Chapter 1. General aspects of Service Producer Price Indices compilation

This chapter gives an overview of general aspects of service producer price indices (SPPIs) compilation. The chapter presents methodological information on the core measurement issues of SPPIs that the compiler will have to deal with when starting compilation and discusses the definition, uses and scope of SPPIs; product and industry SPPIs; the price concept underlying SPPIs; the appropriate statistical units; the international classifications; the identification of service products; the sample frame and weights and; the treatment of quality changes. Efforts have been made to present discussions in line with the Producer Price Index Manual (PPI Manual)[1] and to focus on service-specific aspects of producer price indices (PPIs) compilation by developing further the conceptual framework.

1.1. Definition, uses and scope of Service Producer Price Indices

1.1.1. Definition of SPPIs

SPPIs are defined for the purposes of this *Guide* as output price indices for services that provide measures of the average movements of prices – valued at basic prices – received by domestic service producers. SPPIs are therefore a subset of output PPIs.

1.1.2. Uses and Objectives of SPPIs

SPPIs serve two main functions. The first is to provide an indication of price change by producers of services, and therefore an indicator of inflationary pressure. The second is to provide a suitable deflator of nominal values of output or intermediate consumption for the compilation of production volumes in the national accounts. Notwithstanding the importance that should be attached to use of SPPIs as a timely indicator of inflationary pressures, this *Guide* gives preference to their use as deflators in the national accounts. This choice is in line with the *PPI Manual*.[2]

The choice of primary use of SPPIs can often dictate the way in which they are defined and constructed. The preference given here to their role in deflating current price estimates of economic activity to arrive at measures of activity in constant prices determines a number of characteristics of the indices.

First, the scope of SPPIs should, in theory, cover services provided for all uses, intermediate and domestic final consumption, and for exports. Ideally, separate SPPIs should be available for each of these end use categories, reflecting the fact that prices, and price movements, may discriminate between users. The scope and coverage of SPPIs are discussed further at section 1.1.3.

Second, SPPIs should measure change in the prices of products, rather than industries. This reflects the fact that the output of industries in most countries can typically be broken down into various products, and so measures of industry output in volume terms can be readily derived. Moreover, in order to arrive at volume estimates of value-added it is necessary to use double-deflation which requires deflating the intermediate consumption of industries, which is again typically measured on a product basis. CPIs and other price indices also measure change in the prices of products rather than industries. This approach provides greater scope for combining various price index data at an aggregate level for use in, for example, balancing supply and use tables in the national accounts and in macroeconomic analysis. The choice between product and industry SPPIs is discussed in more detail at section 1.2.

Third, SPPIs should represent all output as defined in national accounts and follow, as closely as possible, the accrual principle in recording prices. In accrual recording, the output of services in national accounts and associated prices are recorded at the date when services are provided. This can give rise to a number of practical problems in respect of the recording of prices. These are discussed further at section 1.3.2.

Normally, there is no conflict between the two main uses of SPPIs mentioned above and where they do arise they can often be reconciled in index development. However, in exceptional cases, it is important to explicitly assess how well an SPPI fits each of them. Two examples illustrate this issue which is discussed in more detail in section 1.3 in the context of the timing of price collection.

1. In air transport, a timely indicator of price change can be based on price quotes for tickets that are bought long before the travel date. For instance, if prices of summer vacation airfares are known by April, this provides a timely indication of emerging price movements that could inform monetary policy decision making. However for deflation of production, these prices need to be reflected in the SPPI for the period in which the underlying production occurred, in this case the summer months.
2. An extreme case is provided by operational car leasing for which prices may stay fixed for several years. The correct deflator should reflect the prices that were in place over the time of the lease for all production. This means that the deflator at any point in time would be mainly composed of old lease contracts that were still running, with a relatively small weight given to the lease price in the most recent period. However, the most pertinent indicator of inflationary pressures would arguably be the price levels of new contracts.

1.1.3. Scope and coverage

The supply and use accounting framework focuses on the process of production and consumption and can help to answer the question "Where do products come from and how are they used?". The supply table itemises the products each industry domestically produces or imports and these are then identified in the use table where the allocation of each product between intermediate consumption and final demand (final consumption, capital formation, and exports) is recorded. Compiling supply and use tables at current values ensures consistency in the different measures of Gross Domestic Product (GDP). Changes in the values of flows of goods and services can be decomposed into two components, one reflecting changes in the price of goods and services, and the other changes in their volume.

The System of National Accounts (SNA)[3] recommends compiling price and volume measures within the accounting framework provided by the supply and use tables because this framework provides a check on the numerical consistency and reliability of the set of measures as a whole.[4]

In principle, four major types of price indices, Producer Price Indices (PPIs), Consumer Price Indices (CPIs), Export Price Indices (XPIs) and Import Price Indices (MPIs) should be available to derive volume measures in the different parts of the supply-use framework. The *PPI Manual* uses this national accounts framework to illustrate the relationships between different price indices.[5]

Services make up a sub-set of all products produced and consumed in an economy. Their supply and use, and associated price indices comprise the following sub-areas:

- Domestic output of services – SPPIs;
- Consumption of services by households – CPIs;
- Other domestic uses of services, such as intermediate consumption;
- Exports of services – XPIs;
- Imports of services – MPIs.

In this framework, SPPIs are crucial not only for measuring output of services but also for estimating price development of the use of services in areas where independent

price indices are not available. This concerns the intermediate consumption of services and exports of services in particular.[6]

This *Guide* has adopted as a principle that the scope of SPPIs should cover all domestic production of services provided for all uses, intermediate and domestic final consumption, and for exports. The consequences in terms of the coverage of SPPIs are discussed below.

First, by definition, services provided by non-resident units are not within the scope of SPPIs which are designed to reflect price movements of domestic producers only. While the separation of resident and foreign producers (and consumers) sounds straightforward, it is not always easy to define. The *2008 SNA* provides general principles for the recording of a unit by referring to its "centre of predominant economic interest". This is explained in par. 4.14 as follows:[7]

> *An institutional unit has a centre of predominant economic interest in an economic territory when there exists, within the economic territory, some location, dwelling, place of production, or other premises on which or from which the unit engages and intends to continue engaging, either indefinitely or over a finite but long period of time, in economic activities and transactions on a significant scale. The location need not be fixed so long as it remains within the economic territory. Actual or intended location for one year or more is used as an operational definition; while the choice of one year as a specific period is somewhat arbitrary, it is adopted to avoid uncertainty and facilitate international consistency. In most cases, it is reasonable to assume that an institutional unit has a centre of economic interest in a country if it has already engaged in economic activities and transactions on a significant scale in the country for one year or more, or it intends to do so. The conduct of economic activities and transactions over a period of one year normally implies a centre of interest, but the choice of any specific period of time is somewhat arbitrary and it must be emphasised that one year is suggested only as a guideline and not as an inflexible rule.*

In par. 4.15, the *2008 SNA* provides some further guidance for the implementation of this definition:

> *Corporations and NPIs may normally be expected to have a centre of economic interest in the country in which they are legally constituted and registered. Corporations may be resident in countries different from their shareholders and subsidiary corporations may be resident in countries different from their parent corporations. When a corporation, or unincorporated enterprise, maintains a branch, office or production site in another country in order to engage in production over a long period of time (usually taken to be one year or more) but without creating a subsidiary corporation for the purpose, the branch, office or site is considered to be a quasi-corporation (that is, a separate institutional unit) resident in the country in which it is located.*

Second, the coverage of all output implies that SPPIs comprise prices for the provision of services to all institutional sectors, financial and non-financial corporations, government units, non-profit institutions (NPISHs), households and the rest of the world. However, as mentioned above, services provided for different sectors are not necessarily the same and their price development can be different. Sub-division of an SPPI by destination of output, where possible, is therefore strongly encouraged particularly for purposes of deflation in national accounts.

Third, there is a potential overlap between SPPIs and CPIs when it comes to the pricing of services delivered to households. There is no general rule for how the compilation of SPPIs *vis-à-vis* CPIs are best organised. The situation varies between service products and data sources may also differ between countries. It may be possible to use CPI information to obtain prices for services acquired by households and if so the data collection for SPPIs would be reduced to business-to-business (BtoB) and export transactions if significant. However, the price concept underlying CPIs is not the same as that underlying SPPIs.[8] There may be other cases where the service output and its prices for different end users are very similar or cannot be separated in practice (*e.g.*, economy-fare air travel). In these cases it may be easier to cover service output prices to all end users in a single estimation.

Statistics by end use, like supply and use tables, are the appropriate tool to identify the relative importance of groups of purchasers (export, intermediate consumption, households) of the output of an industry.

Box 1.1. SPPI by destination - the French experience

Since May 2013, the French National Statistical Office (INSEE) publishes SPPIs disaggregated by destination of output, for a wide range of services activities (*e.g.* sections H, I, J, L, M and N of NACE Rev. 2).

Definition

- **Domestic Business-to-Business SPPIs (BtoB) measure transaction price changes for services sold by national producers to national businesses**; they cover domestic production sold to legal entities established in France (including the general government sector, French affiliates of foreign groups, etc.).
- **Domestic Business-to-Consumer SPPIs (BtoC) measure transaction price changes for services sold by national producers to households in the national territory**; CPIs are the main source for these indices; valued at purchasers' prices, they are however adjusted to basic prices by deducting any taxes including VAT and trade margins.
- **Domestic Business-to-Export SPPIs (BtoE) measure transaction price changes for services sold by national producers to foreign markets**. In the case of France, transaction prices are converted to Euros and therefore include exchange rate effects. Note that intra-group transactions are included.
- **Domestic Business-to-All SPPIs (BtoAll) measure transaction price changes for services sold by national producers to all markets**. INSEE obtains BtoAll SPPIs by "horizontal aggregation" (at each classification level) of BtoB, BtoC and BtoE indices.

Valuation

Measurement of SPPIs in France is conducted at basic prices; precisely by activity, including subsidies on products, but excluding VAT and other taxes on products. Intra-group transactions are included.

Additional BtoB SPPIs valued at market prices (by products, including VAT, excluding subsidies on products, including taxes on products) are also computed mainly for use in contract escalation. Intra-group transactions are excluded.

Box 1.1. SPPI by destination - the French experience, *continued*

Use

The disaggregation of SPPIs by destination of output is of particular relevance to both the deflation of production figures derived from structural business statistics and also to distinguishing between the change in volume of activity and the change in prices of activity ("volume-price breakdown").

The disaggregated SPPIs also provide an indication of inflationary pressure through the economy. As mentioned above, BtoB SPPIs valued generally at market prices may be used in contract escalation.

Source

French SPPIs by destination of output are calculated on the basis of quarterly price observation (or annual observation for some respondents) of some 9,789 products collected from a representative sample of 1,725 respondents in the mandatory "Observation des Prix de l'Industrie et des Services" survey. This survey covers 59% of the value (in 2010) of the markets and classes of products. A further 19% are derived from consumer price indices. The remaining 22% are imputed using close price indicators (from a similar market or class of products).

Computation

French SPPIs by destination of output are Laspeyres chain-linked indices. The weights at the detailed levels (strictly below the 4-digits level of NACE) are updated every five years when the sample of surveyed units in a class of products is renewed. Weights at the upper level are derived from measures of turnover by class of products and markets, and are consistent with the national accounts. These upper level weights are updated annually.

Sources: INSEE, more detailed information is available at:
http://www.insee.fr/fr/themes/indicateur.asp?id=100

1.2. Product and industry based SPPIs

As previously noted, the *SPPI Guide* gives preference to SPPIs measuring change in the prices of products, rather than industries. In practice however, the primary goal of developing product SPPIs is often not systematically adopted because detailed output data is not available for all service products. Thus, SPPIs for a given country may be a mixture of industry and product SPPIs depending on the data sources available for various industries. In this sense, it is important to note that in general, product based statistics on outputs are less developed for service industries than for goods industries.

However, the choice between industry and product based SPPIs may be less important for services than for goods, because the share of secondary production falling under a different industrial class to the principal production tends to be smaller in the former. Exceptions exist however, with significant or growing secondary production in industries such as management consultancy.

Most countries establish individual SPPIs at the 4-digit industry level (ISIC *Class* level or equivalent). An industry based index is created from a sample of business enterprises classified under that industry. All of the output of these sampled units is represented, even secondary activity output that is classified under other industries in the

international classification systems, and aggregated to form these 4-digit industry level indices.

Product based indices are created from samples of products. All service product output (obtained from lists of producers of each product) is eligible for selection, regardless of the classification of the business enterprises that produce it. Price movements for products are generally aggregated to form product *Group* or product *Class* level indices (following the CPC Ver.2 terminology) and can also be aggregated to 4-digit industry level indices.

The larger the share of industry turnover generated from the provision of secondary service activities the stronger the argument for compiling product based SPPIs.

The choice between product and industry based indices and the methodologies for compiling them are discussed further in chapter 3.

1.3. Price concept

1.3.1. Valuation

The *PPI Manual* recommends that PPIs should measure actual transaction prices reflecting the revenue received by the producer for products sold to customers.[9] They should take into account any applicable discounts, rebates, surcharges, etc. that may apply to the customers. Because the price reflects revenue received by the producer, taxes on products should be excluded from prices whereas subsidies on products received by the producer, if there are any, should be added. In other words, the recommendation is to apply a concept of basic prices in the measurement of SPPIs. This is also recommended by the *2008 SNA* for the valuation of output in the national accounts.[10]

1.3.2. Accrual recording

The *PPI Manual* recommends that, in line with the valuation of output in the SNA, accrual accounting rules should be followed as far as possible, so that transaction prices are recorded at the time of shipping or delivery.

Accrual accounting is defined in the *2008 SNA* par. 2.55 as follows:[11]

The general principle in national accounting is that transactions between institutional units have to be recorded when claims and obligations arise, are transformed or are cancelled. This time of recording is called an accrual basis. Transactions internal to one institutional unit are equivalently recorded when economic value is created, transformed or extinguished. Generally speaking, all transactions, however they are described, can always be viewed as dealing with economic value.

Accrual recording, in the case of services, is explained in the *2008 SNA* par. 3.170:

Services are recorded in the SNA when they are provided. Some services are special in the sense that they are characteristically supplied on a continuous basis. Examples are operating leasing, insurance and housing services (including those of owner-occupied dwellings). These services are recorded as provided continuously over the whole period the contract lasts or the dwelling is available.

There are no significant difficulties in implementing the accrual principle in price indices, providing the provision of services coincides closely with the time when the

contract is signed or the payment made. However, there can be differences in practice between the time when services are provided and when they are paid for.

A case in point is transportation services; air transport particularly, where non-refundable tickets purchased months in advance can be bought at lower prices. Evidently, services that have to be paid for at different points of time to when they are provided belong to different quality categories and have to be treated as different services. But how should the accrual principal be implemented in such cases?

The *2008 SNA* recommendations suggest that prepayments should be recorded as "interest free loans" (rather than as purchases of tickets) from clients to service providers that are paid back at the time of service provision. The client "buys" the ticket once again at the time of service provision, which ensures consistency between supply and demand of services.[12] This means that prices used for SPPIs should be based on the actual purchased values accrued and recorded to the time of service provision.

Another problematic case for application of the accrual principle arises when there are long-term contracts with up-front payments rather than payments made over the duration of the contracts. Services are provided continuously and accordingly, prices should be allocated to the whole period. Because of the up-front payment and the long-term nature of the contract it may not be possible to determine whether the price for the delivery of the service is the same throughout the period or it varies. All that is known is the average price over the entire period. However, prices of contracts should reflect supply and demand conditions at the time when services are actually provided.

One possible approach to be considered is to escalate prices over the contract period on the basis of cost development of inputs. Such a procedure is typically applied in the estimation of price development for the shipbuilding industry.[13] While this method might be reasonable in individual contracts it does not capture the evolution of market conditions (or captures only supply-side conditions). It seems that there is no ideal way available to use prices of long-term contracts for SPPIs.

The examples above show that while the accrual principle is very important for services, it may be difficult to implement. Simple solutions can sometimes be useful if they are easily understood by users and bearing in mind that the accrual principle is not always rigorously implemented in the national accounts. Thus, while accrual accounting should in principle be respected, it has to be applied with flexibility in practice.

1.3.3. Frequency of price collection

The frequency of price collection can be monthly or quarterly. When collecting prices for a particular period, there are two basic methods:[14]

1. Period prices are an estimate of the average price throughout the period. A period price should take account of price changes that occurred during the period;
2. Point-in-time prices relate to the price on a particular date or sub-period. For example, it might be the nearest trading day to the midpoint of the period or the middle week of the quarter or month.

Generally, collection of *period prices* is to be preferred. *Point-in-time prices* can be considered for use only if they are expected to be representative over the entire reference period (*i.e.* month or quarter). They should be used with caution if the price collection frequency is greater than one month. It should be noted that the distinction between *period price* and *point-in-time-price* does not address the issue of when the service is

provided. For instance, both *period prices* and *point-in-time prices* can be surveyed for air transport tickets either long before the actual transport, or in the same period as the transport takes place.

1.4. Statistical units

1.4.1. General principles

The *PPI Manual* recommends that a statistical unit should refer to a single output generating entity, analogous to the SNA *establishment* concept.[15] Within the SNA, output measures are based on the production of establishments or *local kind of activity units* (LKAUs) as they are referred in the *European system of national accounts* (ESA 2010) terminology.[16] Establishments are defined as production units that have a single location and whose production is homogeneous (subject to the limitations of obtaining production account data). Thus, enterprises might be partitioned into smaller and more homogeneous units if they are engaged in different kinds of activities or situated in different locations, and services provided by these units should be registered separately. Weighting of and sampling for, an index should in principle be organised accordingly.

In practice, the use of establishments as the basis for weighting and sampling is not always possible as there may be insufficient information available for them. In the case of services, information on turnover by enterprise rather than establishment is typically used as a basis for index compilation. There are also considerable differences between service industries in this respect.

1.4.2. Outputs of statistical units in special cases

A consequence of the definition of statistical units as establishments is that, for consistency, sub-contracts of services should be treated in an index in the same way as any other service, irrespective of whether a service contains sub-contracts or is in itself is a sub-contract. This also holds for any activities that may be outsourced.

This is self-evident if the contractor and sub-contractor belong to different categories in the product or activity classification, as sub-contracted activities do not differ from other activities used as intermediate consumption. However, where the sub-contractor is in the same activity classification as the contractor, it is legitimate to question whether some attempt should be made to remove the sub-contracted activity in constructing an overall SPPI for that activity as there will be some element of double counting. This reflects the fact that the contractor may pass these price changes through in the sales of its own production. However, as stated previously, the main goal of SPPIs should be to provide a price index for national accounts purposes and because output is measured on a gross basis, so too should SPPIs.

In national accounts, separate indices for contracts and sub-contracts are in principle needed for deflation purposes, but only one kind of index is normally produced. If this is the case, an index based on main contracts (that may or may not include sub-contracts) should be preferred on the grounds that it is likely to give an acceptable proxy for overall gross price movements. Equally, SPPIs based on main contracts are likely to be the appropriate deflator for the use of these services in other industries and sectors.

Outsourcing relates to the purchase by business enterprises of ancillary services they had previously conducted in-house. Because many of these services were previously produced within the non-service sector, outsourcing typically leads to growth in service

sector value-added with corresponding falls in manufacturing value-added (mainly through compensation of employees). However, there are no specific reasons why outsourced services should not be treated like any other purchased services for inclusion in SPPIs.

Output also covers services that an establishment provides to other units of the same enterprise.[17] The *2008 SNA* recommends that these intra-enterprise services should be valued at current basic values that would have been received if they had been sold.[18] However, in the enterprise's bookkeeping these services are often valued at reduced amounts, and sometimes not at all, rather than at current basic prices. Furthermore, the services are unique. The *PPI Manual* makes clear that "one of the primary goals of the PPI is to help determine the magnitude and direction of price movement on both a macro- and microeconomic level and for such a use, any index containing non-market prices not paralleling market price movement is of dubious value."[19] Because the national accounts should in theory value these transactions at current market prices rather than the transfer-price values recorded in the establishment and enterprise's accounts, it is preferable to exclude these types of services in compiling SPPIs. Their inclusion may introduce inconsistencies in the deflation of the national accounts.

There are also borderline cases such as the provision of services by temporary employment agencies. The *2008 SNA* (par. 19.21h) recommends that persons employed by temporary employment agencies are to be included in the industry of the agency which employs them, and not in the industry of the enterprise for which they actually work. As a consequence of this recommendation, the value of services produced by the agencies amounts to all payments (including compensation of temporary employees) and not only "net fees" received by the agency. However, this may not be implemented in practice. Any decision concerning the gross or net treatment of prices underlying the SPPI for temporary employment agencies should be made in line with the national accounts practice in a given country.[20] In principle the national accounts should always show non-consolidated flows (gross) but this may not be the case for certain activities in some countries depending on national circumstances. In these cases the SPPI should be designed accordingly.

One particular activity that merits special attention relates to processor firms (*i.e.* firms that provide processing services by manufacturing goods for clients who own part of the inputs in the production process). The *2008 SNA* recommends that international transactions by these firms should follow the principle of economic ownership, bringing the treatment of processing firms that manufacture goods for foreign clients in line with that of processing firms providing manufactured goods for domestic clients.[21] These manufacturing services are currently considered out of the scope of this *Guide*.

1.5. Classification systems

Classification systems provide an organising structure for reporting units and products. Once the sub-aggregates within the classification system are selected, an appropriate frame can be identified from which representative establishments and service products can be selected for inclusion in the index. The classification system also determines the structure of the index and defines the weighting system.

1.5.1. Classification systems by activity

Individual countries usually collect information by activity using their own national activity classifications that reflect the structure of their economy. This may cause some degree of incomparability across countries but typically, especially at the higher levels of aggregation, national classification systems are consistent with the *International Standard Industrial Classification of all Economic Activities* (ISIC).

The other three main regional classification systems by activity are:

- The *Classification of Economic Activities within the European Communities* (NACE);
- The *North American Industrial Classification System* (NAICS);
- *Australian and New Zealand Standard Industrial Classification* (ANZSIC).

1.5.2. Classification systems by product

Individual countries may also refer to national classifications by product or commodity, which are designed to categorise products by common characteristics. Unlike their activity counterparts, national product classifications are typically less consistent with the international standard, the *Central Product Classification* (CPC).

The other two main regional classification systems by product are:

- *Classification of Products by Activity* (CPA) – the CPC equivalent European Union classification;
- *North American Product Classification System* (NAPCS).

Classifications are discussed at a general level in the *PPI Manual*[22] and specific classification systems are well documented elsewhere.[23] Classification aspects relating to services are discussed in chapter 10 of the *PPI Manual* where SPPIs for a set of service industries are introduced. It should be noted that product classifications serve as a guide and cannot in themselves be used to form the components of a weighting structure for an index. This is done by accessing information from structural statistics or information collected during the respondent initialisation process. More information on these processes is provided in *chapter 3*.

1.6. Identification of service products

1.6.1. General guidelines

The identification of service products is a fundamental task in the compilation of SPPIs. It involves identifying those service characteristics that are price-relevant and distinguishing between apparently similar services. These tasks tend to be more complex for services than for goods. Similarly, services that are primarily sold to other businesses tend to be more complex than those sold mainly to households.

Factors to be taken into account in the determination of products are discussed at a general level in the *2008 SNA*.[24] These guidelines are valid for both goods and services and help to identify different products at a given point in time; they also give guidance for the index treatment of goods and services, whose characteristics change over time. A general principle is laid out in par. 15.67 of the *2008 SNA* as follows:[25]

It is generally assumed in economic analysis that whenever a difference in price is found between two goods and services that appear to be physically identical there must be some other factor, such as location, timing or conditions of sale that is introducing a difference in quality. Otherwise, it can be argued that the difference could not persist, as rational purchasers would always buy lower priced items and no sales would take place at higher prices.

The *2008 SNA* further states in paragraph 15.75 that "If there is doubt as to whether the price differences constitute price discrimination, it seems preferable to assume that they reflect quality differences…".[26] Equally, *2008 SNA* rules identify location as a price determining factor.[27] Conceptually therefore, prices of the "same" service provided by a business enterprise in two locations should not be averaged but treated as different services.

However, the *2008 SNA* suggests that price differences between similar service products imply quality differences between these products only on the condition that "full" information is available. For services provided to business enterprises, this condition is often not met because services are typically based on unique contracts between service providers and clients. Prices paid by different clients might vary significantly but this information is not freely available. Additional guidance is needed and the ESA 2010 summarises the general rules to be applied in situations where apparently similar products are transacted at different prices as follows.[28]

In practice, however, two units of a product with identical physical characteristics may be sold at different prices for two types of reasons.

(a) Two units with identical physical characteristics can be considered as not being equivalent if they are sold in different places, at different periods or according to different conditions. In this case, the units have to be regarded as corresponding to different homogeneous products.

(b) Two units with identical physical characteristics can be sold at different prices, either due to lack of information, or to restrictions brought to purchase freedom, or to the existence of parallel markets. In this case, the units have to be regarded as belonging to the same homogeneous product.

This implies that in most cases differences in prices should, at least in practice, be interpreted as price differences rather than quality differences. Specifically, the provision of services that are identical but whose prices discriminate between markets and or clients should be assumed to have the same quality.

1.6.2. Duration of the service-provision as a service determining factor

The delivery of services often coincides with their production. Consequently, the duration of production is of direct importance to the purchaser of services and may constitute an important price determining factor. For example, in the case of transport services the preference for faster transportation means that the duration of the production of the service often impacts on their price.

There are other services where production and consumption do not necessarily coincide (*e.g.* accounting services) and where duration might have less importance as a price-determining characteristic. For these services it is normally sufficient to ensure that the resulting service is well specified. In general, services where clients are directly involved in the creation of the service tend to belong more often to those cases where

addressing duration is important.[29] These are largely consumer services rather than business services. For most business services, longer or shorter duration of production is generally indicative of lower or higher productivity[30] but is not relevant for the quality of the service product, and there is no need to take it into account as long as duration is not explicitly referred in the service specification.

Addressing the question of duration is particularly relevant when prices used in index compilation do not refer to a complete service product received by a client but are expressed in terms of working time, such as charge-out rates where adjustments to reflect productivity changes will be necessary. These issues are discussed in more detail in *chapter 2*.

1.7. Sample frame and weights

1.7.1. Sample frame

SPPIs can be established on the basis of industries, service products or both (see section 1.2). The required sample frame depends on this choice. The use of industries is in most cases easier because the information on establishments needed to construct a frame is organised by industry rather than by product. This issue is further discussed in *chapter 3* of this *Guide*.

The sample frame represents the universe (or population) from which the sample is selected. Business registers often provide the source data for the sample frame. Ideally, the business register will be updated regularly and provide sufficient information for each unit in respect of the value of output at industry and/or product level and also contact details.

1.7.2. Weights

Weights determine the impact that a particular price change will have on the overall index and are key elements in the construction of SPPIs. As price change across service products is not uniform over time, the relative importance of a product, as well as its price development, must be considered in index calculation. The same holds true for establishments and industries. As the market for products and the performance of establishments evolves over time weights must be updated to reflect these changes.

The calculation of SPPIs usually proceeds in two stages which involve the use of relevant weighting at each level. In almost all countries the first stage of index aggregation results in product indices, which are then aggregated further to give both higher level product indices and/or industry indices:

- At the first stage of elementary aggregation, individual prices are combined and, where possible, each price should be weighted by the value of production which it represents. In other words if several establishments (X, Y, Z) produce product A, the weight given to the price of product A produced by establishment X, P_{XA} should correspond to the share of establishment X's production of A in the economy. Where more than one price (i, j, k) for product A is collected from a single establishment, the prices should be weighted using the relative production values of the establishment for the different transaction specifications i, j, k. Thus, it is important to have output data at a detailed product level for all establishments in the SPPI sample;

- These detailed product level indices are then weighted together to give higher level product indices using the values of production of the detailed products for the economy as a whole (macro-weights). Industry indices are obtained by weighting together the product indices relevant to each industry. Ideally, account should be taken of secondary products when compiling industry SPPIs, *i.e.*, detailed product indices covering both the principal and the secondary activities (products) should be combined to give industry SPPIs with the same coverage as the service output which the SPPIs may be used to deflate.

Two approaches can be used to weight individual PPIs to form a higher aggregate, referred to here as gross and net sector weights. This *Guide* gives preference to gross output weights that are simply the total deliveries or sales of each service product in that sector to all consumers; whether final or intermediate consumption. However, aggregation of industry or group indices using gross weights will result in some, albeit implicit, degree of double-counting the effect of input price change.

If the indices are used to analyse how inflationary pressures are transmitted from one sector to another then net sector weights should be used in the compilation of higher level aggregates to overcome the 'double-counting' problem. Net sector weights are based on the value of sales to business enterprises outside the industry or group of industries in question (inter-industry sales only). However, the use of net weights for compiling aggregate indices for inflation monitoring needs detailed input-output tables; which implies an extra layer of complexity in the construction of SPPIs.

The need for revisions to weights depends largely on the service industries concerned. In some industries the contents and structure of service output change rapidly, requiring frequent updating of weights. These changes can be due to the emergence of new products as well as change in the pricing systems. In some other industries there is no strong need to update weights very frequently because, in general, estimated price indices are not very sensitive to small errors in weights. Different strategies can be followed in revising weights, for example upper-level weights may be updated more frequently than lower-level weights. As a general rule, the *PPI Manual* recommends that weights should be updated, at least once every five years to reflect changes in market structure. [31]

More information on this topic can be found in chapter 9 of the *PPI Manual*.

1.8. Treatment of quality change

Assessing the quality of products and adjusting price observations for quality changes are important tasks that price index compilers encounter each time an existing sampled product is replaced by a new one. Chapters 7, 8 and 21 of the *PPI Manual* deal with issues related to quality changes.

The *PPI Manual* (par. 7.75) provides a list of methods that can be used for dealing with quality changes of products.

The same quality adjustments methods can in principle be used for goods and services. In practice however, fewer options are available for services. For example, the hedonic approach is rarely applied, because the quality of services is often made up of intangible factors that are difficult to identify and to measure in quantity terms. Moreover, even where quality factors of service products can be identified, it is often hard to find suitable data to capture gradual changes in the quality of services.

A particular challenge for the compilation of SPPIs is that business services are often unique. One might conclude that the quality of services changes over time and/or that there are differences in the quality of similar services provided by different service producers but it is not possible to quantify the quality change. In some cases, such as advertising services, the quality of a service may not be known when the service is provided but can only be determined with reference to its impact. In these situations, where the characteristics of services are not observable at the time of service provision, it may be considered helpful to use information on outcomes in the measurement of the quality of services. For example in the case of consultation services, consideration might be given to quality adjusting the services provided with reference to changes in revenues or growth of output resulting from the service received. For advertising services the quality of service may be manifested the change in the volume of sales or in the number of people actually seeing the advertisement.[32]

In practice however, changes in outcomes can rarely be used for quality adjustment because outcomes are heavily influenced by factors that are not directly related to the services received. Moreover, a starting point in the measurement of prices is the information available to the service provider and client when a contract is signed. In the case of advertising services, if the number of people actually seeing the advertisement is unpredictable, it may not appropriate to use the size of audience for adjustment although the size of audience per se is an important quality factor and should be used as a classification criterion for advertising services.

Quality adjustment methods that are feasible, particularly for services, are discussed further in *chapter 3* of this *Guide*.

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Notes

1. See ILO et al. (2004b).
2. See PPI Manual, par. 1.10.
3. The System of National Accounts (SNA) is the internationally agreed standard set of recommendation on how to compile measures of economic activity in accordance with established accounting conventions based on economic principles. The System of National Accounts 2008 (2008 SNA) is the latest version of the international statistical standard for the national accounts, adopted by the United Nations Statistical Commission (UNSC) (European Commission, et al. (eds.) (2009)).
4. See 2008 SNA, par. 15.110-112.
5. See PPI Manual, chapter 14.
6. In national accounts based on the supply and use framework, an advantage of using SPPI data on the use side is that consistency of prices in service balances can be ensured.
7. Further information can also be found in chapter 4 of the Balance of Payments and International Investment Position Manual (BPM6) (IMF (2009)), which is fully in line with the 2008 SNA.
8. PPIs measure price change from the perspective of the domestic producers whereas the CPI measures price change from the Household purchaser's perspective. This difference of perspective implies a difference in valuation: PPIs are valued at basic prices reflecting the amount received by the producer exclusive of any taxes on products and transport and trade margins while CPIs are valued at purchaser’s price including any charge incurred in order to take delivery at the time and place required by the purchaser. For further details, see PPI Manual, chapter 2 and Consumer Price Index Manual: Theory and Practice (CPI Manual), (ILO et al. 2004a), chapter 3.
9. See PPI Manual, par. 1.178.
10. More precisely, the 2008 SNA distinguished two valuations for output PPIs, basic prices and producer prices. The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, by the producer as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer. The producer’s price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any VAT, or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately by the producer. Somewhat confusingly, the 2008 SNA and the PPI Manual have a preference for valuations to be measured on the basis of basic prices, rather than producer prices, as basic prices better align with the cash that producers actually receive to compensate them for expenditures on goods and services used as intermediate inputs, for labour costs and as a return to capital.
11. Further information can also be found in chapter 4 of the BPM6 Manual, (IMF (2009)) which is fully in line with the 2008 SNA.
12. The valuation principle is not fully satisfactory because prices at two different points of time cannot be held the same. Neither the present 2008 SNA or ESA 2010 explicitly discuss this issue.

13. See PPI Manual, par. 10.123-124.

14. A more detailed description of these two methods can be found in the PPI Manual, chapter 6.

15. See PPI Manual, par. 3.49 and 2008 SNA, par. 2.38.

16. See Eurostat (2013).

17. See 2008 SNA par. 6.99. Note also that intra-enterprise services should not be mixed up with production of services for own consumption by an establishment (e.g. transportation, storage and maintenance services). These are produced by so-called ancillary units and are not separately identified or recorded either under the output or the intermediate consumption of the establishment/LKAU or the enterprise to which it belongs. Services provided by ancillary units are outside the scope of SPPIs.

18. See 2008 SNA, par. 6.104.

19. See PPI Manual, par. 3.35. Discussion on the treatment of transfer prices in exports and imports can be found in chapter 18 of the Export and Import Price Index Manual, Theory and Practice (XMPI Manual), IMF, 2009.

20. No problems arise, of course, if the temporary worker is not on the payroll of the employment agency. Discussion of when a person is interpreted as an employee can be found in the 2008 SNA par. 7.28-7.37.

21. See 2008 SNA, par. 2.48.

22. See PPI Manual, par. 3.58 – 3.71.

23. Further information on the classifications and links between them can be found in the following websites:

    United Nations classification register:
    http://unstats.un.org/unsd/class/family/default.asp

    Eurostat's classification server:
    http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM&StrGroupCode=CLASSIFIC&StrLanguageCode=EN

    North American industry and product classification system:
    http://www.census.gov/epcd/www/naics.html

    Australian and New Zealand industry classification:
    http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1292.0Main+Features12006%20(Revision%202.0)?OpenDocument

24. Discussion can be found in chapter 15 of the *2008 SNA*.

25. The *PPI Manual*, chapter 8 (section D.3.1.2) discusses evolutionary and revolutionary products that differ in terms of size of changes in products. Evolutionary products can be replaced in an index without changing the weight structure whereas revolutionary products are additions to the index and require changes in weights.

26. See also discussion on price discrimination in the *PPI Manual* (par. 6.92-98). The discussion refers only to goods but its recommendation to investigate reasons for price differences is equally valid for service products.

27. See *2008 SNA*, chapter 15, section 4 – Causes of price variation.

28. See *ESA 2010*, par. 10.14.

29. Still, not all individual services belong to this category. For example, duration of many personal services may vary but they can be treated as the same services when clients are not willing to pay a higher price for a more rapidly delivered service.

30. Productivity is understood here as labour productivity, *i.e.*, a change in the working time needed to provide the same service product in two periods. A rise in labour productivity may be a result of increased intensity of service provision during one hour worked or of increased quantity of capital used per hour worked.

31. See *PPI Manual*, par. 4.4.

32. Outcomes have been extensively discussed in the connection of developing price and volume measurement for health and education services. See the *2008 SNA* par. 15.120-121.