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COMPILATION OF PRODUCER PRICE INDICES

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INTRODUCTION

1. The paper provides a brief overview of the different types of producer price indices (PPIs). It discusses the coverage of PPIs, the compilation of weights, classification standards and the price concept of the PPI. It then gives a short description of the main uses of PPIs and the calculation methods, and end with a section on how to adjust for quality changes.

2. The paper is based mainly on the international *PPI Manual*¹, to which interested readers are referred for further details and explanations.

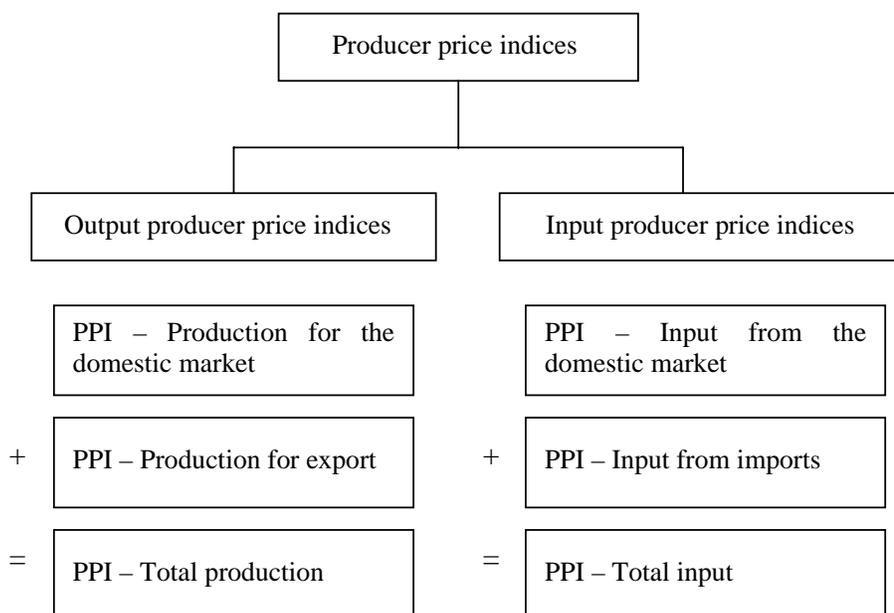
I. DIFFERENT TYPES OF PPIs

3. There are many types and variants of PPIs, which differ according to a number of issues. However, there are two main types of PPIs – supply based *output* producer price indices,

¹ IMF, ILO, UNECE, OECD, Eurostat and the World Bank: *Producer Price Index Manual: Theory and Practice*. IMF 2004, USA. The manual is available in English from IMF's website: <http://www.imf.org/external/np/sta/tegpipi/index.htm>

and demand based *input* producer price indices.

The family of producer price indices



4. In general terms a PPI can be described as an index designed to measure the average change in the price of goods and services either as they leave the place of production or as they enter the production process.

Output PPIs

5. The total production in terms of goods and services can be divided between the domestic and the foreign market. Hence, output PPIs may be constructed to cover total production, production for the domestic market or production for export. In the latter case, this will be an export price index.

6. Output PPIs aims to measure the average price change for goods or services produced by business. They should be based on the prices received by the producers. Ideally, the output PPI should cover all goods and services resulting from the production activity, whether sold on the domestic market or exported. Many countries compile both the output PPI for the total production and separate PPIs for production for the domestic market and for exports. EU member countries are required to compile PPIs for both total production and export price indices.

Input PPIs

7. In the same way producers purchase goods and services from both domestic suppliers and from abroad. Hence input PPIs may be constructed to cover total input of goods and services, input from the domestic market and input from abroad. In the latter case, this will be an import price index.

8. Input price indices measure the change in the prices of all intermediate inputs used in production by a specified sector of the economy. Input PPIs should be based on the prices actually paid by business in return for goods and services purchased. More countries over the last decades have developed input PPIs, and the increase in international trade has spurred the interest in compiling import price indices. In the EU countries that participate in the common currency union, the euro, are required to compile import price indices.

Output PPIs are more common in use

9. Output PPIs are the more common in use as they are more appropriate for deflation of national accounts data and serve as an important inflation measure in their own right.

II. THE SCOPE AND COVERAGE OF PPIs

10. An operational definition of a PPI requires a decision about the actual coverage of establishments and goods and services; whether the index is meant to cover all production, that is, all economic activities and/or products, or just particular industries and/or product groups.

II.1 Net or gross PPI

11. PPIs can be compiled on the basis of two different weighting concepts –*gross or net of intra-sectoral transactions*.

The treatment of intra-sectoral transactions

12. The scope of a gross PPI is broader than that of a net PPI in that it also includes *intra-sectoral* transactions. That is, taking as an example a manufacturing sector output PPI, transactions between different manufacturers would be in scope (for example, sales of refined sugar for the production of soft drinks) for a gross output PPI, while only sales from the sector to the outside would be in scope for a net output PPI.

Gross and net weights

13. In the net PPI approach the weight of a sector would be made up of the value of goods and services sold from the sector to the other sectors. In the gross approach the aggregate weight would include also the value of sales between units inside the sector.

14. It is desirable to produce aggregated PPIs based on net weights. When using gross sectoral indices, there is a problem with multiple counting of price change as products flow through the different production processes. This occurs where the output of one industry is used as an input in another industry within the same sector of the PPI aggregation. The net sectoral approach is the measure that best reflects the impact of inflation in a sector, such as manufacturing, on the rest of the economy.

II.2 Coverage of activities and products

- Output PPIs* 15. Output PPIs should in principle cover all (marketed) goods and services produced and sold by the establishments that are within the scope of the index.
- Input PPIs* 16. Input PPIs should in principle cover all intermediate inputs used in production by the establishments. Intermediate inputs are inputs into the production process of an establishment, excluding primary inputs like land, labor, or capital.
17. In practice, however, the purpose of the index and a number of practical issues, such as the availability of weighting and price data and resource constraints, has to be taken into account when the actual coverage is decided upon
- Traditional coverage of industrial activities* 18. In many countries the PPI is limited to the industrial sector including manufacturing, mining and energy supply. Agriculture is often excluded and there are different practices according to inclusion of activities such as mining and public utilities (gas, electric and water supply). Industrial activities represent a good starting point.
- Services becoming more important* 19. However, the share of such activities in national economies is becoming smaller, and services such as transport, communication, medical care, trade, and business services are becoming increasingly more important. If the primary purpose of the PPI is to serve as an inflation indicator or a deflator for national accounts aggregates, a broad coverage of economic activity is needed.
- Services PPIs* 20. With the growing importance of the service sector many countries are progressively developing PPIs for services. These services PPI can then be incorporated within the larger PPI frameworks. These developments are discussed among interested statistical agencies in the *Voorburg Group*. EU member countries are required to compile PPIs for the services producing industries.
- Export and import* 21. Export and import price indices are important extensions of domestic producer price indices. Foreign trade price indices are the subject of a separate *Export and Import Price Index Manual*, to be published later in 2007 or in 2008.

II.3 Non-market activities

- Non-market activities usually excluded from the PPI* 22. Most countries have defined non-market activities as falling outside the scope of the PPI, which is then limited to marketed products and services. Non-market activities are, e.g., general government services such as national defense and the value of owner-occupied structures. The

decision of whether non-market transactions should be included or excluded should be based on a consideration of the primary objective of the index and on the availability of data sources.

Changes in stocks and imputed rents 23. For example, for an index that aims to reflect changes in actual market transaction prices, prices of notional transactions such as changes in stocks and imputed dwelling rents have no place – in contrast to the national accounts, where conventions provide for the valuation of certain non-traded goods and services so that no economic activity is omitted.

The non-observed economy 24. Similarly, practical decisions need to be made about whether efforts should be expended on trying to capture price changes of goods and services transacted in the non-observed (“hidden”) economy. Issues such as the relative size of the non-observed economy and its accessibility for price measurement should be considered.

Capital formation 25. Other coverage issues include the treatment of capital formation on own account. A decision needs to be made whether these flows are to be included or excluded. If they are to be included, an assessment needs to be made about whether the book entry valuations recorded in the company accounting records are realistic in terms of being contemporary market-based estimates, or are merely notional estimates. If the latter, the preferred approach would be to assign the weight associated with these transfers to the prices obtained from businesses engaging in arms-length trading.

II.4 Globalization and e-commerce considerations

Outsourcing 26. The e-commerce revolution, coupled with globalization, is having a substantial impact on determinations of population coverage. The outsourcings of production are redefining the role of many business enterprises. An enterprise that had been a major manufacturer may now outsource all production to establishments based in other countries. The enterprise may not even provide the material inputs to the production entity because it is more cost-effective to allow the production entity to arrange its own inputs utilizing just-in-time inventory techniques.

27. If the fabricated good is repatriated before marketing, this leaves the domestic enterprise only a wholesale trade margin output-generating activity. However, the enterprise is busily engaged in new product development and prototyping. These are the main wealth-generating activities for the modern corporation. But the enterprise has its output valued as wholesale margin rather than as manufacturing with a gross sales output valuation.

Virtual corporations 28. A related phenomenon is the establishment of virtual corporations to manufacture a new product with a quite short expected life span. The virtual corporation may be production facilities that can be quickly converted to

different manufacturing activities to produce items on a contract basis. A consortium of firms can establish the virtual corporation with different skills coming together briefly to manufacture a new product with a short expected life.

29. In both cases, the PPI program is challenged to review its concepts of domestic production and manufacturing. Criteria for manufacturing may need to be revised to ensure appropriate weighting of these activities. The boundary between manufacturing and wholesale trade may need to be reestablished in recognition of this.

The speed of changes challenges the survey methods

30. Finally, the statistical agency can be expected to be challenged by the speed with which these partnerships are formed and dissolved. Traditional surveying methods may be too slow and cumbersome to permit inclusion of short-lived virtual corporation partnerships in the PPI program. New surveying methods may need to be developed in order to ensure coverage of this most dynamic part of the economy.

III. COMPILATION OF WEIGHTS

31. Weighting data can be considered at two levels: for the calculation of elementary aggregate indices and for the calculation of higher-level indices.

Weights within elementary

32. Elementary aggregate indices can be calculated with or without the use of weights. If *explicit* weights are used, the relevant value data has to be obtained, or estimated, from available sources. Note that if the elementary indices are calculated without the use of explicit weights, there will still be an *implicit* weighting of the price changes determined by the (relative) number of observations of the sampled products. Such “self-weighted” indices require the number of price observations of each product to reflect the relative importance of the products in terms of value.

Elementary aggregate weights

33. The elementary aggregate weights are used to average the elementary indices into indices at successively higher level of aggregation, up to the overall PPI. The selection of the level at which the elementary aggregates are formed and weights applied is particularly important.

Setting the level of the elementary aggregates

34. The main advantage of setting the level relatively high, for example, at the four-digit industry or product group level, is that the price statistician then has greater discretion to maintain the sample (at the establishment and product level) on a needs basis as market activity changes. New products and establishments can be introduced easily into the sample, and individual weights can be updated on the basis of more recent information. That is, there is greater opportunity to keep the index representative through an ongoing program of sample review.

35. If the level is set relatively low in the index structure, there is less freedom to maintain the representativeness of the index on an ongoing basis, and there will be a greater dependence on the periodic index review and re-weighting process. In such circumstances, the argument for frequent re-weighting becomes stronger.

Allocation of weights for production that is not priced

36. In the formation of the elementary aggregate weights it may be appropriate to assign the production values of industry output that is *not* going to be directly priced in the index to a related industry in order to maintain the correct broad weighting relativities. This may happen because certain output clusters are either too small, or because of practical pricing difficulties. The assumption underlying this practice is that the price movements of the un-priced products are more likely to be similar to those of related products than to those of the aggregate of all the products priced in the index.

Smoothing of weights

37. Weights aim to be representative of the pattern of transactions expected to prevail during the period for which they are used in the index construction, which depends on the frequency of re-weighting. It may therefore be necessary to adjust some of the values to *normalize* them and overcome any irregularities in the data for the particular period from which it is being sourced (for example, as a result of a one-off increase in production of a product in response to a temporary increase in demand). Alternatively, the weights may be *smoothed* by basing them on data from a run of years (say, three years).

Source data

38. Potential source data for elementary aggregates include industry surveys, economic censuses, input-output tables, and international trade statistics.

IV. CLASSIFICATIONS

39. The classification system provides an organizing structure for the PPI and is the first step in sample surveying. It defines how industries and/or product groups be grouped and the aggregation structure of the index. The PPI should be compiled according to an international, or international comparable, classification.

Coding

40. A detailed product or activity code should be assigned to each sampled commodity in order to facilitate the grouping and calculation of individual observations into elementary aggregate indices. Similarly, the elementary aggregates should be appropriately coded to allow further aggregation into higher-level indices.

41. The classification at the lowest level of aggregation provides a frame by which to organize the sample. In the UK, for example, the sample is based on the six-digit *Classification of Products by Activity* (CPA) codes.

The elementary indices are calculated at this level and then weighted up into *ISIC* or *NACE* four-digit, two-digit group, or higher-level totals. The *Harmonized Commodity Description and Coding System* (HS) is also common in use.

V. PRICE CONCEPTS IN PPIs

- Basic prices* 42. Output PPIs should be based on *basic prices*, the amount of money received by the producer. The 1993 SNA (paragraph 6.205) defines basic prices as follows:
- 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, on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer.
43. As a rule of thumb, for an output PPI, the pricing point is ex-producer, for example, ex-factory, ex-farm, ex-service provider.
- Purchasers' prices* 44. Input PPIs should be based on purchasers' prices, the price actually paid by the purchaser (the establishment) for goods or services. The purchaser price is the amount paid by the purchaser inclusive of any taxes net of subsidies on products and transport and trade margins. For an input PPI the pricing point is "delivered into store".
- Transaction prices* 45. The prices collected should be actual transaction prices. Transaction prices would not necessarily be "list" or "book" prices because they should reflect any applicable discounts, rebates, surcharges, etc. that may apply to their customers for the sampled transactions. These would include contract prices, where they exist, and spot market prices.
- The time of the recorded price* 46. The prices should be recorded at the time the transaction occurs, not at the time of order, particularly for major durable goods such as airplanes and ships, which have a long production period between order and delivery.
47. Special care needs to be taken with subsidized prices and intra-company transfer prices. The prices used in the PPI should reflect the revenue received by producers from transactions. Prices for products on which subsidies are received will not reflect the revenue to the producer unless the subsidies are included. Also, intra-company transfer prices may not reflect actual market prices.
- Export and import price indices* 48. Export price indices usually are also based on basic prices, the price received by the exporting establishment. Import price indices usually are based on purchasers' prices, including insurance and freight charges incurred to the point of the customs frontier of the importing country, and

taxes and excise duties on imports, since these are not deductible and have to be paid by the producer.

V.1 Transfer prices

Transfer prices become more important ...

49. Intra-company transfer prices are of increasing importance as globalization progresses. Intra-company transfer prices are defined as the value assigned on a per unit or per shipment basis to goods shipped from one establishment of an enterprise to another. The ownership of the good does not change hands, so the value assigned to the shipment is not a market price. Where there is a vertically integrated enterprise, these shipments cross industry lines and account for revenue within that product line. Therefore, they are reflective of output-generating activity in the domestic economy.

... and are likely to distort price analysis

50. 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. Price movements at earlier stages of processing or within intermediate demand are often of the greatest interest to policymakers concerned with price inflation. For such a use, any index containing non-market prices not paralleling market price movement is of dubious value. Intra-company transfer prices may well distort price analysis of market trends in the domestic economy.

51. It is generally recognized that the statistical agency must research the basis for setting intra-company transfer prices to determine how closely they proxy market prices. Often, vertically integrated companies establish separate profit maximizing centers and allow the use of market measures to determine the performance of each unit. In such instances, intra-company transfer prices generally meet the test as good market price proxies.

Transfer prices and taxes

52. Where tax considerations are important in price setting, transfer prices are generally poor proxies. Internationally traded goods might have valuations set to minimize import tariffs and corporate taxes. The statistical agency may decide to exclude such transfer prices from the index when they are judged to be accounting entries with no relation to market prices or values sensitive to taxation. On the other hand, to the extent that such activity is a significant portion of an industry's output, it is important to get the best proxy prices available because they will be needed to derive the industry PPI for use as a deflator in compiling GDP.

V.2 The collection of prices

53. The aim of survey collection techniques is to facilitate the transmission of price data from businesses to the statistical office in a secure and cost-effective manner, while minimizing the administrative burden of the respondent.

Different collection methods 54. A range of approaches to PPI data collection is available: postal survey, automated telephone response, personal interview, telephone interview, and Internet data provision. All of these methods rely on good questionnaire design, good respondent relations, and good interviewing techniques. The exact methods chosen by countries for particular industries will depend on the special circumstances applicable to each form of collection in their industry/country.

Cost efficiency 55. For some products, the prices collected may be *estimated* transaction prices because the transaction sampled did not have sales during the reference period. In addition, it is generally neither practical nor cost effective to try to collect prices each month or quarter directly from establishments by personal visits. Data can effectively be collected using mail questionnaires, telephone contacts, fax, or through Internet.

VI. THE MAIN USES OF THE PPI

56. PPIs serve multiple purposes. The most important ones are the following:

- Short-term indicator of inflation
- Deflation of national accounts and other macroeconomic series
- Indexation of contracts
- Economic analysis and inflation monitoring

Inflation measure 57. A monthly or quarterly PPI is in its own right an important measure of short-term inflation. Detailed series allows monitoring of inflation for different types or through different stages of production.

Deflation 58. A vital use of PPIs is as a deflator of nominal values of output or intermediate consumption for the compilation of production volumes of national accounts. PPIs are used for this purpose because the volumes underlying the nominal values are not directly measurable.

Indexation of contracts 59. PPIs are widely used for indexation of long-term contracts in both the public and private sectors, particularly for more detailed PPI components.

Economic analysis 60. The overall PPI and its sub-indices are used for a variety of economic analysis. For example analysis by commodity to reveal the impact of inflationary pressure from raw materials, which are often priced on international markets outside the control of domestic agencies. A particularly important example is crude oil. Aggregations of commodities can also be constructed to show the total impact of commodity price change on the economy.

Stage-of-processing indices 61. Another method for analysis is to aggregate by stage-of-processing indices. This concept classifies goods and services according to their

position in the chain of production – that is, primary products, intermediate goods, and finished goods. This method allows analysts to track price inflation through the economy – for example, changes in prices in the primary stage could feed through into the later stages, so the method gives an indicator of future inflation further down the production chain.

Productivity calculations

62. A final use for PPIs is in deflating the nominal value added of an industry into a real value added. These industry measures of real value added are then divided by labor input to the industry to form estimates of *industry labor productivity*, or are divided by an index of industry primary input usage to form estimates of *industry total factor productivity*. Productivity increases act as a primary driver of increases in the standard of living of a country, so it is of some interest to try to determine which industries are the main drivers of productivity improvements.

63. PPIs are requested by international organizations such as Eurostat, OECD, IMF and the European Central Bank (ECB).

VII. CALCULATION OF THE PPI

PPI calculated in two stages

64. PPIs are basically calculated in the same way as consumer price indices (CPIs), namely in two stages. In the first stage the *elementary aggregate price indices* are calculated for groups of relatively homogenous goods and services. In the second stage indices at higher level of aggregation, up to the overall PPI, are calculated by weighting together the elementary aggregate indices with their relative volume shares.

VII.1 Calculation of elementary aggregate indices

65. In the absence of available detailed weighting information the elementary aggregates are calculated using one of the three options:

- The unweighted arithmetic mean of the price ratios (Carli index)
- The ratio of the unweighted arithmetic mean prices (Dutot index)
- The unweighted geometric mean of the price ratios, identical to the ratio of the unweighted geometric mean prices (Jevons index).

66. The statistical properties are the same as those explained in the Working Paper 5: *Compilation of Consumer Price Indices (CPIs)*, UNECE Statistical Division. Further discussions about the advantages and disadvantages of using either of the three index formulas are provided in the *PPI Manual*. The following points should be noted, however:

- The Jevons index has the best statistical properties (i.e. it satisfies more tests than the two other formulas)
- The Carli and Jevons are independent of the price levels, while Dutot depends on the initial price levels

- The chained Carli index is biased upwards and should not be used.
- The Dutot index should only be used for strictly homogenous elementary aggregates

Direct and chained indices

67. It is up to the statistical office to decide whether to calculate the elementary indices as direct or chained indices. In practice the use of monthly chained indices seems to have some advantage in terms of facilitating product replacements.

Calculation of weighted elementary indices

68. If weighting information about the individual products is available this can be exploited by calculating the elementary aggregates using the weights. Thus, the elementary aggregates can be calculated as Laspeyres indices or as geometric Laspeyres indices. Expenditure weights should not be attached to individual price observations in a Dutot Index, since this would conflict with the implicit weighting of the price changes in this index.

VII.2 Calculation of higher-level indices

69. The higher-level indices are calculated as the value weighted arithmetic average of the elementary aggregate indices:

$$(i) \quad P_{0:t} = \sum w_b^j \cdot P_{0:t}^j$$

70. $P_{0:t}$ is any higher-level index, w_b^j is the weight of elementary aggregate j that belongs to the higher-level index, and $P_{0:t}^j$ indicates the corresponding elementary indices. The weights refer to a period b , which in practice has to precede period 0, the price reference period.

Laspeyres and Paasche are lower and upper bounds for output PPIs

71. Under the assumption of profit maximizing producers in competitive markets it can be expected that the Laspeyres price index will provide a lower bound of the 'true' economic output PPI, and Paasche will provide the upper bound.

Paasche and Laspeyres are lower and upper bounds for input PPIs

72. For an input PPI it can be expected that the Paasche price index will provide a lower bound of the 'true' economic input PPI, and Laspeyres will provide the upper bound.

Ideal indices

73. Hence, some average of Laspeyres and Paasche could be expected to produce a better estimate of the true price development. It has been shown that the Fisher price index (the geometric average of Paasche and Laspeyres) provides a good estimate of the true economic PPI. The same holds for the Törnqvist and Walsh price indices, which both utilise weighting information from both the reference and current period of the price index.

Retrospective calculations of ideal indices 74. It is not possible to compile these ideal indices on an ongoing basis, since weighting data are usually only available with a considerable time lag. However, when weights become available, such ideal indices can be calculated retrospectively.

Updating of weights 75. To keep the index representative the weights needs to be reviewed and updated regularly. The weights can be updated annually or with less frequency, but at least every five years. A regular update of the weights reduces potential bias arising from basing the PPI on dated weights.

Chain-linking 76. Irrespective of the frequency of weights updating the CPI based on the new weights should be chained onto the terminal value of the CPI based on the old set of weights to obtain coherent long-term index series.

VII.3 Unit value indices

Use Unit values only for strictly homogeneous products 77. Unit values are acceptable in the PPI if they represent a strictly *homogeneous* set of product transactions. Often this cannot be met. If average prices are calculated over a large number of transactions with differing quality and/or terms of sale, they are not acceptable in the PPI. Changes in such prices may reflect any changes in the composition of individual products or mix of quality characteristics. Such changes in the heterogeneous mix of transactions lead to what is often referred to as *unit-value bias* in the measurement of price changes.

78. It is possible, however, to use unit value indices for products where they are known to estimate price indices, and combine these with indices based on surveyed prices.

VIII. ADJUSTING FOR QUALITY CHANGES

The importance of adjusting for quality changes 79. The treatment of quality change is perhaps the greatest challenge facing PPI compilers. It presents both conceptual and practical problems for compilers of PPIs. The whole of Chapter 7 of the *PPI Manual* is devoted to the treatment of quality change, and Chapter 8 addresses the closely related topic of new goods and product substitution. Three points are stressed in chapter 7 in the *PPI Manual*:

- The pace of innovation is high, and possibly increasing, leading to continual changes in the characteristics of products.
- There is not much consistency among countries in the methods they use to deal with quality change.
- Empirical studies indicate that the choice of method can lead to very different results.

Some action has to be undertaken, you cannot “do “nothing

80. When a new product is introduced to replace a disappearing one, it is necessary to establish a link between the series of past price observations on the old transaction and the subsequent series for the new transaction. The two series of observations may, or may not, overlap in one or more periods. Whether or not there is an overlap, the linking of the two price series requires some estimate of the change in quality between the old product and the product selected to replace it. However difficult it is to estimate the contribution of the changed quality to the change in the observed price, it must be clearly understood that *some estimate has to be made either explicitly or implicitly*. Even apparently “doing nothing” necessarily implies some kind of adjustment.

81. The *Handbook on price and volume measures in national accounts*² divides possible methods to adjust for quality changes into three groups:

A methods: most appropriate methods

B methods: those methods, which can be used in case an A method cannot be applied

C methods: those methods, which shall not be used

82. The handbook describes the following methods that can be applied:

- (a) **Direct comparison:** The price of the new item is compared directly with the price of the old one. It is thus assumed that the two items are of comparable quality and the whole of the price change is included in the index.
- (b) **'Link to show no change':** The price of the new item is linked into the index. The price change is assumed to equal the quality change and thus not included in the index calculation.
- (c) **Overlapping prices:** With overlapping prices the new item can be linked into the index. This assumes that the price difference reflects the value of any quality difference between the two items.
- (d) **Matched models only.** This approach may cover *Imputation*, where the price development of the new item is imputed by the price development of similar items or groups of items, or *Monthly re-sampling and chaining*, where the sample is updated regularly on monthly basis and a chained index is calculated on the basis of the matched monthly prices.
- (e) **Option prices:** If the difference between A and C is the inclusion of an extra option, e.g. a CD-ROM drive in a computer, the extra option can be separately priced and appropriate adjustment made in the recorded price.

² *Handbook on price and volume measures in national accounts*. The European Commission, Eurostat, 2001, Luxembourg. The handbook is available in electronic form from Eurostat's webpage.

- (f) **Production costs:** Producers can be asked about the difference in cost of producing the old and new item, and the ratio of costs be applied for adjusting the prices.
- (g) **Experts judgement:** Persons with detailed product knowledge are requested to value the difference between the new and old product, and appropriate adjustment are made in the recorded prices.
- (h) **Hedonic adjustments** by use of hedonic regression.

Unique products 83. Unique products such as major equipment projects (for example ships, aircrafts and special purpose machinery), construction and tailored business services (for example IT or management consultancy) pose a special problem for quality adjustments in PPIs.

84. While a project or a consultancy service may be seen as unique in its entirety it is often possible to break down a project in the components of which it exists. For example a house may seem unique but is made up of a number of combined products and services each of which may be priced. Where it is possible to break down activities in component parts, two methods may be applied:

Model pricing 85. A model is constructed by combining a series of components that can be priced over time. The model should be representative of the projects produced and sold on the market; it does not have to be a project actually observed on the market.

86. Model pricing can be applied when the following criteria are met:

- The model should be representative and regularly updated to ensure that it continues to be representative.
- The model should be defined in terms of outputs, not inputs, e.g. “a tiled wall of 20 square metres”, not “a contract of 100 hours of work”
- The prices used for the component parts should be the actual prices charged, taking account of producers’ profit margins and discounts offered to costumers

Specifikation prices 87. A real product can be broken down in its key elements or components. In the successive periods individual projects are examined and the prices of the matched set of components are compared. No ideal, representative model has to be constructed or updated. However, the key elements specified might become less relevant over time for which reason they will need to be updated regularly. The key elements should be specified in terms of outputs rather than inputs.

Input prices 88. In general, input prices should not be used, as they do not take into account changes in productivity. However, for example charged average hourly wage rates may be used for compiling price indices for certain types

of work, e.g. repair or machineries or legal or management or IT consultant services, if productivity can be assessed to be reasonable constant.

International prices

89. The use of international price indices is an acceptable (B) method for certain products if they can be considered to be representative of the price development in the country. Examples of such possible products may be raw materials and computers where often international prices or indices can be found on Internet; US compiled hedonic indices for computers may be used as a data source.

Resampling

90. Resampling is a practical method in which to cope with quality changes and keep the product sample up to date by gradually dropping certain products and introducing new ones. Products may be dropped for two reasons:

- The product is believed by the respondent or the statistical office to be no longer representative. It appears to account for a diminishing share of the total revenue within the product group or industry in question.
- The product may simply disappear from the market altogether. For example, among other reasons, it may have become obsolete due to changing technology, or unfashionable due to changing tastes.

Update sample of establishment and products on ongoing basis

91. At the same time, new products or new qualities of existing products appear on the market, and at some point they should be included in the sample. Thus, by resampling the sample of establishment and products is updated on an ongoing basis and kept representative

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