND | SER | TOT |
| 70-74 | 6.8 | 5.0 | 5.4 | 5.7 | 5.5 | 5.0 | 5.7 | 6.0 | 5.3 | 2.1 | 2.7 | 2.3 | 3.5 | 3.4 | 3.1 |
| 75-79 | 2.2 | 3.9 | 3.5 | 3.0 | 3.8 | 3.0 | 3.8 | 5.5 | 4.4 | 1.9 | 2.3 | 1.9 | 1.8 | 3.6 | 2.9 |
| 80-84 | 1.3 | 2.3 | 2.1 | 0.8 | 3.5 | 2.3 | 3.4 | 3.9 | 3.0 | -0.8 | 1.7 | 1.0 | 0.7 | 2.7 | 2.0 |
| 85-89 | 3.1 | 3.8 | 3.7 | 2.3 | 3.5 | 3.0 | 5.1 | 4.5 | 4.7 | 3.8 | 3.7 | 3.8 | 3.3 | 3.4 | 3.4 |
| 90-94 | 1.0 | 1.9 | 1.4 | 0.8 | 1.4 | 1.1 | 1.2 | 3.4 | 2.3 | 0.9 | 1.8 | 1.3 | 1.5 | 2.0 | 1.8 |
| 95-99 | 4.0 | 3.5 | 3.6 | 3.3 | 2.0 | 2.0 | 1.6 | 2.1 | 1.5 | 1.3 | 3.8 | 3.0 | 4.1 | 4.5 | 4.4 |
| 00-02 | 2.5 | 4.1 | 3.5 | 2.9 | 2.9 | 2.8 | 0.8 | 1.5 | 1.0 | -0.8 | 3.2 | 2.3 | -1.1 | 3.8 | 2.7 |

Note: IND stands for industry and SER for services sector and TOT stands for total economy.

All the examples shown above suggest that economic evaluation based solely on an IIP may be misleading as evolutions of the services and industrial sectors have not necessarily moved closely with each other over the past three decades. Thus, the aim of compiling a short-term indicator for services production is two-fold: to provide economic analysts with information on the short-term movement of the service sector part of an economy that would complement an IIP; and to provide national accountants with useful information on the performance of the services sector which could be used in the compilation of the quarterly national accounts.

## A.2 International efforts to measure short-term service production activities

Many OECD Member countries have recently made efforts to obtain a more accurate view of short-term economic phenomena in their service sectors. Some have developed more statistics for services and enhanced the quality of existing series. The United Kingdom (UK), for instance, has introduced an experimental monthly index of services (IoS) by expanding its Index of Distribution, which covers Category G of ISIC Rev. 3.1. The Republic of Korea (Korea) is in the process of revising its monthly Services Activity Index (SAI) which was introduced in the late 1980s. Canada has also worked to improve the quality of monthly GDP by enhancing the quality of services data. At the same time, Eurostat now requires European Union member states to collect a wide range of turnover data for the services sector on a regular basis.

Despite these and other efforts, indicators representing the services sector generally receive less attention or credit by economic analysts. Policy makers seem to consider them as supplementary sources of information. Possible explanations for this situation are:

- the types and range of indicators available for the services sector are still very limited and vary significantly from country to country;
- corresponding indicators from various countries are less comparable than those for the industrial sector as international guidelines do not exist;
- it takes years to enhance the statistical environment to collect necessary information for the services sector as:
  - it covers a wide range of economic activities;
  - it consists of a large proportion of small and medium size establishments;
  - it is difficult to identify and maintain an accurate population frame of services units due to the relative ease of units to enter and leave the sector;
  - services activities may belong to an establishment whose predominant activity is non-service, e.g. manufacturing.
- the lack of visibility (publicity) given to existing services indicators;
- the concern that indicators such as the IIP and the proposed index of service production (ISP) do not "really" measure the monthly value added of these sectors.

The OECD STESEG task force on services (TFS) was created in 2002 to work on the issues outlined above. Although it touched on a wide range of issues concerning supply and demand indicators for short-term services activities in OECD Member Countries, the TFS was particularly interested in issues related to the compilation of a production index to measure short-term economic activities in the services sector. In this Manual the indicator is referred to as an "Index of Service Production" (ISP).

The TFS has worked to identify the most preferable and practical methodologies for the compilation of a monthly (or quarterly) ISP. It identified the most suitable variables to measure various services activities and formulated recommendations to harmonise the definitions and titles of key variables for a monthly (or quarterly) ISP. The outcomes from this work are embodied in this Manual.

In addition to the TFS, other groups of statisticians are also currently working on related issues for the service sector. The most relevant of these are the Joint OECD-Eurostat Task Force on Services Prices, and the Voorburg Group. The TFS has worked closely with these two groups and has presented its work at their meetings and visa versa. In particular, the TFS has become a regular member of the Voorburg Group since its first attendance in 2003.

As will be seen below, the work of the Eurostat-OECD Task Force on Services Prices is quoted extensively in this Manual, as many monetary variables are recommended as a means of collecting basic information on services production. The TFS is also indebted to work of the Voorburg Group with respect to key issues of methodology, classification and technical aspects.

## A.3 Purpose and use of the Manual

This Manual was prepared by the TFS primarily to provide official statisticians with practical guidelines to compile a monthly ISP, rather than to merely discuss various methodological aspects for measuring services activities. As a by-product, it is hoped that this Manual will also be a useful aid for the design of monthly surveys to measure the production of services industries. It therefore necessarily borrows from or directly relevant text from a number of relevant sources, such as the *SNA 1993;* various Eurostat manuals, e.g. *The Methodology of Short-term Business Statistics* (Eurostat 2002) and *The Handbook on Price and Volume Measures in National Accounts* (Eurostat 2001*)*; *Quarterly National Accounts Manual, Concepts, Data Sources, and Compilation* (IMF 2001) and the *OECD Glossary of Statistical Term*s (OECD 2002a) The current Manual could be viewed as an extension of the 1950 United Nations manual, *Index Numbers of Industrial Production.* At the same time, as has already been mentioned, the Manual utilises the outputs of other related groups such as the Joint OECD-Eurostat Task Force on Services Prices and the Voorburg Group. As a result, the Manual has been prepared in a cost-efficient way by minimising any possible duplication of similar work.

Although this Manual is intended primarily for the compilation of a monthly ISP, it should also be relevant for the compilation of a quarterly ISP. As shown below in the discussion on the sources and methods for compiling an ISP (in Section D), the Manual recommends use of a wide range of quarterly or annual sources to compile a monthly ISP. This is partly due to the lack of basic monthly data, but more importantly, the intention is to reduce the need to collect monthly information for less- or non-cyclical components or for small industry sectors.

This Manual is organised into six parts. The first two Sections discuss general issues and infrastructure regarding the services sector and its production activities. The third and fourth Sections deal with terminology, methods, and input data and their deflators to be used in the compilation of a monthly ISP. Detailed technical issues regarding the compilation of a monthly ISP are presented in Section E. Finally, a few remarks for implementation and dissemination of the index are given in Section F. This Section also briefly discusses demand indicators for services sector and provides information on the availability of input variables and PPIs for services sector in OECD Member countries.

# Section B: INFRASTRUCTURE

In this Section, statistical units, classifications and coverage of the services sector as defined in international publications are reviewed in order to produce a set of harmonized definitions to be used in the compilation of a short-term Index of Services Production.

## B.1 Statistical units

In this Section, definitions for various types of statistical units presented in international publications are reviewed in order to identify the most optimal definition(s) for each statistical unit. At the same time, the Section recommends the most preferable statistical unit(s) from which data for services activities can be collected.

### B.1.1 Definition

The International Standard Industrial Classification, Revision 3.1 (ISIC Rev. 3.1) defines the Statistical unit as "The entities for which information is sought and for which statistics are ultimately compiled." The European Commission (EC) Methodology of Short-term business statistics, on the other hand, describes a unit as "a specific entity which is defined in such a way that it can not 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."

ISIC Rev. 3.1 provides a general definition on statistical units but the EC focuses on more practical aspects. Thus, both definitions are used as they complement each other.

**Statistical units**

Both ISIC Rev. 3.1 and Eurostat provide a list of the types of statistical units which satisfy the definitions of statistical units provided above. Statistical units in ISIC Rev. 3.1 comprise:

- enterprise;
- enterprise group;
- kind-of-activity unit (KAU);
- local unit;
- establishment;
- homogeneous unit of production.

Eurostat mentions two additional units, i.e. the local KAU and the Local unit of homogeneous production, but excludes the establishment. As outlined below in the discussion on the establishment [see Section

B.1.2], the local KAU corresponds to the operational definition of the establishment. Thus, it is recommended to use types of statistical units listed in ISIC Rev. 3.1.

### B.1.2 Various types of statistical units

In this Section, detailed descriptions for various types of statistical units (i.e. enterprise, kind-of-activity unit, local unit, establishment, and homogenous unit of production) extracted from international publications are presented and compared in order to identify the most appropriate definition for each unit. Many of the definitions can also be found in the *OECD Glossary of Statistical Terms* which presents Eurostat[5], ISIC Rev. 3.1 and/or SNA definitions for the enterprise; enterprise group; kind-of-activity unit (KAU); local unit; and the establishment.

#### Enterprise

The definition of an enterprise can be found in Eurostat, ISIC, and SNA. The following definition from Eurostat is recommended to be used:

> "An 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." [*Source*: Council Regulation (EEC) No 696/93]

The above definition should be complemented by that from ISIC Rev 3.1:

> "An enterprise is an institutional unit or the smallest combination of institutional units that encloses and directly or indirectly controls all necessary functions to carry out its production activities. An enterprise may be a corporation, a quasi-corporation, a non-profit institution, or an unincorporated enterprise." [*Source*: ISIC Rev. 3.1]

#### Kind-of-activity unit

Definitions on the kind-of-activities are available in Eurostat, ISIC and SNA. Definitions from the three sources complement each other, i.e. each definition provides precision or clarification on aspects not included in the others. The Eurostat definition lists various quantitative indicators which are available for each KAU. The SNA definition introduces the notion of 'principal productive activity'. The ISIC describes KAU as not being restricted by the geographic area in which the activity is being carried out.

[5] Source: Council Regulation (EEC) No 696/93

Eurostat: The kind of activity unit (KAU) groups all the parts of an enterprise contributing to the performance of an activity at class level (4-digit) of NACE Rev. 1 and corresponds to one or more operational subdivisions of the enterprise. The enterprise's information system must be capable of indicating or calculating for each KAU at least the production value, intermediate consumption, manpower costs, the operating surplus and employment and gross fixed capital formation. [*Source*: Council Regulation (EEC), No. 696/93]

SNA: A KAU is an enterprise, or a part of an enterprise, which engages in only one kind of (non-ancillary) productive activity or in which the principal productive activity accounts for most of the value added. [*Source*: SNA]

ISIC Rev. 3.1: A KAU is an enterprise, or a part of an enterprise, which engages in one kind of economic activity without being restricted to the geographic area in which that activity is carried out. [*Source*: ISIC Rev. 3.1]

**Local unit**

Definitions for the local unit are available in Eurostat, ISIC and SNA. The three definitions are very similar. Thus, the definition from Eurostat can be used.

"The local unit is an enterprise or part thereof (e.g. a workshop, factory, warehouse, office, mine or depot) situated in a geographically identified place. At or from this place economic activity is carried out for which - save for certain exceptions - one or more persons work (even if only part-time) for one and the same enterprise." [*Source*: Council Regulation (EEC), No. 696/93]

**Establishment**

Definitions for the establishment are available in Eurostat, ISIC and SNA as well. Although the ISIC and SNA definitions are similar, the ISIC definition explicitly emphasises the availability of necessary data to evaluate the production activities of the establishment, which for example allow the calculation of operating surplus. The ESA (European System of Accounts) notes that an establishment corresponds to a local KAU operationally.

ISIC Rev. 3.1: An establishment is an enterprise, or part of an enterprise, which engages in one, or predominantly one, kind of economic activity at or from one location or within one geographic area, for which data are available, or can meaningfully be compiled, that allow the calculation of the operating surplus. [*Source:* ISIC Rev. 3.1]

ESA: According to the Regulation on statistical units, the local kind-of-activity unit (local KAU) corresponds to the operational definition of the establishment. According to the European System of Accounts (ESA) the local KAU is called the establishment in the System of National Accounts (SNA) and ISIC Rev. 3.1. [*Source*: ESA and Council Regulation (EEC), No. 696/93]

**Homogeneous unit of production**

The SNA provides the following definition for the homogeneous unit of production**:**

> "A unit of homogeneous production is a producer unit in which only a single (non-ancillary) productive activity is carried out; this unit is not normally observable and is more an abstract or conceptual unit underlying the symmetric (product- by-product) input-output tables." [*Source*: System of National Accounts 1993, 15.14.]

### B.1.3 Preferred statistical units

Unlike the situation in the industrial sector, services activities are often carried out by a large number of small and medium sized firms. It is therefore rather difficult to collect information on service production activities on a regular basis and to keep the statistical population constant for an extended period. Similarly, a firm can engage in multiple activities in various sectors. At the same time, services activity may be the secondary activity of a firm whose predominant activity belongs to either another service activity or non-service activity such as manufacturing.

Therefore, the establishment is the recommended unit to consider as the primary source for collecting information. An alternative option could be to use the enterprise or kind-of-activity unit as a primary or a secondary information source, if it is more compatible with statistical environment of a country.

## B.2 Classification

This Section compares classifications that are currently used by more than one OECD country to enable identification of differences for the services sector. This Section also outlines the differences between ISIC Rev 3 and ISIC Rev 4.

### B.2.1 Classifications used by OECD countries

The four main relevant international industrial classifications currently in use in the OECD area are the:

- ISIC Rev. 3.1 (International Standard Industrial Classification of All Economic Activities, Revision 3.1): This is the reference industry/activity classification of the United Nations. National classifications such as those for Japan and Korea are related to ISIC Rev. 3.1;
- NACE 1.1 (Statistical Classification of Economic Activities in the European Community): This is derived from ISIC Rev. 3.1. This classification is used in most European-OECD countries;
- NAICS 2002 (North American Industry Classification System): This is an ISIC Rev. 3.1 related classification and is used in Canada, Mexico and the United States; and
- ANZSIC 1993 (Australian and New Zealand Standard Industrial Classification): This is also an ISIC Rev. 3.1 related classification and is used in Australia and New Zealand.

### B.2.2 Preferred classifications

The industry / activity classifications used by all OECD Member countries are either derived from or related to ISIC Rev. 3.1. Some use ISIC unchanged, whilst others derive their national classifications from ISIC and others are related more or less closely to ISIC. Thus, for the purpose of this Manual it is preferable to take ISIC Rev 3.1 as the reference classification. Alternatively, other regional or national classifications could be used with relevant adjustments similar to the table below.

Table B 2.1 Industries to be included in an Index of Service Production (approximate concordance)

| Industry descriptions based on ISIC Rev. 3.1 | | ISIC Rev 3.1 | | NAICS 2002 | NACE 1.1 |
|---|---|---|---|---|---|
| | | Section codes included | Differences | | |
| Wholesale and Retail Trade (G) | | G | None | 41, 44, 45, 81 pt | G |
| Accommodation and Food Services (H) | | H | None | 72 | H |
| Transportation and Warehousing (I) | | A part of I (60-63 and 641) | - 642 | 48, 49 + 5615 | 61-63 and 64.1 |
| Finance, Insurance and Management of Companies (J) | | J | None | 52, 55 pt | J |
| Real estate, renting and business activities (K) | Real Estate and Rental and Leasing | A part of K (70 and 71) | None | 53 | 70 and 71 |
| | Information and Cultural Industries | A part of K (72) | + 642 from I, + 9213, 922, and 9231 from O | 515, 516, 517, 5415, 8112 pt | 64.2, 72, 92.1, 92.2, 92.4, 92.5 |
| | Professional, Scientific, Technical, Administrative and Support Services | A part of K (73 and 74) | None | 54 pt, 55 pt, 561 | 73 and 74 |
| Public Administration (L and Q) | | L and Q | None | 91 (Can) | L and Q |

| Industry descriptions based on ISIC Rev. 3.1 | | ISIC Rev 3.1 | | NAICS 2002 | NACE 1.1 |
|---|---|---|---|---|---|
| | | Section codes included | Differences | | |
| | | | | 92 (U.S.)<br>93 (MX) | |
| Educational Services (M) | | M | None | 61 | M |
| Health Care and Social Assistance (N) | | N | None | 62, 54194 | N |
| Other community, social and personal service activities (O) and private household with employed persons (P) | Waste Management and Remediation Services | A part of O (90) | None | 562 | 90 |
| | Arts, Entertainment and Recreation | A part of O (92) | - 9213 and 923**1** | 71, 512 | 92.3, 92.6, and 92.7 |
| | Other Services (except Public Administration) | A part of O (91 and 93) and P | + P | 81 pt | 91, 93, and P |

### B.2.3 Concordance between ISIC Rev. 3.1 and ISIC Rev. 4

Although definitions and recommendations provided in this Manual are based on ISIC Rev. 3.1, ideally they should be valid for the revised version of ISIC (i.e. ISIC Rev. 4), currently in the process of preparation and which is expected to be finalised by the end of 2007. To this end, it is important to examine how the two versions of ISIC will correspond to each other, especially for service activities. The most up-to-dated information on this issue can be found in ISIC Rev.4 structure draft at http://unstats.un.org/unsd/cr/registry/isic-4.asp.

# Section C: TERMINOLOGIES FOR INDEX OF SERVICES PRODUCTION

At the moment, there isn't a common set of terminologies or definitions that describe the various types of services activities across the OECD area. This stems mainly from the heterogeneous nature of the services sector itself and varying national practices resulting from the diverse statistical, regulatory or social environment across countries, and in some cases within a country. For example, the public sector is the main provider of inland transportation (e.g. train services) in France, whilst the UK privatized train services companies in the late 1980s. Similarly, a major courier company is operated by the Korean central government, while similar activities are carried out by the private sector in the US. As a result, services activities to be classified as market and non-market activities can differ between France, Korea, the UK and the US. As will be further elaborated in the following Sections, in some cases, such differences can be quite significant and can strongly influence the quality (i.e. comparability) of statistical information derived for the services sector.

With the closer integration of the global economy, the need to agree on a set of internationally harmonised terminology and related definitions for service sector terms is an important issue when considering the comparability of a monthly or quarterly Index of Services Production (ISP) compiled on the basis of recommendations outlined in this Manual. This Manual therefore proposes a set of harmonised definitions for key terms and concepts used in the context of the ISP.

In order to avoid adding yet another layer of "international" concepts, etc., the definitions presented in this Section have been derived to the maximum extent possible from existing international guidelines and recommendations. To some extent there exists some inconsistency between concepts and definitions at the international level and in such situations the recommended definition in this manual are based on the most common formulation derived from various international publications and sources. The definitions presented below were largely derived from the:

- System of National Accounts 1993 (1993 SNA); and
- European System of Accounts 1995 (ESA 1995).

Although it is preferable to present a single harmonised definition for all the variables and concepts discussed in this Section, in some instances this has not proven possible or practical in terms of implementation. In this situation a range of terms are presented.

This Section deals primarily with the boundary of the services sector and concepts related to market and non-market services. It also discusses definitions of the ISP and its input variables such as turnover, sales, physical quantities, etc. The concepts provided in this Section are used in the discussion in Sections B and D of this Manual.

## C.1 Terminologies related to ISP

A set of key terminologies related to the ISP are presented in this Section. Although many of these terms have a widely accepted understanding, there are variations which are highlighted and compared. This Section also presents a recommended definition for each terminology that can be used by official statisticians as guidance. The main reference sources for the terminologies and their variants are Eurostat's CODED glossary and the *OECD Glossary of Statistical Terms*.

### C.1.1 Services activities

**Services**

Both Eurostat and the OECD present the SNA 1993 definition for services. The definition in the OECD Glossary, however, is clearer as it is more precise about coverage (market and non-market activities). Thus, this Manual takes the following definition from the OECD Glossary:

> "Services are not separate entities over which ownership rights can be established. They cannot be traded separately from their production. Services are heterogeneous outputs produced to order and typically consist of changes in the conditions of the consuming units realized by the activities of producers at the demand of the consumers. By the time their production is completed they must have been provided to the consumers (…). The service sector covers both market and non-market services." [*Source:* SNA 1993]

**Services sector**

While services can be defined in the above, industries included in the services sector vary with the industrial classification used. Eurostat and the OECD present the SNA definition for services as follows:

> NACE Rev. 1: The terms service industry(ies), services sector(s) or simply service(s) are generally used to refer to economic activities covered by Sections G to K and M to O of NACE Rev. 1, and the units that carry out those activities.
>
> ISIC Rev. 3: In terms of International Standard Industrial Classification (ISIC) Rev. 3 services are defined loosely in terms of the following Tabulation Categories:

- wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods (G);
- hotels and restaurants (H);
- transport, storage and communications (I);

- financial intermediation (J);
- real estate, renting and business activities (K);
- public administration and defence, compulsory social security (L);
- education (M);
- health and social work (N);
- other community, social and personal activities (O);
- private households with employed persons (P);
- extra-territorial organisations and bodies (Q).

Note that Eurostat does not provide a definition for the Services sector on the basis of ISIC Rev. 3.1. However, given the similarities between NACE and ISIC, the Services sector should be identical. Thus, this manual recommends a services sector to include ISIC Codes from G to P[6].

### C.1.2 Market and Non-market services

#### Market establishments

The difference noted above in the definitions of the Services sector appears to be tied to the treatment of some of the market establishments. Eurostat's CODED glossary mainly uses ESA 1995 definitions whereas the OECD provides both the ESA 1995 and the SNA 1993 definitions. Slight variations between the two national accounting standards explain some of the differences between the definitions given for "market producers", "market output", and "market services". However, there is no difference for "market establishment", whose SNA 1993 definition is:

> "Market establishments produce mostly goods and services for sale at prices which are economically significant." [*Source*: SNA 1993]

#### Market producers

The Eurostat glossary gives two definitions for market producers from ESA 1995, one for "market producers", the other for "market/non-market producers". The OECD glossary, however, provides a single definition for each standard, ESA 1995 and SNA 1993. The difference between the two standards is that ESA 1995 provides a more operational definition for market producers. This difference is clearly stated under "market/non-market producers" for ESA 95 provided by Eurostat, which is therefore preferable:

[6] It should also be noted that the three main industry classifications (ISIC, NACE, and NAICS) do not always clearly identify each industry class as either a goods-producing or a service-producing industry.

ESA 1995 (market/non-market producers): Market producers are producers that sell their output at economically significant prices. Non-market producers are producers that provide most of their output to others free or at prices that are not economically significant. Moreover, the ESA95 provides additional rules for the distinction between market and non-market producers. In distinguishing market and other non-market producers by means of the 50% criterion, "sales" and "production costs" are defined as detailed in the corresponding CODED-definitions. [*Source*: ESA 1995]

**Market output**

Both SNA 1993 and ESA 1995 present definitions for market output. More precision, however, is given in ESA 1995 compared to SNA 1993 with regard to the definition of "market output". Thus, the ESA 1995 definition is preferable.

ESA 1995: Market output consists of output that is disposed of on the market or intended to be disposed of on the market. Market output includes:

- products sold at economically significant prices;
- products bartered;
- products used for payments in kind (including compensation of employees in kind and mixed income in kind);
- products supplied by one local KAU to another within the same institutional unit to be used as intermediate inputs or for final uses;
- products added to the inventories of finished goods and work-in-progress intended for one or other of the above uses (including natural growth of animal and vegetable products and uncompleted structures for which the buyer is unknown). [*Source*: ESA 1995]

**Economically significant prices**

Similar differences can be found for the definition of "economically significant prices" between ESA 1995 and SNA 1993, though the definition in ESA 1995 is more precise.

ESA 1995: In ESA, the economically significant price of a product is defined partly in relation to the institutional unit and local KAU that has produced the output (see paragraphs 3.27. - 3.40). For example, by convention, all the output of unincorporated enterprises owned by households sold to other institutional units is sold at economically significant prices, i.e. is to be regarded as market output. For the output of some other institutional units, output is only sold at economically significant prices when more than 50% of the production cost is covered by sales (see paragraphs 3.32. - 3.37). [*Source*: ESA 1995]

**Market services**

Only Eurostat's glossary provides information regarding the fact that the NACE-CLIO classification is not currently used (under the NACE-CLIO entry). The definition of "non-market services" under NACE-CLIO seems to explain in part the NACE Rev. 3.1 definition of the Services sector.

Market services comprise 8 NACE-CLIO branches:

- recovery and repair services, wholesale and retail trade services;
- lodging and catering services;
- inland transport services;
- maritime and air transport services;
- auxiliary transport services;
- communication services;
- services of credit and insurance institutions;
- other market services. [*Source*: NACE-CLIO]

**Non-market services**

Non-market services comprises 4 NACE-CLIO branches covering general public services, non-market services of education and research provided by general government and private non-profit institutions, non-market services of health provided by general government and private non-profit institutions, domestic services and other non-market services n.e.c. These in turn comprise 10 NACE-CLIO Groups:

- general public services of national defence, of compulsory social security;
- non-market services of refuse disposal, sanitation, cemeteries, provided by general government;
- non-market services of social welfare, hostels, tourist offices, employers' and professional associations, economic organisations provided by general government;
- non-market services of recreational and cultural activities provided by general government (entertainment's, sports grounds and clubs, libraries, public archives, museums, botanical and zoological gardens);
- non-market services of education provided by general government and private non-profit institutions;
- non-market services of research and development provided by general government and private non-profit institutions;
- non-market services of health provided by general government and private nonprofit institutions;

- non-market services of social welfare, hostels, tourist offices, trade unions, employers' associations, religious organisations and learned societies, political parties, consumers' and civic organisations etc. provided by private non-profit institutions;
- non-market services of recreational and cultural activities (entertainment's, sports grounds and clubs, libraries, public archives, museums) provided by private non-profit institutions
- domestic services. [*Source:* NACE-CLIO]

### C.1.3 Definition of index of service production (ISP)

**Index of Services Production**

As the primary aim of compiling an Index of Services Production (ISP) is to measure the short-term movement of the production activity of services part of an economy, ISP should be defined as a weighted average of the real output of these industries, where the weights are based on their shares in the value added of the Services sector.

One can adapt the description of the Index of Industrial Production given by Hong & Chavoix-Mannato (2000) to obtain the following definition of the ISP:

> "An ISP measures changes over time in the volume of output of the Services sector. More precisely, it is defined as the ratio of the volume of output produced by the services industries in a given time period to the volume produced by the same industries in a specified base period. The products included are all those that contribute to gross output of the services industries, and may include products that are not primary to the industries; products may either be goods or services."

It is also preferable that the ISP is presented together with its main industrial components, and is also disaggregated by market and non-market activities. However, there are slight variations between standards with regard to the definition of market and non-market activities. These differences are now examined to determine the possible extent to which they could affect international comparability.

**Index of Market Services Production and Index of Non-Market Services Production**

The fact that the industrial classifications currently used generally do not distinguish between market and non-market establishments explains the use of "tailored" classifications where this distinction is made. Although the relative importance of market and non-market establishments by industry class varies across countries, the production of market establishments is very likely to undergo economic cycles that differ from those for non-market establishments.

Accordingly, it is recommended that the ISP should be presented together with two sub-indexes, one for Market Services Production and the other for Non-market Services Production. This breakdown cannot be mapped precisely with current industry classifications, but is recommended for the whole economy by both the ESA 1995 and SNA 1993 national account standards.

For international comparability, there are some slight differences between the two standards with regard to establishments to be considered as market or non-market. However, it is very likely that the differences between countries will be largely explained by differences in the institutional environment than by differences in standards. In addition, for many countries the bulk of non-market activities occur in ISIC Tabulation categories M, N, L and Q.

## C.2 Types and definitions of variables to measure services production

Output of services production can be measured directly from the amount of services production or indirectly from inputs that are used for the production. Although output variables are always preferable, there are many incidences when information on input measures are the only readily available sources. Thus, in this section, types and definitions of variables to measure services production will be reviewed and compared.

### C.2.1 Deflated gross output

There are a number of related concepts used in the evaluation of output, which differ in terms of their component items. These concepts include sales, turnover, revenue, receipts and gross output. These concepts are reviewed in this Section. As the concepts are mostly expressed in value terms, they need to be deflated in the compilation process using a set of price indices so that the resulting ISP can reflect the volume changes of service production during the reference period.

**Output (Gross output)**

As noted previously, an ISP should include the value of the output of all products of the industries covered. Since these products may include goods, changes in inventories of these goods should be part of the output for the services sector. The following definition in the OECD Glossary is taken from SNA 1993. This states that output should be:

- sold;
- entered into the producer's inventories prior to sale, barter, etc;
- supplied to other establishments belonging to the same enterprise for use as intermediate inputs;
- retained by their owners for own final consumption or own gross fixed capital formation;

- supplied free, or sold at prices that are not economically significant to other institutional units;
- provided to their employees as compensation in kind or used for other payments in kind;
- bartered in exchange for other goods, services or assets. [*Source*: SNA 1993: 6.38]

**Turnover / sales**

As noted in the OECD Glossary, there is currently wide variation between countries in the definition of turnover and sales. The Council Regulation on structural business statistics of the European Union provides a definition of turnover. At the same time, definitions for sales can be found in ESA 95 and the OECD Manual on Statistics of International Trade in Services. As the definitions in the various documents are not fully comparable in terms of the component items described, it is not obvious whether there are in fact any significant conceptual differences between the turnover and sales concepts in the international context.

At the national level, different terms may be used for different economic activities, e.g. sales for goods and turnover for services. However, it is not clear whether practical differences in data collection exist due to the availability of information or accounting practices. In addition, in some countries, e.g. Canada and the United States, the term turnover is not used at all, and the terms "sales" and "receipts" are used to refer to similar concepts.

In order to avoid the creation of any "artificial" distinction between the turnover and sales concepts at the international level which may not be reflected in reality at the national level, this manual therefore recommends the interchangeable use of the terms for the compilation of the ISP. The following definition on turnover is derived from the definition of turnover included in the Council Regulation on structural business statistics. Some of the detail in this definition has been expanded to provide further clarification:

> "Turnover comprises the totals invoiced by the observation unit during the reference period, and this corresponds to gross sales of goods or services supplied to third parties. Turnover includes all duties and taxes on the goods or services invoiced by the unit with the exception of VAT invoiced by the unit vis-à-vis its customer and other similar deductible taxes directly linked to turnover.
>
> It includes all other charges (shipping and handling, installation, maintenance and repair, alteration, storage, etc.) passed on to the customer, even if these charges are listed separately in the invoice. It also includes receipts from the rental of vehicles, equipment, instruments, tools, and other merchandise; commissions from the arrangement of financing; payments for work in progress; and market value of compensation received in lieu of cash. In addition, it includes gross sales from departments, concessions, and amusement and vending machines operated by others; and amounts received from work subcontracted to others.

Reduction in prices, rebates and discounts as well as the value of returned packing must be deducted. Income classified as other operating income, financial income and extra-ordinary income in company accounts is excluded from turnover. Operating subsidies received from public authorities or the institutions of the European Union are also excluded[7]."

In addition to turnover / sales, a set of other output variables are also used to collect basic information at the country level, the principal additional terms being revenue and receipts. The relationship between the concepts of turnover, sales, revenue and receipts in terms of their component items are summarized in Table C.2.1 below.

[7] Note that indirect taxes can be separated into three groups:

i) The first comprises VAT and other deductible taxes directly linked to turnover which are excluded from turnover. These taxes are collected in stages by the enterprise and fully borne by the final purchaser.

ii) The second group concerns all other taxes and duties linked to products which are either: 1) linked to turnover and not deductible, or, 2) taxes on products not linked to turnover. Included here are taxes and duties on imports and taxes on the production, export, sale, transfer, leasing or delivery of goods and services or as a result of their use for own consumption or own capital formation.

iii) The third group concerns taxes and duties linked to production. These are compulsory, unrequited payments, in cash or in kind which are levied by general government, or by the institutions of the European Union, in respect of the production and importation of goods and services, the employment of labour, the ownership or use of land, buildings or other assets used in production irrespective of the quantity or the value of goods and services produced or sold. [*Source:* Definitions of SBS Regulation variables (12 11 0)]

Table C.2.1 Comparison between turnover, sales revenue and receipts

| Component item | Turnover / Sales | Operating Revenue | Total Revenue | Total Receipts |
|---|---|---|---|---|
| Gross sales of goods | yes | yes | yes | yes |
| Provision of services | yes | yes | yes | yes |
| Shipping and handling | yes | yes | yes | yes |
| Installation | yes | yes | yes | yes |
| Maintenance and repair | yes | yes | yes | yes |
| Alteration | yes | yes | yes | yes |
| Storage | yes | yes | yes | yes |
| Receipts from the rental of vehicles, equipment, instruments, tools, and other merchandise | yes | yes | yes | yes |
| Commissions from the arrangement of financing | yes | yes | yes | yes |
| Payments for work in progress | yes | yes | yes | yes |
| Market value of compensation received in lieu of cash | yes | yes | yes | yes |
| Gross sales from departments, concessions, and amusement and vending machines operated by others | yes | no | no | yes |
| Units share of sales from departments, concessions, and amusement and vending machines operated by others | no | yes | yes | no |
| Amounts received from work subcontracted to others | yes | no | no | yes |
| Consumption, sales, and value added taxes | no | no | no | yes |
| Proceeds from the sale of real estate, investments, or other assets held for resale | no | no | no | yes |
| Income from interest and dividends | no | no | yes | yes |
| Rental of real estate | no | no | yes | yes |
| Contribution, gifts, loans and grants | no | no | yes | yes |
| Reduction in prices, rebate, discounts and returned packing | no | no | no | no |
| All duties and taxes on the goods or services invoiced by entity | no | no | no | no |
| Operating subsidies received from public authorities | no | no | no | no |

Note: yes stands for inclusion; no stands for exclusion.

### C.2.2 Other relevant variables

**Physical quantity**

This refers to the volume of quantity unit in which a service can be measured. This unit is either discrete or continuous. The quantity of services provided in discrete units is obtained simply by counting the number of units, e.g. number of haircuts, cars washed or customers to be served in a bank to obtain loans. The quantity of services provided in continuous units, on the other hand, varies continuously in respects of characteristics such as weight, volume, power, duration, distance, etc. Such examples can easily be found in the transportation industry.

**Employment**

Employment is one of the main variable groups covered by structural business statistics. It is readily available for most services sectors on a monthly (or at least quarterly) basis for most countries. Although it is related to inputs of production, it has been used as a proxy measure of production activities where no other variables for the sectors are readily available.

Employment represents the number of workers on the payroll for the pay period in question. Employment includes all corporation officials, executives, supervisory personnel, clerical workers, wage earners, pieceworkers and part-time workers. Employment includes persons on paid sick leave, paid holiday, and paid vacation. Those on leave without pay for the payroll period are excluded. Employment also excludes proprietors and partners of unincorporated businesses.

The European Union Labour Force Survey - Methods and Definitions, (Eurostat, 1996, ESA 11.11-11.16) states that "more complex measures are sometimes produced by measuring the number of hours worked or by conversion into full-time equivalent units. In addition, a number of specific categories of employment are measured, such as part-time employment, female employment, self-employment, apprentices, home-workers and unpaid employment (unpaid family workers and working proprietors)."

**Other variables**

The compilation of an ISP requires a great deal of information from a variety of sectors at different levels to compile an ISP. At the same time, there exist a number of composite or synthetic indicators for specific sectors to measure those industries. Thus, it is recommended to make use of pre-existing information as long as they are comparable or consistent with recommended variables presented in Section D, until a country is in a position to develop all the necessary statistics that are required to compile a more reliable (i.e. methodologically acceptable) ISP. For example, retail trade and wholesale trade indices can be used directly to form an overall ISP with proper weights.

# Section D: SOURCES AND METHODS FOR COMPILING AN ISP

Because of the very heterogeneous nature of the services sector, the compilation of a monthly aggregated production index for this sector is far less straightforward than that for the industrial sector. As a consequence, a wide range of practices are currently being used by OECD Member countries to evaluate the economic performances of the services sector, depending on national needs and the availability of basic information. For example, Japan compiles a monthly index for tertiary industry. Canada does not publish a separate index for a services industry but instead compiles a monthly GDP by economic activities which can be regrouped into a production index for services industry. Many European countries, on the other hand, collect monthly or quarterly information on production for various services sectors but do not aggregate them into a single index.

A major difficulty encountered in the services sector by data compilers is the non-existence of a single type of variable or source from which various services production activities can be measured. At the same time, only an output measure in current prices may exist without the availability of an appropriate deflator. Also, statistical information at lower frequencies may be available but nothing for higher frequency. Collecting basic information for a monthly index requires extra reporting burden. Furthermore, due to the 'non-material nature' of many services outputs, there are some services categories for which a choice of the best variable to measure its evolution may not be obvious (e.g. the financial sector) and as a consequence the choice adopted can vary across countries. As a result, there is a great deal of discrepancy in the measure of short-term services production across OECD countries.

While recognising the challenges of measuring short-term change in the service sector, and some national constraints, this Section presents data sources and methods which, if adopted, would optimise the comparability of the Index of Services Production (ISP) within and outside the OECD. It describes the approach to classifying variables as "preferred" (representing best practice), "alternative", and "other". The Section also discusses a framework and criteria to assess the quality of the variables to be used. For example, a variable that is regarded as best practice conceptually may not be sufficiently timely, or it may not be sufficiently accurate. In this case it would be preferable to use an alternative or other variable that scores more highly against other assessment criteria in an overall evaluation of suitability for use in compiling a monthly ISP. The Section then presents, for each ISIC category, a set of preferred, alternative and other variables along with their deflators and sources, based on the harmonised terminologies and definitions identified in the previous Sections, i.e. Sections B and C above.

## D.1 Description of Preferred, Alternative and Other methods for compiling ISP

If just one "recommended variable" for each ISIC category, representing the best approach conceptually, were to be presented, it may recommend data that many countries would not have available and would not

have the resources to collect. On the other hand, if the recommended variables were those that are easiest to collect, there could be some compromise in quality. As the aim of this Manual is to provide support and assistance in the collection and presentation of services sector data, it presents a range of possible variables that could be used for each ISIC activity. For each ISIC category a table is produced in Section D.4.3 below, that presents three options:

- preferred data source(s);
- alternative acceptable data source(s);
- other data sources that might be used, accepting that they will produce a less precise measure.

The Eurostat *Handbook on price and volume measures in national accounts* (Eurostat 2001) provides guidance on compiling annual data. The broad principles from the Eurostat Handbook will be referenced to assess the conceptual appropriateness and hence whether a data source or method should be categorised as "preferred", alternative" or "other". Although some of the recommendations are not practical for monthly or quarterly data, much of the Handbook's text on compiling output is relevant.

In addition to providing suggested sources and methods, this Section provides quality measures for assessing the appropriateness of suggested data sources as proxies for short-term change in gross value added (GVA).

The preferred approach presents the data sources and methods that are considered to be most appropriate conceptually as a short-term indicator. However, they are only suitable if the data sources also meet the general conditions for short-term indicators (as outlined below in Section D.2). If this preferred data source is not available, or does not meet the general conditions, the use of alternative data sources should be considered. The 'other data sources' column presents alternative data sources that produce a less precise measure but, in the absence of other data sources, could reasonably be used to compile a monthly ISP at least until a preferred (or even an “alternative”) data source becomes available.

## D.2. Evaluation of a variable: quality measures

This Section describes quality measures that should be used in assessing the suitability of input data sources and methods. In general terms quality is defined as “fitness for use” in terms of user needs. This definition is broader than has been customary used in the past when quality was equated with accuracy. It is now generally recognised that there are other important dimensions of quality. Even if data is accurate, they can not be said to be of good quality if they are produced too late to be useful or cannot be easily accessed or appear to conflict with other data. Thus, quality is viewed as a multi-faceted concept.

Several national and international organisations have identified the dimensions of quality (timeliness, relevance, consistency, accuracy, etc.) which they have embedded in quality frameworks that are used to

assess the quality of new and existing statistical outputs. The quality measures presented below are broadly consistent with the quality frameworks of the IMF and Eurostat. The quality measures presented focus specifically on the requirements for short-term indicators. This Manual does not an attempt to present an alternative measure of quality. The assessment of quality uses a subjective approach rather than a numerical assessment. The statistician or "industry expert" may wish to use a simple scoring system to assess a data source/method, assigning marks 1 to 5 for each of the categories below.

**Coverage** An indicator that estimates short-term change in value-added should cover, in some representative fashion, the full range of businesses or other types of organisations or activity that are included within the industry or sector category in question. A proxy or indicator should ideally relate exactly to the relevant part of the ISIC. Nevertheless, at times indicators can be used where this match is not exact; for instance if an indicator is only available which covers more than the industry in question, the indicator might still be used, as a necessary compromise.

**Timeliness** As the purpose is to estimate short-term change in GVA of the service sector, a short-term proxy or indicator is required to be made available quickly - delivering early estimates, say, within a month or two of the period to which they relate. Punctuality is closely related to timeliness. Data sources should be made available in accordance with any agreed delivery dates.

**Periodicity/frequency** To reflect monthly (or quarterly) GVA, an indicator should ideally consist of independent monthly (or quarterly) observations. A quarterly indicator interpolated to provide monthly data is less suitable but may be acceptable if the series is not volatile or indeed if the intention in to produce a quarterly ISP.

**Accuracy** The level of accuracy of the indicator itself should be acceptable. Accuracy can be assessed in terms of the degree to which the data correctly estimate or describe the quantities or characteristics they are designed to measure. Accuracy refers to the closeness between an estimated result and the (unknown) true value. It is preferable to calculate sampling errors but if this is not possible a more subjective assessment might be that the variability of the series of observations should not be considered to be so great as to obscure the path or rate of change of the indicator series.

**Relevance** As the purpose is to measure short-term change in services GVA, an indicator should be designed to do that; rather than, for instance, being designed to measure the level of the indicator at a point in time. That is, the indicator should measure changes in output (or GVA) rather than some other variable or concept. It is impracticable to collect timely monthly data for intermediate consumption, so generally it will be necessary to assume that the GVA to output ratio is constant in the short-term. Series can be benchmarked to quarterly or annual GVA data to reduce the possibility of long-term bias.

**Consistency** The same indicator should be used throughout the entire time series. If there are definitional changes, adjustments should be applied to ensure consistency and to enable comparison over time and domain.

The shaded box below provides an example of a system of subjective assessment used by Statistics Canada.

*Framework for the Subjective Assessment of the Quality of Monthly GDP: An example from Statistics Canada*

This example provides a brief summary of Statistics Canada's assessment of the quality of monthly GDP.

This particular assessment was carried out in 2004 and was restricted to two dimensions of quality: (i) a subjective assessment of the quality of the indicators used to track the monthly growth rates of value added (GDP) for each industry; (ii) an analysis of the revisions to the growth rates of GDP for each industry.

This example summarises the subjective assessment of quality: an assessment of accuracy. Accuracy refers to the property of an estimate to match the true but unknown value of the characteristic of interest, whereas reliability refers to the stability of the estimate. Clearly, revision analysis is the appropriate tool to study, and quantify, the reliability of the monthly GDP estimates. Their accuracy however cannot be quantified objectively; only a subjective assessment based on our professional opinion can be undertaken. Statistics Canada produces a list of criteria by which each analyst can subjectively rate the accuracy of the indicators used for their industries. The list of categories is broadly similar to the quality measures described in Section D.2 of this Manual. With a common understanding of these criteria, the assessments become consistent across analysts, and can be summarized to assess the accuracy of industry aggregates.

Each analyst rates her/his indicators according to each of the criteria described in the list on an absolute scale of **1 (worst)** to **5 (best**). A score of 5 should be used to indicate that there is absolutely no other indicator, existing or achievable, that would outperform the one currently used with respect to a particular criterion. A score of 1 should be used to indicate that the current indicator is inappropriate **for a particular criterion** and that a replacement indicator could be found. (Note that the overall appropriateness of a set of indicators for a particular industry reflects a compromise between the various criteria. Hence, it is not anticipated having any indicator scoring 1 or 5 on all criteria.). For the accuracy assessment, where coefficients of variation (CV) are available, the following grading system is suggested:

| CV | Grade |
|---|---|
| < 3% | 5 |
| 3-4.9% | 4 |
| 5-9.9% | 3 |

10-14.9%
2

15% +
1

Statistics Canada compiles an overall weighting for each industry giving more weight to some quality measures than others. An overall rating for GVA is calculated by aggregating the marks for the individual industries using the latest weighting structure for these industries.

The issue of data quality is taken further below in Section E.3.2 in the context of the evaluation of the quality of the ISP compiled, rather than just with respect to the evaluation of input variables as outlined above.

## D.3 Criteria for conceptual appropriateness

Section D.2 above describes the parameters of quality that help to identify the strengths and weaknesses behind a set of proxy indicators. This Section sets out criteria for the conceptual appropriateness of proxy indicators. These criteria are based on the criteria set out in the Eurostat *Handbook on price and volume measures in national accounts*. However, the Eurostat price and volume Handbook was developed as a best practice guide for compiling annual indicators. Therefore, while many of the principles are relevant, monthly data are not expected to have the same degree of conceptual appropriateness. For example, when compiling a monthly or quarterly estimate of services it is not practical to collect information on intermediate consumption.

When estimating gross value added using turnover information (estimating the outputs), it will usually be necessary to assume that in the short-term the movement in output is a reasonable indicator of movement in gross value added (i.e. that the ratio of GVA to output is constant in the short-term). Where it is appropriate to assume a constant net to gross ratio in the short-term the index should, ideally, be benchmarked to quarterly or annual estimates of constant price GVA, for example, as derived from Supply Use tables, where available.

The Eurostat price and volume handbook classifies output indicators into three categories: A, B and C; with C category indicators being considered as undesirable. These three categories relate solely to conceptual appropriateness, they do not address the aspects of quality presented under Section D.2 above. An output indicator should measure change, which is related to some kind of change in gross value added or output. Eurostat now favours gross constant price output indicators, principally deflated turnover, as the best type of proxy for short-term change in constant price value-added. Appropriately deflated turnover

would be classified as an “A method”. Turnover deflated by a less appropriate deflator (e.g. with wider industry coverage) would be classified as a “B method”. Generally the Eurostat handbook classifies volume measures as B methods. However, if there is a detailed breakdown by type of commodity, there is homogeneity, and there is very little change in quality, a volume indicator could be classified as an A method. 'Input' indicators are classified as C category indicators by the Eurostat, because they do not adequately detect changes in productivity; employment is an example.

Eurostat's price and volume handbook aspires to an "A method" for each industry category regardless of whether it is practical to achieve it. It presents a theoretical best for each industry. However, the current Manual presents preferred measures that are achievable. Consequently, some of the preferred data sources presented here would be considered to be a "B method" by the Eurostat manual. Section D.4.1 below presents the guidelines that have been used to compile the table of recommended variables in Section D.4.2.

## D.4 Recommendations for variables and deflators by services activity

### D.4.1 Proposed criteria for deciding conceptually appropriate indicators

This Section outlines how the principles explained in Section D.3 above are used to categorise methods as:

- preferred;
- alternative; and
- other.

**Turnover deflated by an appropriate output price index**

Turnover deflated by an appropriate output price index is considered by the Eurostat Handbook to be an "A method" and will usually be the first choice for a preferred data source. As it is important that quality and quantity changes are taken into account, the output (turnover) data should preferably be deflated by an appropriate and representative output price index that takes account of quality change. The price index used should be representative of the particular ISIC industrial classification being deflated. If a combination of price indices is used, then ideally these detailed price indices should be weighted together using expenditure weights (e.g. a component of a consumer price index adjusted to basic prices used in conjunction with a services industry producer price index).

Where the service is provided to business, appropriate service sector producer price indices (SPPIs) should be used, measured at basic prices. Where services are applied to households, appropriate consumer price indices should be used, adjusted to basic prices. Where turnover is deflated by an appropriate deflator, this will be classified as a "preferred" method. It is likely that in most countries SPPIs will be produced as

quarterly indicators. It may be appropriate to use these by extrapolating the series and interpolating a monthly path, provided the prices are relatively stable.

Deflating output (turnover) by a less appropriate, but satisfactory, price index would be classified as an "alternative indicator"**.** The price index might be less appropriate because its coverage does not relate directly to the output being deflated or because it is not adjusted for known changes in quality. For example, under certain circumstances industrial producer price indices may be used where SPPIs are not available (e.g. to deflate wholesaling). If the deflator is less satisfactory, e.g. the total CPI or total PPI, the approach would be classified as "other".

**Volume indicator**

Deflated turnover is presented as the preferred indicator, where it is practical. Where it is difficult to use deflated turnover, a volume indicator is presented, either as an alternative "preferred indicator" or as the sole "preferred indicator". Volume indicators can be useful where it is difficult to measure price changes due to a lack of available data or the complexity of the data source. For example, in the case of air transport it is difficult to measure price changes so a measure of the volume of air passenger kilometres may be more practical, although it is important to categorise such a measure into business travel, economy travel, etc.

Where deflated turnover is considered to be practical as a preferred indicator, an appropriate and representative volume indicator for well-defined products not subject to rapid quality change is presented as an "alternative indicator". It is important that these volume indicators are applied in sufficient detail that the products are relatively homogenous. If a volume indicator cannot be broken down into relatively homogenous groups it should be classified as an "other" indicator.

**Input indicator**

Input indicators such as employment are generally less suitable as the use of an input indicator will not take account of productivity changes. Therefore, with the exception of non-market collective services, input indicators are classified as "other".

The use of input indicators such as employment is, however, recommended by the Eurostat price and volume Handbook when measuring non-market collective services. Therefore, for collective non-market services input indicators are classified as "preferred" or "alternative".

**D.4.2 Deflators**

**Why remove prices**

The Index of Services Production (ISP) is defined as a weighted average of the real output of the services industries, where the weights are based on their shares in the value added of the Services sector. The ISP is intended to measure changes over time in the volume of output of the services sector, it should not reflect any change in price. Users of an ISP are interested in how the output of the service has changed over a period of time. Comparison will be made with the percentage change in output over other periods of time and, possibly, with change in the volume of service sector output in other countries. The rate of change in price will be different at different periods of time and in different countries. Therefore it is important to remove changes in price to allow a realistic comparison of change in output.

Deflation is a process which removes the impact of price changes from an estimate of nominal value or 'current price' output (e.g. turnover). This is normally performed by dividing the current price estimate of output by a price index, referred to as the *deflator*. The deflator, if chosen with care, will give a good approximation of the price movements that have affected the current price series and allow for the calculation of an accurate constant price series. For many industries the preferred approach to measuring real output (i.e. output at constant prices) for the ISP is deflated turnover, using a representative price index.

**Level of deflation**

It is recommended that the indicators of current price output are deflated at the ISIC 4-digit level for the ISP. For this to be achieved Consumer Price Indices (CPI) and Service Producer Price Indices (SPPI) should be available at this level of detail. If deflators are not available in sufficient detail to deflate at the 4-digit level the current price series could be deflated at the ISIC 3-digit level instead.

**Consumer Price Indices and Service Producer Price Indices**

Within some 4-digit industry groups services are provided almost entirely to businesses, for example, the wholesaling groups and road haulage. Other industry groups provide services to businesses and to households, for example telecommunication and air transport. A few industry groups, such as retailing, provide services primarily to households. Where the industry group provides the services mostly to businesses, the preferred deflator would be a Services Producer Price Index relevant to that industry group. Where the industry group provides the service mostly to households the preferred deflator would be a Consumer Price Index.

For industry groups that provide services to businesses and households the price index used must be representative of business to business prices and business to household prices. The Eurostat / OECD methodological guide for producing SPPIs recommends that the scope of an SPPI should include all domestic output (i.e. business, consumers, government and export). The advantages of an all inclusive

price index are that it is not necessary to weight together separate price indices and also the price index would be at basic prices (it would not include taxes less subsidies on products) and so it avoids a potential step from tax changes, e.g. a change in VAT rate. However in many countries SPPIs are restricted to represent only business to business transactions[8], in an effort to avoid duplication with the CPI where most countries will have good coverage of transactions with the household sector. Under these circumstances it would be necessary to weight together the SPPI and the CPI using any available information on the breakdown between consumption by business and consumption by households. This information would ideally be available from national accounts input-output tables. If not, another possible source may be structural surveys. If no information is available, then weighting together SPPIs and CPIs may require a value judgement[9].

Another issue relevant to SPPIs is that they may be industry-based, product-based, or both. Many countries' SPPIs are produced at a 4-digit ISIC industry level, through collection of prices of products primary to that industry[10]. They are therefore generally in the required form to use as deflators as proposed in this Manual.

**Application of deflators**

The table in Annex 1 describes an assessment by the United Kingdom Office for National Statistics (ONS) of where CPIs are appropriate and where SPPIs are appropriate, by ISIC category, for deflating current price series within an ISP.

The table provides a detailed list of recommended variables for compiling an ISP, including sources for deflating current price data. The first column lists the preferred variables. The other two columns provide alternative and other variables that could be used if the preferred source is not available. For deflation within many industry groups a 'more general' PPI is presented as an alternative. A more general indicator might be an SPPI that has wider industry coverage than the ISIC industry group of the current price series that is to be deflated. For some industry groups the use of a 'more general' SPPI might involve using a whole economy SPPI. The definition and appropriateness of a 'more general' PPI is contextual and its appropriateness must be considered within the context of the industry group being deflated.

**Periodicity**

[8] This in principle should also cover output to governments and exports

[9] There may often exist a private 'industry association' whose members are generally those who own businesses in the relevant industry. These associations may often have a reasonable understanding of the likely split of output for the industry between sales to businesses and sales to households.

[10] Consequently, for the majority of countries they will not represent price changes for products secondary to the relevant 4-digit ISIC industry.

If the ISP is being compiled as a monthly index, monthly price indices will be needed. If SPPIs (or CPIs) are only available quarterly it will be necessary to interpolate a monthly path. In fact, the monthly path can be created from a quarterly series using a variety of methodological procedures [see Section E for further discussion].

**Constructing SPPIs and CPIs**

The OECD / Eurostat methodological Guide for developing producer price indices for services provides guidance on constructing SPPIs. The OECD / Eurostat Guide sets out three options for SPPIs. They can be based in industries, products or both. The Guide recommends sample frames for each of these. The Guide also gives an overview of pricing methods including: Pricing of non-unique, repeated services; Component pricing; Unit value method; Model pricing; Percentage fee method and; Time based methods (e.g. charge-out rates). All of these pricing methods are clearly defined in the OECD / Eurostat Guide, with descriptions under which circumstances they can be applied. The Guide provides guidance on each stage in the process of developing an SPPI, covering such issues as sampling frames, pilot surveys, Index formulation, Weights & aggregation and assessment of quality.

The OECD / Eurostat methodological Guide for developing producer price indices for services (OECD and Eurostat 2005) is available at **[a link to be inserted**]. Advice on compiling Consumer Price Indices is provided in the CPI manual (ILO 2004) at **[a link to be inserted].**

### D.4.3 Recommended variables and deflators and their sources

In this Section, a list of recommended variables and deflators are presented, along with their sources for all services activities as defined in Section B, i.e. Tabulation categories G through P of ISIC Rev. 3. As already mentioned in the previous Section, a set of preferred, alternative and other methods are proposed for 4-digit ISIC levels of each 2-digit ISIC group. Thus, twenty-seven tables cover all twenty-five services industries defined in ISIC Rev. 3 and two additional groups which are undifferentiated goods-producing activities of private households for own use (NACE code 96) and undifferentiated services-producing activities of private households for own use (NACE code 97). A list of services industries covered in tables is presented below:

- Code 50: Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel;
- Code 51: Wholesale trade and commission trade, except of motor vehicles and motorcycles;
- Code 52: Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods;

- Code 55: Hotels and Restaurants;
- Code 60: Land transport; transport via pipelines;
- Code 61: Water transport;
- Code 62: Air transport;
- Code 63: Supporting and auxiliary activities; activities of travel agencies;
- Code 64: Post and telecommunications;
- Code 65: Financial intermediation, except insurance and pension funding;
- Code 66: Insurance and pension funding, except compulsory social security;
- Code 67: Activities auxiliary to financial intermediation;
- Code 70: Real estate activities;
- Code 71: Renting of machinery and equipment without operator and of personal and household goods;
- Code 72: Computer and related activities;
- Code 73: Research and development;
- Code 74: Other business activities;
- Code 75: Public administration and defence; compulsory social security;
- Code 80: Education;
- Code 85: Health and social work;
- Code 90: Sewage and refuse disposal, sanitation and similar activities;
- Code 91: Activities of membership organisations not elsewhere classified;
- Code 92: Recreational, cultural and sporting activities;
- Code 93: Other service activities;
- Code 95: Activities of private households as employers of domestic staff;
- Code 96: Undifferentiated goods-producing activities of private households for own use; and
- Code 97: Undifferentiated service-producing activities of private households for own use.

There are two parts in each presentation at the Division level (two-digit ISIC group): a general comment and a table. The general comment describes types of services activities included and excluded in the corresponding Division, the desirable method for measuring gross value added, definitions of turnover data, and types of preferred deflators. The table presents explanatory notes and descriptions for each 4-digit ISIC class and preferred, alternative and other methods to measure economic activities of the ISIC class.

It should be noted that the selection of the recommended variables and their deflators are made based mainly on current UK practices supplemented by information from Canada and Korea. As the aim of this Manual is to be as practical as possible, any methods that are theoretically optimal but practically less plausible have not been included in the tables. It is, however, worth noting that the contents of the tables are subject to change in the future, if better methods are developed and employed.

The actual tables are, presented in Annex 2 at the end of this Manual.

# Section E: INDEX COMPILATION

This Section deals with practical issues that can be encountered during the actual ISP compilation process. A range of index methods are currently employed by national statistical agencies for various types of economic time series. Although the Laspeyres index and Paasche index are the most commonly used forms, the Fisher index is also used by several OECD Member countries despite its technical difficulties and resource intensity. To enhance the comparability of economic analysis on the services sector across the OECD area, it is important for national ISPs to be compiled according to comparable indexing method(s). Practical advantages and disadvantages, especially in regards to measuring short-term movements, of various indexing methods will be examined in order to identify a set of preferable types of indices to be used for ISP compilation.

It is often observed that not all input variables are fully suitable to be integrated into an ISP or its sub-groups. Differences in measurement, data in raw or other forms and with adjustments, breaks in a series, or missing data are typical examples of unexpected values and heterogeneities often encountered during ISP compilation. In order to cope with these problems, a range of solutions are currently being adopted by national statistical agencies, depending upon their statistical environment and resource availability. As different options may produce different results which could hamper the comparability of ISPs across the OECD area, this Section also suggests a set of viable methods for transformations to input data that can be applied to aid the compilation of a monthly or quarterly ISP. Other issues, such as overall quality and the comparability with national accounts, which should be considered at the consolidation stage of the ISP compilation are also discussed in this Section.

## E.1 Types of indices

Theoretical and practical aspects of three main types of indices are reviewed in this Section. Based on their advantages and disadvantages, a set of the most preferable index types for various ISP compilation stages are proposed. Discussions in this Section are based on several national and international sources such as the UK Office for National Statistics, the SNA 93, and the Eurostat Handbook on price and volume measures in national accounts.

In the choice of the indices to be used to compile a monthly or quarterly ISP, the following aspects should be considered:

- Independency: the index is independent of base year and levels of input data;
- Symmetry: the index formula assigns equal weight to the two situations being compared; i.e. the situation of the current period and the situation of the base period;
- Time reversal: the time reversal test requires that the index for a period $t$ using period $0$ as base is the reciprocal of the index for the period $0$ using the period $t$ as base;

- Factor reversal: the factor reversal test requires that multiplying a price index and a volume index of the same type should be equal to the proportionate change in the current values (SNA 1993);
- Additivity: according to the SNA 93 glossary, "Additivity is a property pertaining to a set of interdependent index numbers related by definition or by accounting constraints under which an aggregate is defined as the sum of its components; additivity requires this identity to be preserved when the values of both an aggregate and its components in some base period are extrapolated over time using a set of volume index numbers.";
- Interpretability for users and cost of maintenance. These represent the more practical issues to be taken into consideration.

**Laspeyres, Paasche and Fisher indices**

Three main types of indices are widely used internationally to aggregate economic quantities for various periods. If the weights of some earlier base period are used, this defines a Laspeyres index. If, on the other hand, the weights of the most recent period are used, this defines a Paasche index. The Fisher index is then defined as the geometric mean of the Laspeyres and Paasche indices.

For a fixed base year 0 and time t, a Laspeyres-type index can be expressed mathematically as follows:

$$L_t = \sum_i (w_{i,0} \frac{C_{i,t}}{C_{i,0}}) * 100$$

where $w_{i,0}$ : relative share of value added of sector i at time 0
$C_{i,0}$ : volume index for sector i at time 0
$C_{i,t}$ : volume index for sector i at time t

A Paasche-type series can be written as:

$$P_t = \frac{1}{\sum_i w_{i,t} \frac{C_{i,0}}{C_{i,t}}} * 100$$

where $w_{i,t}$ : relative share of value added of sector i at time t
$C_{i,0}$ : volume index for sector i at time 0
$C_{i,t}$ : volume index for sector i at time t

A Fisher-type series is obtained for each period by taking a geometric mean of the values for the same period in the Laspeyres-type index and Paasche-type index. Thus, it is expressed mathematically as follows:

$$F_t = [L_t \; P_t]^{1/2}$$

As can be seen in the formulae presented above, the Paasche index focuses more on the economic situation of the most recent period. The Laspeyres, on the other hand, uses those conditions in a past base period. As a principal use of economic time series is to predict future movements of the economy, it seems more relevant to compile the index whose weights reflect the market conditions of the most recent period. By design, weights will have to be estimated every year if the Paasche index is employed, while it is more common for the Laspeyres index to have less frequent updates in weights (generally every five years). If, however, the weighting variables are evolving rapidly (e.g. due to technological changes in the market place etc.), it is preferable to update the weights every year even in the case of using the Laspeyres index.

Table E.1-A below presents the advantages and disadvantages of the various types of indices mentioned above. As can be seen, different types of indices possess differences in their advantages and disadvantages, which are all crucial for the quality of the resulting index.

The Laspeyres index costs are relatively low to compile and is simpler to interpret, while the Paasche index is more costly to maintain and somewhat impractical as it requires current period weights. The Fisher index is theoretically the best one, as it satisfies in particular the time and factor reversal tests, and it is a symmetric index. It is, however, very costly and non-additive, and compiled with some delays as it requires both the Laspeyres and the Paasche indices.

Table E.1-A. Advantages and disadvantages of various types of volume indices

| | Interpretability | Cost-efficiency | Additivity | Time reversal | Factor reversal | Timeliness in compilation | Symmetry | Weights Relevance for latest periods |
|---|---|---|---|---|---|---|---|---|
| Laspeyres index | X | X | X | | | X | | |
| Paasche Index | X | | X | | | | | X |
| Fisher Index | X | | | X | X | | X | X |

**Chain-linked indices**

When changing the base year, two main options can be considered with respect to the revision of historical data. One option is to recompile values for all periods using the weights from a new base year. In this case, the entire historical series will be revised as the weights for the whole series are expressed in terms of

the economic situation in the new base year. This type of index is referred to as a fixed-weight index, and whilst this may seem a simple approach it has a number of undesirable statistical properties (see table E.1-B below) and should not be used in practice. Alternatively, historical data of an index can be aggregated by the weights estimated from the economic situations for periods closer to their chronology. Each time the weights and base year for the index are updated, data are only compiled with the new weights for periods close to the reference period for the weights, and the series is then linked to the historical portion. This is called a chain linked index, as it is compiled for a succession of different segments while keeping the original weights for each past segment fixed. The weighting methodology for the segments will depend on the type of index used, i.e. chained Laspeyres, chained Paasche, or chained Fisher.

Regarding the preference between fixed-weight and chain-linked indices, it should be considered that in practice chain-linked indices show better results for the majority of cases as they take account of modifications in the relative weights of the different categories of services over the whole historical series. In addition, rebasing revisions occur to a much lesser extent. In the case of annual chain-linking, the inaccuracies caused by the assumption of a stable relationship between GVA and turnover are reduced; and, furthermore, as every year is automatically a link year, no subjective choice is required.

On the other hand, however, annually chain-linked indices are often criticised for their non-additivity. For the purposes of compiling the ISP, a chain-linked volume index is likely to provide a reliable measure as long as its weights are revised every five years.

Table E.1-B. Advantages and disadvantages of fixed-weight and chain-linked indices

| | Interpretability | Cost-efficiency | Additivity | Timeliness in compilation | Independence from base year | Low sensitivity to changes in weighting patterns |
|---|---|---|---|---|---|---|
| Fixed-weight index | X | X | X | X | | |
| Chain-linked index | X* | X* | P[11] | X* | X | X |

*: In the case of a Laspeyres index

**Recommendations for ISP compilation**

As mentioned in the previous Section, the Fisher index is theoretically superior to the other types of indices. In addition, a procedure proposed by Statistics Canada can be employed to resolve its main disadvantage of non-additivity. However it remains a complicated and burdensome technique to be applied to short-term statistics such as ISP, especially from the lower level, as it requires very detailed and timely information. Thus, the other two methods, i.e. Laspeyres and Paasche indices, seem to be more

[11] A chained Laspeyres index will be additive from the most recent reference base and weighting period onwards

attractive and appropriate for a monthly or quarterly ISP. But in reality, one would never be able to produce a true Paasche index for a monthly ISP in real time because a reliable weighting source for end point weights required for Paasche would never be available.

The chain index is recommended in the context of ISP because it is independent of base year and levels of input data, as opposed to a fixed weight index. At the same time, it takes into account long-term changes of relative prices and quantities. Eurostat also recommends a chain-linked Laspeyres index for volume in *the Handbook on price and volume measures in national accounts*, while it also recognises the theoretical superiority of the Fisher index.

In order to allow some flexibility caused by the specific statistical environment of each country, different practices can be considered for different levels of compilation. For this purpose, the levels of index compilation can be divided into two groups: elementary and intermediate level on one hand; and dissemination level on the other hand. The former would allow more flexibility and independence in the index compilation to each nation. For the latter, however, harmonisation amongst national ISPs is necessary for global comparability.

As spelled out in Table E.1-C below, the preferred method for all levels is a chain-linked Laspeyres index. The formula of annual chain-linked Laspeyres Index is as follows:

$$L_t^{\,C} = \sum_i (w_{i,t-1} \frac{C_{i,t}}{C_{i,t-1}}) * \sum_i (w_{i,t-2} \frac{C_{i,t-1}}{C_{i,t-2}}) * \ldots * \sum_i (w_{i,0} \frac{C_{i,1}}{C_{i,0}}) * 100$$

where $w_{i,t}$ : relative share of value added of sector i at time t

$C_{i,t}$ : volume index for sector i at time t

Although countries could employ other types of indices at the elementary and intermediate levels according to their limitations or availability of information, it is highly preferable to use the chain-linked Laspeyres method at the dissemination level in order to enhance the international comparability of countries' indexes.

Table E.1-C Types indexing methods for various stages of ISP compilation

| Level | Preferred | Alternative | Other |
|---|---|---|---|
| All levels | Chain-linked Laspeyres index | Any form of Laspeyres or Paasche index depending upon the national situation. The type of index used to compile national ISP should | Any form of Laspeyres or Paasche index depending upon the national situation. The type of index used to compile national ISP can be |

| | | | |
|---|---|---|---|
| | | be consistent with those of national IIP or volume index of national GDP at the corresponding levels. | inconsistent with those of national IIP or volume index of national GDP at the corresponding levels. |

Reweighting, rebasing and chaining every 5-years seems to be the most common practice in OECD countries for indices related to production. However, in recent years some countries have moved to annual chain-linking for the compilation of their Industrial Production Indices (e.g. United Kingdom). Annual chain-linking is definitely the option that takes better account of changes in the relative weights of the different sectors. Nevertheless, 5-years chain-linking may also be an acceptable option if the weighting structure is not evolving too quickly.

In practice the choice of the periodicity of chain-linking may depends on the activities: for some activities, it is strongly recommended to do annual linking, as the structure of weights evolves rapidly. For some others, 5-years may be convenient.

For detailed aggregation at a lower than 4-digit level, it may be more practical to use five-yearly rebasing.

## E.2 Transformation of input data

Practitioners in national statistical agencies are often confronted with various types of abnormalities or heterogeneities with respect to input variables and deflators. As these could influence the overall quality of the ISP, it is important to ensure the nature of each input variable before actual compilation. The list of variables recommended in Section D refers to various measures such as data in monetary values, units of quantities, and index form. Another difference in data presentation arises from various adjustments such as working day or trading-day adjustment, and seasonal adjustment. Although such differences can be overcome by applying more standardised techniques, the choice of method and stage of these adjustments are often dependent on the needs and resource availability of each statistical agency. It would, on the other hand, require more complicated processes to remove the abnormalities in the data if they are due to underlying defects, e.g. missing values, breaks or outliers.

### E.2.1 Coping with problems in input data

#### Missing input variables

In practice, compilers are often confronted with a situation where all the necessary information are not readily available. Missing data for part of a series can occur at the beginning of a series due to a shorter length of historical data, or in the middle of series due to exceptional events in the statistical environment.

Missing data can also be found at the most recent period due to the less timely nature of data collection in some services industries.

Also, because of the specific nature of the services industry, data for some services industries can only be collected at lower frequencies, i.e. collected annually or quarterly for monthly ISP or annually for quarterly ISP. This means that necessary information for a particular period will have to be estimated from existing information at different frequencies.

At the same time, data for some service industries may not be available at all. This may require compilers' judgement as to whether these industries should be included in the compilation of ISP.

Tables E.2.1-A, E.2.1-B and E.2.1-C below present preferred, alternative and other options which can be used to resolve a range of problems with missing data. If the frequencies of the ISP and input variables with missing data are the same, it is preferable to estimate the missing values using information available for other variables in the same ISIC group, as long as they are readily available and their long-term behaviours are similar to the series with missing data, or to estimate using the information from the series with missing values only. When the missing data point occurs at the beginning of the series, it is preferable to do this estimate using backcasting techniques; if it is located in the middle, then interpolation can be used. Forecasting is preferable if missing data are found at the end of the series Alternatively, in situations where a series with missing data has only a small number of observations, the missing information can be recuperated by imputation using information on other variables in the same ISIC group or by estimation using basic methods such as a simple moving average.

When the frequency of an input variable with missing data is lower than that of the ISP, it is preferable to forecast quarterly or annual data for three periods ahead and then to interpolate[12] a monthly or quarterly path from the forecasted data.

[12] Monthly path can be created from a quarterly series using various mathematical functions. For example, UK Office of National Statistics uses a cubic spline. It is recommended that the series is forecast three data points ahead before a monthly path is interpolated using a cubic spline. Various approaches could be used for forecasting the data. A common approach is to use a univariate model such as Auto-Regressive Integrated Moving Average (ARIMA).

ARIMA models are a broad category of models that bring together three concepts in forecasting a time series, the:

- auto-regressive (AR) part of the model assumes that individual values in a time series can be described by linear models based on previous observations;
- moving average (MA) part assumes that the value for any point in a time series depends on the error of the linear auto-regressive model in estimating the previous point. These errors are then taken into account in estimating the next value; and
- integrated (I) part refers to the operations used to model the long-term trend.

The Holt-Winters model is a specific type of ARIMA forecasting. The level, slope and seasonality of a series are forecast separately using 'exponential smoothing'. This means that the moving averages used to take account of errors in forecasting previous points are exponentially weighted, that is, more weight is given to the most recent period than to earlier periods. This is appropriate in forecasting short-term indicators. The Holt-Winters model is not designed for forecasting long runs of missing data points. If it is used to forecast more than three periods, results can

When there is no data for a particular services activity, the index for the services sector can be compiled with available information in other sectors at the same level of the same ISIC group. This operation assumes that their long-term behaviours are reasonably comparable. Otherwise, no attempt should be made to compile any index for the services industry. 'Implicit imputation' in the tables means imputing the average of the other service activities involved in that aggregation.

Table E.2.1-A Missing data in input variables with the same frequency as the ISP

| Nature of problems | Preferred | Alternative | Other |
|---|---|---|---|
| Missing data at the beginning of series | Backcasting with information on other variables in the same ISIC group; or Backcasting with series information only | Imputing using information on other variables in the same ISIC group and with the same statistical behaviour. | Backcasting with simple method, e.g. simple moving average; or use of implicit imputation |
| Missing data in the middle of series | Interpolation with information on other variables in the same ISIC group; or Interpolation with series information only | Imputing using information on other variables in the same ISIC group and with the same statistical behaviour. | Interpolation with simple method, e.g. simple moving average; or use of implicit imputation |
| Missing data at the end of series | Forecasting with information on other variables in the same ISIC group; or Forecasting with series information only | Imputing using information on other variables in the same ISIC group and with the same statistical behaviour. | Forecasting with simple method, e.g. simple moving average; or use of implicit imputation |

Table E.2.1-B Missing data in input variables with lower frequency than ISP

| Preferred | Alternative | Other |
|---|---|---|
| Forecasting quarterly or annual data for three periods ahead and interpolating a monthly or quarterly path from the forecasted data | | |

Table E.2.1-C No data for a services activity

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sometimes be subject to substantial revision.

Other possible approaches to forecasting involve the use of secondary data sources, model-based forecasting and expert judgement taking account of information from secondary sources.

| Nature of problems | Preferred | Alternative | Other |
|---|---|---|---|
| No information is available for any indicators in the same ISIC group | Do nothing for this sector | | |
| Some information is available for other indicators in the same ISIC group | Compiling index with available information only, if these indicators are expected to provide a reasonable estimate for changes in output of the activities with no data. | Do nothing for this sector | |

**Breaks in time series**

A long and statistically consistent historical time series is one of the most desirable characteristics for an ISP. This would maximise its usefulness in empirical analysis and as a tool to predict future turning points as well as growth rates of an economy. As a consequence, this property is also required for its input variables. However, a variety of changes in statistical behaviour are often observed in a time series with long historical data. They can be due, for example, to changes in technology, in the social and economic environment, and methodologies used for compiling statistics. These changes can affect the comparability of data for the same series over different periods of time, and may often cause unexpected values or 'breaks' in the time series. These breaks could influence the quality of both the input series and the resulting ISP. It is, thus, crucial for the reliability of the ISP to treat breaks in input variables properly. This Section presents several recommendations for the detection and treatment of two main groups of breaks: temporary and permanent breaks.

*Temporary breaks*

A temporary break in an economic time series is observed when a value for a given period (or for a few consecutive periods) is significantly different from the overall pattern of the series. This break, however, has no significant impact on the long-term behaviour of a series. There are two types of temporary break. A break can be due to exceptional events, e.g. strikes or temporary changes of regulations or market conditions, which is called an outlier. This break is a true value, which should be kept in the series as it reflects actual economic phenomenon and contains true information on the market. It is, however, often removed or smoothed during the compilation process such as seasonal adjustment. The second type of temporary break consists of errors from recording or transmission processes. Such breaks in a series should be removed and replaced by correct (or more plausible) values. A careful investigation by statisticians with help of economists and consultation with data suppliers is often necessary to distinguish outliers from possible errors.

There are several possible explanations for a permanent break. It may happen because of a significant change in methodology such as an increase or decrease in sectoral or geographical coverage, or changes in data collection from survey to administrative sources or vice versa. Permanent breaks may also be the result of changes in market conditions, regulations or changes in consumer behaviours. For example, introduction of sales via internet may reduce turnovers from conventional markets and thus lead to a break if internet sales are not captured by the relevant survey.

*Permanent changes*

Permanent changes in the series are observed in a series in various forms: level shift; change in long-term growth rates, i.e. slope changes; both level and slope changes; or change in seasonality.

Tables E.2.1-D and E.2.1-E below presents recommendations that can be used respectively to detect and address series breaks. If a strange data point is observed, it is preferable to examine its property by a relevant statistical test and to then consult with economists and data providers, if further verification is necessary. Alternatively, it can be determined by consultation with economists and data providers followed by graphical checking and simple statistics of the series, in situations when the number of observations is not large enough for a statistical test. If consultation is not possible due to time constraints or non-availability of data providers and economists, the breaks may be determined by graphical checking and simple statistics of the series such as growth rates or averages before and after the suspected break.

If errors are found in a series they will have to be corrected. It is definitely preferable to try and obtain the correct data from the data compiler. Otherwise, the information for this period has to be considered as missing and this problem is analogous to recovering the missing input variables, discussed in the previous Section. The alternative solution is, thus, to compute an estimate by interpolation, possibly using information from other variables in the same ISIC group.

For permanent breaks involving a level shift, if a series shows the same trend-cycle behaviour before and after the rupture, the information for the whole period should be used in the ISP compilation. Both parts of the series (i.e. before and after the break) will have to be linked, in order to remove the effects of the change in the level, by use of a factor. In other words, the level of the data before the break should be harmonised with the level of the data after the break. The main difficulty is that in most cases there is no common period between the two parts of the series and, as a consequence, strong assumptions are necessary. As Table E.2.1-B shows, the preferred method is to compile an average monthly (or quarterly) growth rate over several periods before and after the break and to assume that this average rate corresponds to the movement of the series between the months (or quarters) immediately before and immediately after the break. The periods to be used to compile this average growth rate should be chosen carefully. For a seasonally adjusted series, for example, these could be the 12 months (or 4 quarters) immediately before or after the break. For a series with seasonality, these could be the same month (or quarter) for the same years

immediately before and after the break. The alternative is to compute this change using changes in series with clear correlation if available

For permanent breaks with changes in level and slope, i.e., for series whose trend-cycle behaviour is significantly changing along with the level shift, it is more hazardous to consider that consistent information between both parts of the series (i.e. before and after the break) can be drawn. For this reason, only the data after the break should be kept. The data before should, thus, be estimated. This becomes an issue of estimating missing values in the beginning of a series. The recommendations for this are the same as in Table E.2.1-A.

Table E.2.1-D Detecting breaks

| Preferred | Alternative | Other |
|---|---|---|
| Relevant statistical tests and consultation with economists and data providers | Graphical checking and simple statistics of series and consultation with economists and data providers | Graphical checking and simple statistics of the series |

Table E.2.1-E Fixing breaks

| Type of break | Preferred | Alternative | Other |
|---|---|---|---|
| Errors | To try to get the correct data from the data provider | To replace the error by an estimate obtained by interpolation from other variables in the same ISIC group; or from series information only. | To replace the error by an estimate obtained by imputation using information on other variables in the same ISIC group; or by interpolation from simple method, e.g. simple moving average; or use of no data |
| Permanent breaks with level shift only | To modify data before the break by multiplying them with a factor based on the average of growth rates before and after the break | To modify data before the break by multiplying them with a factor computed using changes in series with clear correlation. | |
| Permanent breaks with changes in level and slope | Only keep data after the break and estimate the data before by backcasting with information on other variables in the same ISIC group; or backcasting with series information only (after the break) | Only keep data after the break and estimate the data before by imputing using information on other variables in the same ISIC group | Only keep data after the break and estimate the data before by backcasting with simple method, e.g. simple moving average; or use of implicit imputation |

### E.2.2 Indexing

As can be seen in Section D, variables that are used as input in the ISP may be very different in nature, e.g. in monetary value, index or unit of quantity. Harmonisation of their heterogeneous aspects is a prerequisite before they can be aggregated into an index.

The most widely recognised means of harmonisation involves transforming all the input variables into indices. In fact, a volume index is most appropriate as it is free from inflationary effects. Thus, all nominal data will have to be deflated before indexing according to the recommended procedures described in Section D. Deflated data in monetary values and other data in units of quantity will then have to be indexed before further processing.

While input data can be indexed at any level of aggregation, it is preferable for all the input data to be indexed at the lowest level possible so they can be aggregated with other variables within the same group or aggregated into higher groups.

### E.2.3 Adjustments

A variety of forms of Index of Services Production are required by various users depending upon their needs for economic analyses. The most frequently requested forms are ISP in raw, in working day adjusted, and in seasonally adjusted forms[13]. ISP in raw form can be compiled by integrating basic information without any further adjustments. The other two forms of ISP, on the other hand, require further adjustments for unequal number of working days or seasonality for different periods. Seasonally adjusted data are implicitly (by the nature of the computer software) adjusted for working days as well.

This Section discusses practical issues relating to seasonal and working day adjustments. Discussions are focused on their methods, on the stage in the ISP compilation process and on the frequency of the adjustments. It is assumed in this section that the seasonal and working days adjustments are performed on deflated series.

#### Method of adjustment

X12-ARIMA or TRAMO SEATS or combinations of both methods are preferable, as they have become standard tools to perform seasonal and working day adjustments in the majority of statistical agencies of the OECD area as well as by analysts. Other nationally developed adjustment methods can also be used as

[13] Definitions of the different forms of data are provided in the OECD's *Data and Metadata Reporting and Presentation Handbook* (2005). The Handbook also provides recommendations on the methodological information (metadata) that should be provided to users outlining the significance of seasonally adjusted series.

an alternative, as a number of agencies have found that they produce very reliable results and are sometimes more useful for specific statistical environments.

**Level of adjustment**

It is theoretically preferable to have adjusted data (in addition to the corresponding raw data) for all detailed levels of aggregation. This means that data would preferably be adjusted at the lowest level before their aggregation into the adjusted ISP, i.e. seasonally and working day adjusted data. However, such a policy could raise a few practical problems due to the number of variables to be seasonally adjusted and whether series at the lowest level are of suitable accuracy to enable reliable seasonal adjustment to be performed over a longer period. A large amount of noise in the data may, indeed, result in large changes in seasonal parameters each time they are re-estimated causing unwanted revisions. This may often be the case at low levels of aggregation and therefore it may be preferable to aggregate to a higher level before performing the seasonal adjustment. This policy also raises the problem of the availability of suitable deflators at the lowest levels. In practice, deflators may not be available at 5 or 6-digit levels. Different approaches are currently used across the OECD area.

Statistics Canada, for example, carries out seasonal adjustment for the majority of industries at the lowest level in the industry classification, i.e. worksheet level. The United Kingdom ONS, however, compiles seasonally adjusted data from the group level (roughly 4-digit SIC), as the amount of seasonal adjustment to perform at the class level would be huge. The ONS assumes that "The components feeding into a SIC 4-digit classification are sufficiently homogeneous in their seasonality to make seasonally adjusting the group level aggregate the preferred method."

Table E.2.3 below proposes the performing of seasonal and working day adjustments at the lowest level provided data have sufficient accuracy to enable reliable adjustment to be performed. If this is not plausible due to resource constraints and / or due to a lack of accuracy in the data, statistical agencies may determine the most optimal level, according to their assessment of the best balance between practicality and homogeneity.

**Frequency of adjustment**

Although it is a costly process, technically speaking it is preferable to perform seasonal and working day adjustments every month or quarter. However such a process can be confusing to users if both recent and historical data are revised every month or quarter. Statistics Canada has adopted the following revision policy for their GDP by industry series. "With the addition of each new observation, concurrent seasonal factors are calculated from all of the available data. Revised seasonal factors are used in the most current period consisting of up to 18 months, while seasonal factors in the time period preceding this segment of

the GDP series remain unchanged. Once a year, at the time of the incorporation of the benchmarks from the Input-Output tables, new revised seasonal factors are incorporated in the earlier years as well. This revision policy ensures that while all significant improvements are included, the number of times a given month gets revised is kept to a minimum." [Statistics Canada (2002), *Gross Domestic Product by Industry, Sources and Methods*]. On the other hand, the Korean National Statistical Office revises the seasonal factors only once a year. in February when all monthly data for the previous year becomes available. The principal reason for this approach is to avoid user confusion.

Thus, Table E.2.3 proposes that the seasonal factor revision policy should be between two approaches. Small revisions, e.g. use of concurrent seasonal factors method which should be performed every month, especially when options are used in the seasonal adjustment. However, this should only apply to the most recent values of the time series (e.g. up to 18 months as is the case at Statistics Canada). Larger revisions i.e. applying the latest seasonal factors to all the historical data, should be done only once a year

**Treatment of series with short historical data**

When historical data for a time series is short, it is normally preferable not to attempt to estimate the seasonally adjusted data for the series until the length of historical data is sufficiently long. Four to five years of monthly or quarterly data is generally accepted as the minimum length to perform seasonal adjustment. This could, however, cause problem in the construction of seasonally adjusted ISP data for the whole services industry and its sub-groups, if for example, a few new component series become available due to a new survey. In such a case, it is preferable to estimate seasonally adjusted data for the series with short historical data from their imputed (backcasted) raw data [See previous Section for a detailed discussion].

Table E.2.3 Seasonal and working day adjustments

| | Preferred | Alternative | Others |
|---|---|---|---|
| Method | X12-ARIMA or TRAMO-SEATS | Other national methods | |
| Level of adjustment | 4-digit level or higher, provided suitable accuracy of the data | Any level for which reliable information for adjustment are available and for which a deflator is available | Top level |
| Frequency of adjustment | Concurrent adjustments every month or quarter for recent period; and once a year for all period | Once a year | Ad hoc |
| Treatment of series with | Estimate seasonally | Do not perform seasonal | |

| | Preferred | Alternative | Others |
|---|---|---|---|
| short historical data | adjusted data for the newly introduced series in order to produce seasonally adjusted ISP for whole services industry and its sub-groups | adjustment until enough historical data become available | |

## E.3 Consolidation

### E.3.1 Weighting

#### Weights

Input variables can be aggregated into the ISP, once all the necessary transformations at the individual series level, e.g. treatment of missing data points, deflation, indexing, etc., have been completed. Aggregation is carried out at each level from the lowest level of the ISIC. In other words, for a given level of the ISIC, e.g. a Group, the ISP for the level is derived from all the ISPs of the lower level, i.e. Class. An index of a sector is estimated by taking a weighted average of all the component industries in the sector, where the weights are derived from their relative contributions to total GDP. If for some reason an index is not available for one of the lower level activities, 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.

As shown in Table E.3.1, it is preferable to measure the relative importance of industries in GDP using gross value added. Such information is usually available in Input-Output tables. For most countries, however, it requires the use of other comprehensive data sources for lower levels of ISIC groups to obtain weights for those levels. The sources also vary from one industry to another as the services industry is very heterogeneous in nature. Thus, it is often necessary to use alternative weighting variables such as turnover data and quantity indicators, or indicators that measure input to an industry such as employment.

#### Frequency of weights revision

In the case of a Laspeyres index, weights for production indices are normally updated every five years, which is coordinated with base year changes. On the other hand, weights for Paasche and Fisher indices by their construction will have to be updated every year when reliable annual data for the year become available. For maintaining a coherent time series, Eurostat in its *Methodology of Short-term Business Statistics: Interpretation and Guidelines* (Eurostat 2002) advocates the following:

> "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."

Thus, if for example weights relating to a new base year of 2000 were introduced in 2003, index series based on the new 2000 weights would be revised back to the beginning of 2000, which is also the point where the index would be linked (i.e. spliced) to the historical series.

Another issue related to the frequency of weights revision is whether weights for different levels of ISIC categories should be revised with the same frequency. Due to resource and data constraints, it may be more practical to update weights for higher levels more frequently than those for lower levels. The ONS in their *Methodology of the Experimental Monthly Index of Services* (Fenton and Pike 2001) suggests the following practice:

> "The contributions, or 'weights' of indicators at class level (which is normally below the level of 4-digit SIC(92)) are updated every five years. The weights of indicators at group level (normally equates to 4-digit SIC) and above are updated every year."

Table E.3.1 Weights

| Weight | Preferred | Alternative | Others |
|---|---|---|---|
| Weighting variables | Gross value added | Turnover or quantity indicators | Indicators measuring inputs to the industry |
| Missing variable or index | Proportional distribution of[14] the weight of that activity amongst the other activities in the same group | | |
| Frequency of update | Once a year for higher levels and every five years for lower levels of ISIC groups | Every five years for all levels of ISIC groups | Ad-hoc |

### E.3.2 Other important issues

#### Quality of data products

The previous Sections have primarily discussed the quality of input variables and the methodologies to be used to compile monthly or quarterly Index of Services Production. Less attention, however, has been given to the quality of the resulting ISP. Most statistical institutions at national and international levels evaluate the quality of their own statistics one way or another based on various tools. At the same time, more systematic efforts have been implemented within the framework of the IMF, i.e. General Data

[14] This is the most realistic option for this issue and it is therefore proposed as the preferred option though it was regarded as the 'other' option in table E.2.1-A relating to missing data in input variables with the same frequency as the ISP.

Dissemination System (GDDS) and Special Data Dissemination Standards (SDDS). Similarly, the OECD has recently developed tools to assess the quality of statistics stored and maintained by various Directorates within the Organisation. The OECD's quality framework[15] provides robust results regardless of statistical subjects and origins and is used as a basis for discussing ways to ensure the quality for an ISP in this Manual. Quality frameworks have also been developed by other institutions such as the European Commission's Eurostat, Statistic Canada, Statistics Finland, Statistics Denmark, etc.

In the OECD's quality framework, the quality of a statistical product is assessed via the following seven dimensions:

- relevance;
- accuracy;
- credibility;
- timeliness;
- accessibility;
- interpretability; and
- coherence.

In addition to the seven criteria mentioned above, the OECD also recognises the cost to produce necessary statistics. When it comes to the production of short-term statistics such as a monthly or quarterly ISP, cost-efficiency is an indispensable criterion to assess the quality of statistics. The exact meanings of the eight dimensions are discussed in detail in the remainder of this Section.

**Descriptions of quality dimensions**

- Relevance: As described in the introduction to this Manual, the ISP is to be compiled to meet the strong demands of analysts. According to the OECD document quality framework, "Relevance depends upon both the coverage of the required topics and the use of appropriate concepts." Thus, relevance is proportional to the number of sub-sectors covered in the index. Relevance is also positively correlated to the number of "preferred" methods adopted in comparison to the number of alternative or other methods.

- Accuracy: As the ISP is compiled by a bottom-up approach, the accuracy of the index is strongly dependent on the accuracy of the individual components. The OECD explains that "Accuracy refers to the closeness between the values provided and the (unknown) true values" and that "Accuracy has many attributes, and in practical terms there is no single aggregate or overall measure of it." The framework then advises assessment of accuracy via "the closeness between the initially released value(s) and the subsequent value(s) of estimates" in practice. It, however,

[15] Detailed information on the OECD quality framework is available at www.oecd.org/statistics/qualityframework

also notes that "The absence of revisions does not necessarily mean that the data are accurate". According to the Eurostat's *Methodology of Short-term Business Statistics: Interpretation and Guidelines*, "Accuracy can be measured using several indicators: random sampling errors, non-random sampling errors, statistical frame errors, measuring errors, process errors, non-response errors, model errors".

- Credibility: According to the OECD "the credibility of data products refers to the confidence that users place in those products based simply on their image of the data producer, i.e., the brand image."

- Timeliness: Monthly ISP should preferably be as timely as the corresponding monthly Index of Industrial Production. But, as the service industries are much more complex than their industrial counterpart, it is very difficult to collect all the necessary information in a timely manner. It is however still preferable to produce monthly ISP within six weeks after the reference period, or within two weeks after the monthly IIP. If the ISP is compiled on a quarterly basis, it should be produced before the quarterly GDP so that it can be used to understand short-term economic fluctuations and as an input to quarterly GDP.

Table E.3.2 Timeliness of IIP with ISP for countries currently publishing ISPs

(periods after the end of the reference month)

| | IIP | ISP |
|---|---|---|
| Canada | About 50 days | About 50 days |
| Finland | About 30 days | 7-8 weeks |
| Korea | About 30 days | About 40 days |
| UK | 35-40 days | 7-8 weeks |

- Accessibility: In the OECD quality framework, the accessibility of data products is described as "how readily the data can be located and accessed from within OECD data holdings. Accessibility includes the suitability of the form in which the data are available, the media of dissemination, and the availability of metadata and user support services. It also includes the affordability of the data to users in relation to its value to them and whether the user has reasonable opportunity to know that the data are available and how to access them." In addition, the Eurostat SBS Manual states that there is a "need for a catalogue system to allow users to find what information is available, and where to find it" and that "the SDDS therefore requires advance dissemination of release calendars and simultaneous release to all interested parties". Accessibility is discussed further below in the Section covering dissemination.

- Interpretability: The interpretability of data is closely related to the users' understanding of the data for their use. Thus the degree of interpretability depends on all aspects of information on the data such as adequacy of the definitions of concepts, target populations, variables and terminology,

limitations of the data, etc. Thus the quality of metadata provided along with the ISP is indeed crucial to improve the interpretability. Such metadata should, in particular, inform the user on how close to the target variable (i.e. the change in value added) the input variables used in the ISP are. When there is a significant difference, it should be explained to what extent this may cause a bias in the measure of the services production for particular services activities or the index as a whole.

- Coherence: The OECD states that "the coherence of data products reflects the degree to which they are logically connected and mutually consistent." The OECD distinguishes four important sub-dimensions for coherence:

  - coherence within a dataset;
  - coherence across datasets;
  - coherence over time; and
  - coherence across countries.

ISP can be *coherent within a dataset* if all individual sub-indices that are components of an overall ISP are compiled based on the methodologies proposed in this manual.

*Coherence across datasets* for ISP cannot be ensured until its coherence with corresponding datasets is properly checked. As the ISP is designed to complement the IIP, coherence between these two indices will thus have to be examined by ensuring consistency in classifications, concepts and definitions. Comparability between ISP and GDP is also an important aspect.

*Coherence over time* and *coherence across countries* are in theory achieved using the methodology recommended in this Manual. However, in practice, as described in the previous discussions in this Section, there are many reasons for these properties not to be respected for all services sub-sectors. When this is the case, it is advisable to clearly note the differences from the recommendations. Coherency across countries and amongst various sub-sectors of services activities may be dependent upon the degree of adoption of recommended methodologies presented in this manual.

- Cost-efficiency: The OECD describes cost-efficiency as "A measure of the costs and provider burden relative to the output. Provider burden is a cost that happens to be born by the provider, but is a cost nevertheless." As mentioned earlier, the OECD does not include cost-efficiency as a dimension of the quality framework. However the OECD views cost-efficiency as a factor that must be taken into account in any analysis of quality as it can affect quality in all dimensions.

The challenge is how to assess the quality of an ISP based on the criteria outlined above. It is not an easy task to assemble the eight criteria into an index by which the level of quality of an ISP can be evaluated. The main problems arise from the difficulties in quantifying the level of individual dimensions and in aggregating the levels of all dimensions. Any resulting score can be arbitrary as it to a large extent

depends on the data compilers choice of quality measurement variables and weights used for their aggregation.

Thus, no attempt has been made in this Manual to outline a method for deriving a single quantitative quality measure for an ISP. In the absence of such a single measure, it is sufficient that qualitative statements be made with respect to each quality dimension adopted by the statistical agency compiling the ISP. This would enable subsequent determination of priorities on the basis of an understanding of user needs.

It is recommended that a quality review of the ISP be undertaken every four or five years, or more frequently if significant new data sources become available

**Productivity**

Although it is preferable for the ISP to be compiled from output variables, in Section D.4.3, use of a list of inputs to production, e.g. employment, is also recommended as less preferable methods for some services sectors. The main reason is that output measures for those sectors may not be readily available, especially in the short-term. Where changes in input and output are proportional to each other, use of input variables instead of output figures may produce reliable estimates. Otherwise, this could mislead users by neglecting the effect of productivity gain or loss. Thus, it is important to consider changes in productivity, if input variables are to be used as alternative or other methods, in place of output variables.

Generally, a rise in productivity means that a larger volume of services can be produced with a given input. The change in volume may be a consequence of a change in quantity or quality of the services. [Alternatively, a rise in productivity means that output prices fall even though input prices remain unchanged: refer to the Manual on SPPI, p. 21 for further discussion].

**Comparability with GDP**

The Index of Services Production provides an estimate of monthly (or quarterly) change in output of the service sector. The index is compiled using Gross Value Added (GVA) weights and, for most industries, it is considered to be a reasonable estimate of short-term change in Gross Value Added (this assumes that the ratio of Gross Value Added to Output is constant in the short-term). The Index of Industrial Production provides an estimate of change in industry on a similar basis. The Index of Services Production and the Index of Production can be aggregated along with estimates of change in GVA for agriculture, forestry and fishing and for construction to arrive at an estimate of change in monthly (or quarterly) GVA. This provides an estimate of short-term change in GVA. The estimate of GVA is produced at basic prices, that is, excluding taxes less subsidies on products.

The System of National Accounts 1993 (SNA 1993) specifies that GDP is estimated at market prices, i.e. it is the sum of gross value added of all relevant producer units plus taxes less subsidies on products. GDP can be estimated using the production approach, the expenditure approach or the income approach. The preferred approach to compiling a single estimate of GDP is to construct Input Output Supply Use tables which balance the supply and use of products, by industry. The components for the production, expenditure and income measures of GDP can be extracted from the Input Output Supply Use tables. At a minimum, Supply Use tables would be balanced using annual current price data. However it is preferable to have quarterly Supply Use tables at current and constant prices (or annually chained volume measures). Where Supply Use tables are not available the three measures of GDP can be balanced using a more subjective approach.

It is usual practice to compile the headline estimate of GDP using a separate process and separate data sources from the short-term indicator of GVA. For the production measure it is practical to collect annual data for both output (turnover) and intermediate consumption, to achieve a direct measure of GVA. It is therefore likely that there will be some incoherence between the estimate of GVA produced as a short-term indicator and the estimate of quarterly/annual GVA and GDP that is produced by balancing the three measures of GDP.

Although some discrepancy can be expected, users would prefer the presentation of a consistent message about the economy, and so it is preferably to 'benchmark' the short-term indicator to the quarterly and annual estimates of GVA or GDP. If the reconciliation focuses on GDP at market prices the short-term estimate of GVA must be 'converted' to market prices by adding an estimate of taxes on products and deducting subsidies on products. The benchmarking of the short-term indicator to the quarterly and annual estimates of GDP may be done through an informal process of applying adjustments to bring the short-term and headline estimates of GDP to within a specified tolerance. Alternatively, a more formal benchmarking or reconciliation process can be adopted, reconciling the industry components of the short-term indicator with the components of the production account within a Supply Use framework. This approach will ensure that the short-term indicator is fully consistent with the Quarterly & Annual accounts. Ideally this consistency should be preserved for both quarterly and annual growth rates. The data sources and methods used in the short-term indicators and quarterly Supply-Use tables should be as consistent as is practical, to minimise revisions from benchmarking.

Where the estimate of headline GDP is quarterly and the short-term indicator is monthly the benchmarking process may be used to impose seasonally adjusted quarterly growth rates onto the monthly short-term indicators.

# Section F: PRESENTATION AND DISSEMINATION

The issues briefly discussed in this Section for the transmission and dissemination of ISPs compiled by national statistical agencies cover two broad areas: the form of presentation of the ISP, and their dissemination to users.

## F.1 Presentation of ISPs

The main issues touching on the presentation and reporting of ISPs relate to their type and form of presentation. The information provided below is drawn largely from guidelines and recommendations outlined in the *Data and Metadata Reporting and Presentation Handbook* (OECD 2005a) [to be] published by the OECD in mid-2005. Particular attention is drawn in various parts of this Handbook (especially in Section 5) to the need to ensure that statistics disseminated to users via various media are accompanied by appropriate methodological information (or metadata) describing key concepts and terminology and practices used in the collection of basic data, etc.

### Presentation as an index

As outlined in Section E.2.2 above, the heterogeneous nature of the input variables used in the compilation of the indicator necessitates the presentation of the ISP as an index. Methodologies for the compilation of the indicator in index form are presented in Section E, and the focus of this Section are recommendations for the presentation of appropriate information about the index to enable users to assess its relevance to their particular requirement(s).

The Statistics Canada Policy on Informing Users of Data Quality and Methodology (Statistics Canada 2000, p. 11) states that the provision of an adequate description of characteristics and methodologies specific to indices is as important to users as quality assessments of the data. Canadian recommendation as to the range of information (or metadata) that should be provided are also relevant to ISPs. Such information comprises:

- precise definitions of the underlying economic concepts the indices are intended to measure. Specific mention should be given to any limitations in the use or application of the index; and

- descriptions of the methodologies used in the compilation of the index, with particular reference to the:

    - index calculation methods entailing the choice of index formula (e.g. Laspeyres, Paasche, Fisher) and the strategy for constructing the index series (i.e. as either fixed base or chain indices);
    - weighting system used, weight revision practices and frequency of weight revision;

- computation at various aggregation levels;
- selection of base year;
- frequency of re-basing;
- procedures for linking indices;
- treatment of changes in the composition of commodities in the market as well as changes in quality.

The methodologies applied should be compared with underlying index concepts and the impact of any departures described.

Finally, as much of the above information is of specific interest to specialised users, consideration should be given to having differing levels of detail of information targeted to different kinds of users. The OECD data and metadata presentation Handbook emphasises the need to structure metadata appropriately for users with differing degrees of expertise and need. In this context the distinction is often made between the general public who require only a layperson's explanation of key aspects relating to index compilation and informed / analytical users who require more detailed technical information.

**Form of presentation**

The question of the most appropriate form of ISP presentation is however less clear-cut, with a range of possible options. Section E.2.3. above emphasises that a variety of forms of ISP are required by various users depending on their need for economic analyses, the most requested forms being raw, working day adjusted and seasonally adjusted series. The same Section then outlines some of the practical issues relating to the actual compilation of working day adjustment and seasonal adjustment estimates.

The OECD Handbook on data and metadata presentation (OECD 2005, Section 4.2) outlines a set of terminology covering concepts related to time series analysis, working day adjustment and seasonal adjustment to which readers of the ISP Manual are referred.

It should be emphasised that working day and seasonally adjusted estimates represent an analytical massaging of the raw or original time series and are intended to complement the original data and can never replace them. The original series shows the actual changes that have taken place (subject to the impact of sampling and non-sampling errors) and the other forms of presentation represent an analytical elaboration of the data to help show underlying movements. There is continuing debate among statisticians on which is the most appropriate form for the presentation of a time series to users – raw, seasonally adjusted or trend-cycle. The outcome of the discussion is that there is generally no absolute ideal, and the final choice depends on the media for the dissemination of data and the main focus or intent of the series. Dissemination of detailed data via an on-line database could imply the availability of original series which

affords maximum flexibility to users, whereas dissemination of more aggregated and headline series in a press release would involve the presentation of seasonally adjusted, perhaps in addition to original series.

The recommendations provided in the OECD Handbook on data presentation relevant to the presentation of working day adjusted or seasonally adjusted ISPs (OECD 2005, Section 4.6) are summarised below.

- When seasonality is present and can be identified, sub-annual indicators should be made available in seasonally adjusted form. The level of detail of indicators to be adjusted should be chosen taking into account user demand and cost-effectiveness criteria. The adjustment should be applied appropriately using the method chosen as a standard by the agency. The method used should be explicitly mentioned.

- When applicable, the focus of press releases (or similar releases to the general public) concerning the main sub-annual indicators should be on their appropriately seasonally adjusted version. Users should also be given access to the original (or raw) series, either in the publication (if space permits) or by reference to it.

  Where there is a user demand, the agency may also disseminate intermediate components of the seasonal adjustment process (e.g. series adjusted for calendar effects) and / or trend-cycle estimates but it should be clearly indicated that the focus is on the seasonally adjusted data.

- The general public has an interest in understanding what seasonal adjustment is all about. However, given the sophisticated nature of seasonal adjustment methods, it is not reasonable to expect such users to possess the mathematical and statistical background to understand a technical description of any particular adjustment method. Accordingly, statistical agencies should provide metadata on seasonal adjustment in the form of a layperson's explanation of the seasonal adjustment process and how seasonally adjusted series should be interpreted.

- For the benefit of informed users requiring information about the validity of the seasonal adjustment method applied, statistical agencies should provide a minimum standard of information that would facilitate an assessment of the reliability of each seasonally adjusted series.

- For analytical users, the availability of metadata is of paramount importance. The main elements of this metadata could include the following: a short standardized description of the method used, all the main parameters of the adjustment (e.g. additive versus multiplicative decomposition model), and some of the derived information (e.g. the trading-day weights). The principle to be followed is that the metadata should be of sufficient extent to enable an analytic user to seasonally adjust in a consistent way other series from the same statistical program which may not have been adjusted, or to compare the results obtained from using different options or methods for seasonally adjusting the same series.

**F.2 Dissemination to users**

The dissemination of ISPs will be undertaken by statistical agencies in accordance with existing dissemination strategies and practices involving the release of statistics in a variety of media. These range from the release of key aggregates in press releases and summary tables on websites, the use of paper publications, CD-ROMs and finally, providing user access to more detailed data through on-line databases.

As mentioned above in the introduction in Section A, the main aim of this Manual is to provide economic analysts with information on short-term movements in the service sector that would complement existing indices of industrial production (IIP). The introduction also mentions that such service indicators, where they exist at the national level, tend to receive less attention by users than other key indicators, often being regarded more as supplementary indicators. Possible reasons for this are outlined in Section A.2.

In order to overcome the inertia of existing user practices, national agencies therefore need to devise strategies for placing any new output indicators for services both in the context of existing key short-term indicators (such as IIP, price indices, employment and unemployment indicators, external trade, etc.) and in terms of the importance of the services sector and how short-term movements in services may differ from those for other sectors such as manufacturing and agriculture.

Ideally, the "promotion" of the ISP should be undertaken within a broader strategy for the development of a range of short-term indicators for services. For example, each of the short-term indicators listed above have a services "component" that should be developed and where possible sector disaggregations provided that highlight differences in short-term evolution.

The obvious targets for this information and strategies are government and non-government analysts themselves, however, there is also a need to develop a targeted approach to the media.

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# ANNEXES

Annex 1

# A list of proposed deflators (using UK practice as an example)

| | Code | CPI | PPI |
|---|---|---|---|
| 50 | 5010 | New and used cars; other new vehicles | New cars; new and used lorries and trailers |
| | 5020 | Car maintenance and repairs | Car maintenance and repairs; lorry and truck maintenance and repairs |
| | 5030 | Motor vehicle parts and accessories | Motor vehicle parts and accessories |
| | 5040 | Motor cycles; motorcycle maintenance and repairs | Motor cycles; motorcycle maintenance and repairs |
| | 5050 | Petrol; diesel; lubricants and cooling products | None |
| 51 | 511 | None | None |
| | 512 | None | Agricultural raw materials; food and beverages; tobacco product excluding duty |
| | 513 | None | Textile, clothing and footwear; household furniture and appliances; other household goods |
| | 514 | None | Coal and petroleum products; metals and metal ores; wastes and scrap |
| | 515 | None | Computers and software; electronic and telecommunication equipment; office machinery and equipment |
| | 519 | None | Various miscellaneous goods |
| 52 | 521 | Food and beverages; cigarettes and tobacco; pharmaceutical and medical goods, cosmetic and toilet articles; textiles, clothing, footwear and leather goods; household appliances; hardware, paints and glass | None |
| | 522 | Fruit and vegetables; meat and meat products; fish seafood products; bread and cakes; cigarettes and tobacco | None |
| | 523 | Pharmaceutical and medical goods; textiles, clothing, footwear and leather goods; household appliances; hardware, paints and glass | None |
| | 524 | Antiques; second-handed books; other second-handed goods | None |
| | 525 | Food and beverages; pharmaceutical and medical goods, cosmetic and toilet articles; textiles, clothing, footwear and leather goods; household appliances; articles and equipment | None |
| | 526 | Repair of household appliances; repair of leather goods; repair of clocks and watches | None |
| 55 | 5510 | Hotels; domestic holidays; camping sites; restaurant meals; beer on sales; wine and spirits on sales | Conference rooms |
| | 5520 | Restaurant meals; beer on sales; wine and spirits on sales; self-service meals; burgers to eat-in; take-aways and snacks; night clubs admission; canteens and catering | Catering for functions |
| 60 | 6010 | Rail fares | Rail freight changes |
| | 6021 | Underground railways; other metro fares; bus and coach fares | None |

| | Code | CPI | PPI |
|---|---|---|---|
| | 6022 | Taxi and minicab fares | Non-local bus and coach journeys all hiring |
| | 6023 | None | Road haulage |
| 61 | 6110 | Sea travel | Sea freight (import; export) |
| | 6120 | River and canal excursions; inland ferries and water taxis | Inland waterways freight (internal and seagoing traffic) |
| 62 | 6210 | Internal air travel; trans-continental air travel; inter-continental air travel | Air freight (import; export) |
| | 6220 | Carter air fares ; other non-scheduled air fares | Charter air fares; other non-scheduled air fares |
| 63 | 6301 | None | Cargo handling |
| | 6302 | None | Storage and warehousing |
| | 6303 | None | Miscellaneous transport activities |
| | 6304 | Holidays | Travel agents and tour operators |
| | 6309 | None | Freight forwarding; freight logistic |
| 64 | 6411 | Letters and parcels | Letters and parcels |
| | 6412 | None | Domestic letters and parcels; trans-continental letters and parcels; inter-continental letter and parcels |
| | 6420 | Telephone services | Telephone services; transmission of radio and television programme |
| 65 | 6519 | Retail back fees; savings bank fees; investment fund management fees, overall CPI, general GDP deflator | Retail back fees; merchant bank fees; investment fund management fees; security transaction fees |
| | 6592 | Retail back fees; savings bank fees; investment fund management fees, overall CPI, general GDP deflator | Retail back fees; merchant bank fees; investment fund management fees; security transaction fees |
| 66 | 6601 | Life insurance premiums, life insurance set up fees | None |
| | 6602 | Employees' contributions | Employees' contributions |
| | 6603 | Car insurance premiums; house insurance premiums; health insurance premiums | Building insurance premiums; pecuniary loss and liability premiums |
| 67 | 6711 | Financial services | Financial service |
| | 6712 | Financial services | Financial service |
| | 6719 | Financial advice fees; mortgage advice fees; bureau de change commission fees | None |
| | 6720 | Insurance premium | Insurance premium |
| 70 | 7010 | Residential rent | Residential rent; non-residential rent |
| | 7020 | Residential rent; management fees | Non-residential rent; management fees |
| 71 | 711 | Car and van rental | Car and van rental; truck and trailer rental; boat rental (passenger; freight); air transport rental (passenger; freight) |
| | 712 | None | Agricultural machinery rental; construction material rental; office machinery rental |
| | 713 | Furniture and appliance rental; do-it-yourself equipment rental; records, video etc. rental | Furniture and appliance rental; flowers and plants rental |
| 72 | 721 | None | Consultancy (hardware; software) |
| | 722 | Software packages | Software (publishing; consultancy; production; maintenance) |
| | 723 | None | Data processing; operation of data processing facilities |
| | 724 | Internet services | Database service; online publishing |
| | 725 | None | Maintenance of (computing equipment; photocopiers; other office machinery) |
| | 729 | None | Computer disaster recovery; software installation services |
| 73 | 7310 | None | Research charges out rates |
| | 7320 | None | Research charges out rates |
| 74 | 741 | Legal services; financial services | Services (legal; financial); market research; |

| | Code | CPI | PPI |
|---|---|---|---|
| | | | consultancy (business; management); management holding companies |
| | 742 | Architectural services | Services (architectural; engineering); other technical consultancy; technical testing |
| | 743 | None | Advertising services; advertising space |
| | 749 | Film processing | Recruitment agencies; security services; contract cleaning; film processing; contract packaging; stenographic services |
| 75 | | None | None |
| 80 | 8010 | Education fees (pre-primary; primary) | None |
| | 8021 | Secondary education fees (day schools; boarding schools) | None |
| | 8022 | Secondary education fees (day schools; boarding schools) | None |
| | 8030 | Degree fees; non-degree fees | None |
| | 8090 | Day and evening class fees; driving school fees; fees for vocational courses | Training course fees |
| 85 | 8511 | Health services | Health services |
| | 8512 | Health services; dental charges | Health services |
| | 8519 | Physiotherapy; eyesight test fees; chiropody fees; chiropractic fees | Health services |
| | 8520 | Veterinary fees | Veterinary fees |
| | 8531 | Residential care | Residential care |
| | 8532 | Non-residential care | Non-residential care |
| 90 | 9000 | Waste disposal | Waste disposal; contaminated waste; decontamination |
| 91 | 9111 | None | Legal fees; publishing of journals and periodicals |
| | 9112 | Examination fees | Legal fees; publishing of journals and periodicals |
| | 9120 | None | Legal fees; publishing of journals and periodicals |
| | 9191 | None | Building insurance; contents insurance |
| | 9192 | Alcohol | Hire of conference facilities; publishing of journals and periodicals |
| | 9199 | Alcohol; legal fees | Publishing of journals and periodicals |
| 92 | 921 | Tickets (cinema; theatre tickets; concert) | Advertising (cinema; television) |
| | 922 | None | News agencies |
| | 923 | Entrance fees to (museums; historical sites; botanical gardens; zoological gardens) | None |
| | 924 | Health clubs; football matches; bowling alleys; golf club membership | None |
| 93 | 9301 | Services (laundry; dry cleaning); carpet and rug shampooing | Services (laundry; dry cleaning); carpet and rug shampooing |
| | 9302 | Cutting (men; women); permanent; colouring; beauty treatments | None |
| | 9303 | Funeral services; grave and gravestones; crematorium fees | Maintenance of grave and gravestones |
| | 9309 | Turkish bath; escort services; coin-operated personal service machines; pet grooming and boarding | None |
| 95 | 9500 | Domestic service | None |
| 96 | 9600 | Domestic service | None |
| 97 | 9700 | Domestic service | None |

Annex 2

# Recommended variables and deflators and their sources

[Please refer the separate Excel file attached]