Alignment of Methodology and Scope between Services Producer Price Indices (SPPIs) and Consumer Price Indices (CPIs): Developing a framework for using CPIs in SPPI calculation

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The views expressed by the authors do not necessarily represent the positions of their institutions. Any errors and omissions are only the responsibility of the authors.

FOREWORD

This Voorburg Group Task Force was formed with the mandate of improving knowledge regarding the utilization of CPIs as proxy and/or directly comparable replacements to SPPIs.

Official presentations on CPI usage in SPPIs have been made most recently at the Ottawa Group meeting (2022), 36th Voorburg Group meeting (2021), 34th Voorburg Group meeting (2019), 29th Voorburg Group meeting (2014) and via the second edition of the Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services (2014).

A formal framework, however, is yet to be officially established. The paper that this task force has developed takes a further important step in the establishment of such an official framework.

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1 INTRODUCTION

For over 30 years, the Voorburg Group has worked towards expanding Producer Price Index (PPI) coverage to services by establishing and maintaining an internationally comparable methodology for measuring output and producer price indices for the service industries. As many countries continue to expand their coverage of services PPIs, and as members of the European Union (EU) are formally adopting a business-to-all basis[1], there has been discussion among Voorburg group members about utilizing selected Consumer Price Index (CPI) based indices to represent PPIs[2]. CPI usage, when appropriate, has the potential to simultaneously reduce costs and the level of burden on both statistical institutions and respondents, whilst also providing a swift route to higher levels of PPI coverage.

PPIs and CPIs have some inherent differences that must be explored and considered to ensure that usage of CPIs is done so in a considered way. First of all is the price definition. A PPI measures changes in the **price received by a domestic company** for providing goods or services whereas CPI captures changes in the **price paid by the resident consumer** for a good or a service. Thus, the indices will differ regarding the valuation principle.

The second main difference rests on the coverage of the indices. The PPI measures changes in the prices received for products **provided by domestic companies,** which excludes imported products and includes exported products. Whereas the CPI measures changes in the prices for **all products available to a consumer**, and which includes imported products and excludes exported products. The presence of imports or exports will generate numerical differences in the indices only if the prices of imported or exported services change at a different rate than the equivalent domestic services.

Other methodological issues and practical concerns that must be addressed are the differences in nomenclature and classification systems and differences in the weighting of products within the index structures.

Using CPIs as a proxy[3] for PPIs may be a viable proposal but must be adapted to each national situation. It is not necessarily suitable for industries with a low percentage of sales to consumers where lack of price correlation can pose a risk. Furthermore, CPI data needs to be adjusted to take account of the explicit fees, implicit fees, and also of the imported and exported services. And even when all these boxes are checked there are still some issues with the difference in nomenclature that must be considered on a case-by-case basis. Existing empirical studies that compare CPIs and PPIs for similar commodities suggest that these methodological differences can be numerically important.[4]

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[1] European Business Statistics (EBS), formerly Framework Regulation Integrating Business Statistics (FRIBS), is a common legal framework for business statistics adhered to by EU member states and formerly mandates production of SPPIs on a business-to-all basis (Eurostat, 2021). Eurostat (2021). European Business Statistics Manual - 2021 Edition, Page 247

[2] Official presentations have been made by R.Draper and M.Fridén (Statistics Sweden, 2019) at the 34th Voorburg Group meeting, K.Pegler and C.Taylor (ONS, 2014) at the 29th Voorburg Group meeting. Voorburg Group members also gave input regarding this topic via the second edition of the Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services (2014)

[3] In statistics, a proxy or proxy variable is generally defined as a variable that is not in itself directly relevant, but that serves in place of an unobservable or immeasurable variable. Upton, G., Cook, I. (2002) Oxford Dictionary of Statistics. OUP ISBN 978-0-19-954145-4. In terms of the use of a CPI as a proxy for a PPI, this paper takes a different stance in that the proxy is chosen not because something is necessarily unobservable or immeasurable but rather the CPI proxy presents a strategically viable alternative that is either a partial or full match to the PPI it is representing.

[4] See, for example, Pegler and Taylor, *CPI Use in PPI Context*, Office for National Statistics, UK, 2014, Shang-Jin Wei Yinxi Xie ,(2014) »The Wedge of the Century : Understanding a Divergence Between CPI and PPI inflation Measures » NBER

2 SCOPE OF SPPIS

The Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services states that the scope of SPPIs should cover services provided for all uses, including both intermediate and domestic final consumption as well as exports. That is, SPPIs should represent all output as defined in national accounts.[5] Additionally, since prices, and price movements, can vary depending on the purchaser, they advocate separate SPPIs for each of these end use categories. The guide also states that SPPIs should measure change in the prices of products, rather than industries since the output of industries in most countries can typically be broken down into various products, and CPIs and other price indices also measure change in the prices of products rather than industries.

The IMF's Producer Price Index Manual: Theory and Practice notes a large variety across countries with regard to both the scope and coverage of SPPIs, whether indices are provided by purchaser, and in the choice of product vs industry indices. When the main purpose of the PPI is as a deflator of national accounts, broad coverage of economic activity is needed. Moreover, "For deflation of the national income accounts, it appears to be highly desirable to calculate and publish indices that are differentiated by GDP category. » (P. 73, 2020 manual).

3 CALCULATION OF SPPIS

There are (at least) two ways for calculating business-to-all (B2All) SPPIs.

One method is a single B2All SPPI that covers output prices to all end users in a single estimation. This method might be used when service output and its prices for different end users are very similar or cannot be separated in practice.

Conversely, a B2All SPPI can be created as an aggregation of SPPIs computed by purchaser, by "horizontal aggregation" (at each classification level) of B2B, B2C, and B2X, as defined below.

- **Domestic Business-to-Business SPPIs (B2B) measure transaction price changes for services sold by national producers to national businesses**; they cover domestic production sold to legal entities established in the national territory (including the general government sector, affiliates of foreign groups, etc.).
- **Domestic Business-to-Consumer SPPIs (B2C) measure transaction price changes for services sold by national producers to households in the national territory**.
- **Domestic Business-to-Export SPPIs (B2X) measure transaction price changes for services sold by producers established in the national territory to foreign markets.** These transaction prices have to be converted to national currency and therefore include exchange rate effects.

Working Paper 24319 http://www.nber.org/papers/w24319 and Jonathan C. Weinhagen, "Comparing new final-demand producer price indexes with other government price indexes," *Monthly Labor Review,* U.S. Bureau of Labor Statistics, January 2014, https://doi.org/10.21916/mlr.2014.4

[5] OECD/Eurostat (2014), *Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition*, Page 20

This approach requires the ability to track price changes across different types of customers, which is costly in the terms of surveys. Aggregating across the indices also requires information on the relative weight of these sectors in total production.

While the two strategies could conceivably yield numerically different SPPIs measures, our review of the literature failed to find studies that directly address this issue in the PPI context. Diewert's (1978) work on "consistency in aggregation" in the CPI context[6] and more recent work on the "outlet substitution bias" problem (Nakamura, Diewert, Greenlees, Nakamura and Reinsdorf (2014)[7] touch on related issues. In the PPI context, a study by Moyer, Reinsdorf and Yuskavage (2005)[8] addressed whether real GDP obtained by aggregating over the components of final demand is exactly equal to real GDP constructed by aggregating over components of each industry's gross outputs less intermediate inputs seems relevant as well.

4 CPI AS A PROXY FOR B2C OR B2ALL – BASIC PRINCIPLES

When using CPIs to compile SPPIs, CPIs can be used either exclusively or in tandem with other producer price data not covered by the CPI, especially those relating to business users.

4.1 CURRENT GUIDANCE

According to the Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services, there is potential overlap between SPPIs and CPIs when it comes to the pricing of services delivered to households. The guide does not provide any rules for how to use CPIs when compiling SPPIs since there is so much variation in the service products and data sources between countries. However, it does state that if a country is using CPI information to obtain prices for services acquired by households, SPPI data collection would only be needed for B2B and export transactions if those segments are significant, suggesting that the CPI may be used for the household portion of an SPPI .[9]

Furthermore, the guide explicitly addresses using price data collected for the CPI as a special case of direct use of prices of repeated services when this method is used for calculating SPPIs. This situation arises in particular for service industries where the vast share of output goes to final demand, such as passenger transportation, food and accommodation, or finance and insurance. In other words, when services that are predominantly but not exclusively destined for household consumption, the use of CPI data can help to remove or minimize the requirement for data collection.[10]

The IMF manual does not address the use of CPIs as a proxy for PPIs.

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[6] W. E. Diewert (1978) Superlative Index Numbers and Consistency in Aggregation, Econometrica Vol. 46, No. 4 (Jul., 1978), pp. 883-900 (18 pages)

[7] Nakamura, Alice O., W. Erwin Diewert, John S. Greenlees, Leonard I. Nakamura, and Marshall B. Reinsdorf. 2015. "Sourcing Substitution and Related Price Index Biases." In Measuring Globalization: Better Trade Statistics for Better Policy - Volume 1. Biases to Price, Output, and Productivity Statistics from Trade, Susan N. Houseman and Michael Mandel, eds. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, pp. 21-88.

[8] Brian Moyer, Marshall Reinsdorf & Robert Yuskavage (2005) Aggregation Issues in Integrating and Accelerating BEA's Accounts: Improved Methods for Calculating GDP by Industry NBER WORKING PAPER 11073, January.

[9] OECD/Eurostat (2014), *Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition*, Page 23

[10] OECD/Eurostat (2014), *Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition*, Page 44

4.2 VALUATION PRINCIPLE: BASIC PRICES VS. PRODUCER PRICES VS. PURCHASER PRICES

When using CPI data as a proxy for SPPIs, attention must be paid to the principles underlying the methodology of SPPI development.

The System of National Accounts (SNA) defines two kinds of prices to measure output, namely, basic prices and producers' prices, both of which are actual transaction prices that can be directly observed and recorded[11]:

a. 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. Basic prices exclude any taxes on products the producer receives from the purchaser and passes on to government but include any subsidies the producer receives from government and uses to lower the prices charged to purchasers.

b. 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.

SNA also defines the concept of *purchaser's price* which corresponds to the amount paid by the purchaser, excluding any VAT or similar tax deductible by the purchaser, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.[12]

CPIs aim to measure transactions in purchasers' prices; SPPIs aim to measure transactions in basic prices.

The figure below13 gives an overview of the official differences between basic, producer and purchasers' prices:

Basic prices (PPI)
+
Taxes on products excluding invoiced VAT
-
Subsidies on products
=
Producers' prices
+
VAT not deductible by the purchaser
+
Separately invoiced transport charges
+
Wholesalers' and retailers' margins
=
Purchasers' prices (CPI)

[11] *System of National Accounts (2008),* Page 101

[12] When a purchaser buys directly from the producer, the purchaser's price may exceed the producer's price by: (1) The value of any non-deductible VAT, payable by the purchaser;(2) the value of any transport charges on a good paid separately by the purchaser and not included in the producer's price; and (3) If purchasers buy output not from the producer directly but from a wholesaler or retailer, it is necessary to include their margins in the difference between basic and purchasers' prices also.

[13] *System of National Accounts (2008),* Page 103 (§ 6.69)

If CPI data is used in the compilation of SPPIs it must at least be adjusted from valuation at purchasers' prices to basic prices, as basic prices are better aligned to the remuneration that producers actually receive. Explicit fees that are added to the price at the point of sale, such as value added tax and excise duties, are typically calculated as a percentage of the price and therefore easy to remove from the CPI data. Removing the implicit fees (taxes on products other than VAT, freight, and insurance) is more difficult because they are hard both to identify and to quantify. Additionally, adjustments should be made for subsidies on products and services which are not included in CPIs. For example, in France, the prices charged for canteen services in school universities or even companies are largely subsidized. Prices paid by consumers are often lower than the prices received by the producers who provided the service.

5 Supply and Use Tables – Practical Applications

5.1 Identifying Candidates

"Traditionally, the main use of SUTs has been to improve GDP estimates by balancing records of the supply of goods and services with those of the demand for them, thus capitalizing on and confronting disparate sources of data–business surveys, household surveys, labour force surveys, administrative tax records, imputations, and so on. But their potential goes well beyond this[14], as SUTs provide a bird's-eye view of the structure of the economy–who makes what, how and for whom." (OECD, 2017)

Simple schematic of supply-use tables

Supply

Industries / Products	Industries			Imports	Trade and transport margins	Taxes less subsidies on products	Total
	Agriculture	Industry	Services activities				
Agricutural products Industrial products Services	Output by product and by industry at basic prices			Imports by product	Trade and transport margins by product	Taxes less subsidies on products by product	Total supply by product at purchasers' prices
Total	Total output at basic prices by industry			Total imports	Total trade and transport margins	Total taxes less subsidies on products	Total Supply at purchasers' prices

Use

Industries / Products	Industries			Final uses			Total
	Agriculture	Industry	Services activities	Final consumption	Gross capital formation	Exports	
Agricutural products Industrial products Services	Intermediate consumption by product and by industry			Final uses by product and by category			Total use by product at purchasers' prices
Value added	Value added by component and by industry, at basic prices						Value added
Total	Total output at basic prices by industry			Total final uses by category			

[14] In recent years, SUTs have become the key accounting tool used to generate national input-output tables, and have become essential to the construction of datasets such as those used for Trade in Value Added (TiVA) estimates and related applications, such as CO2 footprints and jobs embodied in trade. And their potential goes beyond even these high-profile applications. SUTs can, for example, help simulate and estimate the economic impact of potential price shocks, or develop productivity estimates taking account of labour, capital and intermediate inputs. Moreover, they provide the basis for simple descriptive statistics that are not typically available or collected.
http://oecdinsights.org/2017/06/05/statistical-insights-what-role-for-supply-use-tables/

SUTs provide an objective and practical basis to determine whether a CPI for a given product would constitute a good proxy for a product or industry PPI.

As stated previously, SPPI measures changes in the prices received for all services provided by domestic companies (including exports) while CPI measures changes in the prices for all services available to a consumer, and this will include imported services.

To the extent that imports are small, the composition of goods covered in the CPI will reflect that of the B2C portion of the SPPI, making the CPI a good proxy for that piece. The presence of imports is particularly problematic for countries that are affected by exchange rates fluctuations that drive a wedge between import and domestic prices.

B2C

The supply table provides information on the importance of imports, a key factor in assessing the applicability of a CPI for the B2C portion of an SPPI. Though import data is presented there as total import to all segments, a low level of imports to all is sufficient to guarantee the coverage of the CPI will align with the B2C portion of an SPPI. However, national accounts may have unpublished data at a finer level enabling a segment-based assessment to be conducted for import data too.

With imports low, a special case occurs when virtually all the services are consumed by households (death services, e.g.), in which case it can be argued that the CPI is an exact match to the PPI counterpart and the term proxy becomes redundant. This can be checked using data on household consumption's share of total use reported in the use table.

B2All

Supply Use tables are less helpful in determining whether a CPI can serve as a good proxy for the two other portions of an SPPI—B2B and B2X. This is because the potential usefulness of a CPI proxy here hinges on how close the composition of services provided to households is to that for business purchases and exports and the use tables do not provide direct information on that. Of course, if the bundle of services purchased by households and businesses are similar enough, and the movements in prices track each other closely, then the CPI could serve as a reasonable proxy. However, there is little evidence to support this assumption and though one would ideally want to test it, that is difficult for national statistical offices when the goal is to use CPIs for estimating SPPIs that they do not calculate. [15]

There are a number of factors that can be derived from SUTs to support the feasibility of a CPI's fitness-for-purpose as a proxy.

Commonly available information

- Household consumption share of total use
- Export share of total use
- Import share of total supply

Less commonly available information

- Household consumption share of total domestic production

[15] OECD/Eurostat (2014), *Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition*, Page 45

The first practical step is to calculate the *household consumption share of total use* on a per product basis (or the lowest level of available data). This gives the price statistician a mapping of where to focus other analysis, for example, classification assessments (see section 6.1). The second practical step that the SUTs allow for is calculating the prevalence of exports and imports, which can interfere with the feasibility of the CPI as a proxy. These objective measures of CPI suitability give the price statistician a sound basis from which to make decisions from, yet some exceptions may exist. A further qualitative assessment may be made to delve into homogeneity and heterogeneity of products and price change in cases where household consumption is low and/or international trade is high.

As suggested, it is preferred to make this analysis on the lowest classification level possible, or in the case of lack of detail it should only be made for industries and services that are relatively homogeneous. In certain rare cases it can be argued that the CPI is an exact match to the PPI counterpart and the term proxy becomes redundant. For example, if 100% of the revenue comes from household consumption and international trade is non-existent.

Ideally, the price statistician will utilize a supply-use table already valued in basic prices but if not then explicit and implicit taxes will need to be considered (see section 4.2).

A quick checklist to consider when using SUTs for finding and utilizing CPIs as PPI Proxies:

- How detailed are your Supply-and-Use-tables, industry, service, 6-digit level?
- How homogenous are the given industry or service at the level of detail available to you?
- Is there a share of household consumption for a given service or industry that is deemed to be too high a risk for use as a broad-based proxy?
- How big are the export and import share of the revenue data in the SUT for the given industry or service?

The following table depicts an assessment that can be completed utilizing the most recently available SUTs. Ideally the analysis will be conducted at the lowest classification level possible deemed of a high enough quality of data. On the use side the price statistician needs to allocate use data to appropriate segments (consumer; business; government and export). On the supply side, by design, import data is presented as total import to all segments, however, national accounts may have unpublished data at a finer level enabling a segment-based assessment to be conducted for import data too.

SUPPLY	
Imports	I2ALL
USE[16]	
Total Intermediate Use	B2B
Household final consumption expenditure	B2C
Government final consumption expenditure	B2G or B2B
Gross fixed capital formation	B2B
Exports	B2E

[16] B2B can be further split by industry based dimensions and by outputs utilised by government entities (B2G), however, such splitting is currently outside the bounds of mainstream application.

Once allocated on a per classification basis a percentage share can be generated to ascertain the suitability of a CPI proxy as a replacement for PPI direct collection of prices.

As an example, we have extracted some data from the OECD website and made an overview table for a selection of counties (See appendix B). The tables used to create this table are the supply and use tables:

- 43.Use at basic prices
- 30. Supply at basic prices and its transformation into purchasers' prices

It is important again to note that this analysis is a starting point to assessing the feasibility of a CPI as a proxy for PPI. After a sufficient good/service/industry have been identified, there are other qualitative assessments on a case-by-case basis that should be considered, which have been described throughout this paper.

5.2 Blending – Using CPIs in Combination with Traditional Data Sources[17]

Once appropriate candidates have been identified for coverage by CPIs and CPIs have themselves been deemed fit-for-purpose, explicit weights may be constructed for their inclusion in the aggregation structure of the PPI. The CPI is most often used to represent output destined to households but may also be utilized where output to non-households exhibits a shared price behavior. Traditional direct collection and/or other alternative data sources are used to represent the remaining share(s) of output and each discrete homogeneous group is then aggregated using a calculation method attentive to the quality of weighting data that is available.

Predominantly, this is based on the proportion of B2C and B2B shares of output with the Supply-Use-tables (SUTs) providing the price statistician with a sensible starting point. SUTs generally hold the information needed to create weights for blending the data sources together, but there are a few steps needed to calculate the output shares. Just as the SUTs can be utilized to support determining suitability of CPIs as a proxy, the same calculation can be utilized to build a weighting structure.

Where possible, SUTs in basic prices should be utilized in keeping with the valuation principles of the PPI. In a simplified world, we would be able use *Household Final Consumption Expenditure (HFCE)* on the use side to represent B2C based output with the remainder largely attributed to B2B and B2E. At this juncture, if imports and domestic production were similar in nature and equally distributed and had similar price development irrespective of the intermediate or final use, we could accept these as representative for weighting purposes. Some practitioners, in the absence of more detailed information, will indeed use data at this point as a proxy. If previous steps have been followed, then we ideally have chosen candidates with low import levels and so arguably the risk is minimal.

For those practitioners that have access to more detailed import data and want to attempt to incorporate CPIs where larger levels of import exist and/or want to incorporate data into upper-level weighting schemes the process can continue to adjust for unrepresentative import based impacts.

[17] What this paper refers to this as blending can also be considered as multi-source data collection.

A simplified approach to utilizing S-U Tables.
Firstly, we assume no exports, re-exports, gross fixed capital formation (GFCF), and subsidies. The calculation would in its simplest form be the ratio of domestic production relative to total supply. We will call this *Share of production*. *Share of Production* is calculated from the Supply-side, such that:

$$Share\ of\ Production = \frac{Production}{Sum\ of\ Production\ and\ Import}$$

The *Share of Production* can then be multiplied by the various categories of use, for example *Household Final Consumption Expenditure* (HFCE) and *Intermediate Use*, to readjust their values to exclude imports. The obvious shortcoming is that each use category imports in a relatively similar fashion. To improve upon this calculation more detailed supplementary information is often required. At the aggregate level, however, the product being calculated retains its representative size to other products.

To add some more sophistication to the process a service can also have exports, re-exports, GFCF and subsidies. The logic is the same but we must also include exports and GFCF in the process. Therefore, we can expand our *Share of Production* calculation definition to this:

$$Share\ of\ Production = \frac{Production - export}{Sum\ of\ Production\ and\ Import - Export}$$

This new calculated *Share of Production* can be used exactly as before. The reason we exclude exports from the *Share of Production* is that exports cannot contain imports by definition in the SUTs.

For completeness we must include exports and GFCF in the blending weights. By definition, GFCF is related to the SPPI-weight as it is more or less investments on a company level. The OECD introductory manual to National Accounts states that "gross fixed capital formation is precisely defined in the national accounts as the net acquisition of produced fixed assets, that is, assets intended for use in the production of other goods and services for a period of more than one year"[18].

GFCF can also contain imports and therefore we need to remove imports using our new *Share of Production*, precisely as we have done for HFCE and *Intermediate Consumption*. Exports of a service can happen within the country providing a service to non-domestic consumers such as tourists. Therefore, exports need to be distributed between the blending weights. This is done by assuming that the amount of exports that have been sold directly to consumers is the same relative amount to the split between HFCE and Intermediate Consumption, such that:

$$Export\ share\ for\ households = \frac{HFCE}{HFCE\ +\ Intermediate\ Consumption} * Export$$

You can do the exact same thing for the SPPI weight by exchanging *Household consumption* with a sum of the *Consumption in the industry*, such that:

$$Export\ share\ for\ Industry = \frac{Intermediate\ Consumption}{HFCE + Intermediate\ Consumption} * Export$$

[18] Lequiller, F. and D. Blades (2014), Understanding National Accounts: Second Edition, OECD Publishing. http://dx.doi.org/10.1787/9789264214637-en

When you have calculated your *Share of Production* and the two export shares, you can complete your blending weights as seen below:

$$CPI\ weight = (HFCE * \ Share\ of\ production) + (Export * Export\ share\ for\ households)$$
$$PPI\ weight = (Consumption\ in\ the\ Industry * Share\ of\ Production) + (Export * Export\ share\ for\ industry) + (GFCF * Share\ of\ Production)$$

With these two weights, you are able to blend the SPPI and CPI together for a given service. As discussed, depending on the information available at your NSO this process and the aggregation level at which this blending is done can vary.

For some services subsidies are present. The PPI definition states that discounts and subsidies are to be included and therefore our blending weights need to reflect this. Information on subsidies are present in the SUTs and should be distributed on each item on the SUT-table. With complete information, it is an easy matter to subtract the subsidies from our CPI or SPPI weights, based whether they are present on *Household consumption* or *Consumption in the Industry*, or both. It should be noted that if there are subsidies present for a given service, that this also needs to be accounted for, when you are calculating your *Share of Production* (simply add it to each side of the fraction).

Practical Example – CPIs used as B2C SPPIs

Some countries currently use CPIs as part of their B2All SPPI calculations. For example, Hungary produces B2All SPPIs for air passenger transport, post and telecommunications services as a weighted average of CPIs with B2B SPPIs.[19] In Sweden, 17% of SPPIs are derived from CPIs. CPIs are the primary source of prices in section I – Accommodations and food services, section R – Arts, entertainment and recreation services, and section S - Other services.[20] In France, 19% of SPPIs are derived from CPIs.[21]

The French SPPIs are calculated by decomposing indices according to the different types of users: domestic market of companies (B2B), household consumers (B2C) and non-domestic markets (B2X).

The consumer price indices (CPIs) are naturally the main source for the basic prices for services sold directly to households in France even if they are compiled and published including VAT, that is to say at "market prices". They are thus recompiled at "basic prices", if applicable, by being "fiscally adjusted" when they are also used as B2C SPPIs.

Furthermore, because the consumer prices are computed by "basic headings" (articulated with the combined nomenclature COICOP) and not by "class of product" (the 4-digit level of the "Classification des Produits Française - CPF" broadly equivalent to the CPA classification), a correspondence table between these two concepts (CPIs and SPPIs), hence between CPA and COICOP has been defined. This correspondence table is similar to the correspondence table defined in part 6.1 below.

Thus, it is mainly consumer price indices for passenger transport, food and accommodation or communication services that are used, sometimes to estimate different SPPIs (see appendix A). A recent survey conducted by the Voorburg Group mapped alternative data use in PPIs including CPI usage (see appendix C).

[19] Holocsy, *CPI Use in PPI Context*, Hungarian Central Statistical Office, 2014

[20] Draper and Fridén, SPP by customer sector – "the Swedish experience", Statistics Sweden, 2019

[21] OECD/Eurostat (2014), *Eurostat-OECD Methodological Guide for Developing Producer Price Indices for Services: Second Edition*, Page 24

6 OTHER METHODOLOGICAL ISSUES AND PRACTICAL CONSIDERATIONS

6.1 NOMENCLATURE: COICOP/ISIC/CPA

Another methodological problem arises when one wishes to estimate SPPIs by CPIs. The nomenclatures used by these two categories of indices are different. This can have an impact on definition or scope of the two categories of indices.

CPIs are (generally) calculated according to the Classification of Individual Consumption by Purpose (COICOP), a nomenclature of consumption functions. As an international standard classification, COICOP is the primary tool for collecting and presenting internationally comparable statistics on individual household consumption according to purpose. Only its four levels of aggregation (5 digits code) are internationally standardized. This nomenclature could combine goods and services or several services purchased by consumers from retailers.

At the state level, national statistical offices have mostly developed more detailed levels of the COICOP nomenclature to better monitor consumer prices. In EU, Member States use and disseminate CPIs based on a harmonized specific COICOP.

SPPIs should be representative of all the different service activities. The International Standard Industrial Classification for all industries (ISIC) is the international reference classification of economic activities. It essentially aims to provide a set of categories of activity used to compile production statistics based on these activities. Besides, ISIC covers production activities, falling within the scope of the System of National Accounts. Only, its first four levels of aggregation (coded with 4 digits) are internationally standardized.

Take, for example, the product regular vehicle inspections. Here, the index structure may further distinguish by region and by type of vehicles for which these tests are performed. In the CPI, trucks probably have a very small share of vehicle inspections, while motorcycles probably play little role in the SPPIs. The different shares of vehicle tests could have an impact on the overall price development of the product. In principle, this is true for many products that play a role in both index types.

As SPPIs should reflect the evolution of prices of specific services sold by companies, it is only possible to use CPIs at a very detailed level of activity, which are at the intersection of two sets of services definitions, from two heterogeneous nomenclatures.

To illustrate this point, we have attempted to map the COICOP nomenclature (2018) to the European CPA product nomenclature (derived from the ISIC nomenclature). It takes up the work carried out by Eurostat to provide the Member States of European Union with a harmonized table of mapping consumption functions and products decomposition of the SUT, at more detailed levels (COICOP 2018 defined at the 4-digit level of detail - 6-digit level of detail of the CPA nomenclature).

This exercise is limited to the elements required by the European EBS regulation covering only the products of CPA sections H, I, J, L, M and N (excluding group 70.1 and divisions 72 and 75). This set of products corresponds to market services only, excluding financial activities (section K of CPA). For the latter, output and price measures are mainly conventions specific to National Accounts rules (FISIM, production of non-life or life insurance services production). National Accounts use probably only banking and financial investment fees, as measured by CPIs.

A file attached to this document attempts to define concordance between SPPIs and CPIs [22]. This work was carried out on the basis of a concordance table, at detailed levels, between CPA 2.1 and COICOP 2018 disseminated by Eurostat[23]. Analyzing the headings of different items of the two nomenclatures as well as the elements explicitly included or excluded in each of them. From 129 categories tested, only 77 showed varying degrees of concordance.

Thus, we can define, in a relatively subjective way, five categories of concordance between the categories as defined by COICOP and those as defined by CPA:

1) **Match** - when the definitions of the two classifications are relatively close (8 CPA categories out of 129), especially for transport of passengers, services relating to dwellings, videogames, etc.;

2) **Proxy -** when the definitions of the two classifications partially overlapped (22 CPA categories out of 129);

3) **Proxy by aggregation of several CPIs** - with the question of the weightings of these CPIs which have to be used in order to estimate the evolution of a SPPI (20 CPA categories out of 129);

4) **Weak Proxy,** when the definitions of the two classifications are far from being close (16 CPA categories out of 129); and finally

5) **Weak Proxy by aggregation of several CPIs**, with only 11 CPA categories covered.

The varying degrees of concordance shows that some limitations may need to be considered when using CPIs to represent SPPIs.

6.2 PRODUCTS VS. INDUSTRIES

The Eurostat-OECD methodological guide for developing producer price indices for services defines industry based and product-based indices as follows:

> **Industry based indices** are 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

For both index types, prices and price changes of products are observed. The differences lie, on the one hand, in the population from which the sample of providers and the sample of price observations are drawn and, on the other hand, in the weighting of the individual services.

[22] see An_attempt_to_define_concordance_between_CPIs_and_SPPIs.xls

[23] https://ec.europa.eu/eurostat/ramon/relations/index.cfm?TargetUrl=LST_REL&StrLanguageCode=EN&IntCurrentPage=5

How does the population of providers of certain services affect the index development? Is the price development different for providers for whom the services in question represent their economic focus than for companies that provide this service as a by-product? In open markets with a large number of providers, it can be assumed that the economic focus of the provider plays only a minor role compared with other factors such as the economic importance of the provider, its reputation or regional circumstances. One could assume that the price development of a product category is closely linked to the price development of these products at the market leaders - regardless of whether these market leaders have their focus in the corresponding economic sector.

The second crucial difference between product-based and industry-based indices - the weighting of the individual services - probably has a stronger influence on the index trend. On the one hand, an industry-based index is composed of the price trends of main and by-products. On the other hand, within the main products one may have a different internal weighting depending on whether one considers only the suppliers of the respective industry or all suppliers.

This, of course, depends heavily on how much is known about the revenue significance of the services in the various groups of providers. Often, no clearly distinguishable data on the sales significance of individual services are available for either type of index. If we consider only the section of an industry-based index that reflects the price development of the main products, its inner weighing is subject to similar uncertainties as those of a product-based index. The smaller one chooses the product section, the more similar the price developments in the chosen product section are likely to be.

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 easily derived. Regardless of the type of index published by the statistical offices, these indices can be broken down to products too.

The part of a product index that is most observable, and probably the most secure, is the sub-index for which prices are collected from companies for which the products in question correspond to their economic focus. The same applies to industry-based indices. The sub-index that is easiest to collect and probably best secured is the price development of the main products of the industry.

Based on the previous considerations on the influences of the economic focus of companies on price developments, it seems reasonable to estimate index components by price developments for the corresponding products in other economic sectors. That is, missing parts of an industry-based index can be estimated by product indices from other sources, and missing parts of a product-based index can be estimated by product components of an industry-based index.

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.

7 CONCLUSION

The CPI represents a viable opportunity to increase and/or replace coverage in the production of SPPIs. Conceptual differences between the PPI and CPI, which are consistent with the primary uses of the two measures, need to be carefully considered in order to ensure accurate and a theoretically and practically sounds suite of price indicators. The different uses result in differences such as valuation principle, scope and coverage, aggregation and classification and other differences such as timing and frequency of the series. This paper has discussed a number of these important aspects to consider whilst also providing some practical guidance.

1) **Valuation principle** – the PPI measures changes in the prices received by the company for the provision of goods or services and is defined in basic prices. It should include subsidies on products and taxes on production while excluding taxes on products, subsidies on production, retail and wholesale margins and ancillary aspects of the transaction that are separately invoiced (e.g. insurance charges). In contrast, the CPI measures changes in the prices paid by the consumer. The price is the total amount the purchaser pays, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser; the purchaser's price of a good or service includes any ancillary charges paid separately by the purchaser to take delivery at the required time and place. Thus, the indices will differ with regard to the inclusion and/or exclusion of certain taxes, subsidies and ancillary charges.

2) **International trade in services** – The SPPI measures changes in the price received for services provided by domestic companies to the domestic market and to export. The CPI measures changes in the prices for all services available for the consumer, including imported services and excluding exported services. For industries that contain a large portion of imported services, it is potentially less appropriate to use the CPI as proxy for the SPPI and it may be necessary to remove the prices of imported services from the CPI. The imported services impact the indices only if their prices change at a different rate than the equivalent domestic services.

3) **Classification** – the compilation of the SPPI and the CPI are based on different classification structures. The PPI is compiled according to industry or product classification (ISIC/CPA) and the CPI is compiled according to the classification of individual consumption (COICOP). Therefore, the CPIs must be mapped onto the classification used to compile the SPPI's. When there is not much overlap between the two different nomenclatures, the CPI proxies must be matched at the very specific and detailed level.

4) **Products vs. industries** – The SPPI can be industry based or product based. For both index types, prices of products are observed; the differences are in the sample design and in the weighting of the services. The outputs of industries can be separated into various products. The CPI also measures changes in the prices of products.

5) **Supply and Use Tables (SUTs) –** SUTs provide a basis to determine which industries or products are suited to the use of CPIs as proxies, because they contain information about the share of final consumption of total use, as well as the share of export, import, and intermediate consumption for each service industry at a detailed level.

To summarize, this paper describes the differences and similarities between the two indices to enable the price statistician to make a more informed assessment of the risks involved in using CPIs as proxies for SPPIs. Beyond these aspects there are of course other operational differences in the practical application of, for example, quality adjustment and imputation methods, different methods of measuring intermediate services, such as banking and insurance services, and coverage of personal consumption components that are not directly paid by the consumer but by a third party. This paper sets the foundations from which more studies and analysis on the implication of using CPIs as a proxy for SPPIs can be done in the future.

8 APPENDICES

8.1 APPENDIX A: FRENCH CPIS USED DIRECTLY FOR SPPIS – B2C

COICOP 2018	COICOP HEADING	SPPIs
03.1.4.2	Repair, tailoring and hire of clothing (S)	95.29 | Repair services of other personal and household goods
03.2.2.0	Cleaning, repair, and hire of footwear (S)	95.23 | Repair services of footwear and leather goods
04.1.1.0	Actual rentals paid by tenants for main residence (S)	68.20 | Rental and operating services of own or leased real estate
04.4.4.1	Maintenance charges in multi-occupied buildings (S)	81.10 | Combined facilities support services
04.4.4.1	Maintenance charges in multi-occupied buildings (S)	81.22 | Other building and industrial cleaning services
05.1.2.0	Repair, installation and hire of furniture, furnishings and loose carpets (S)	95.24 | Repair services of furniture and home furnishings
05.3.3.0	Repair, installation and hire of household appliances (S)	95.22 | Repair services of household appliances and home and garden equipment
07.2.4.4	Hire of personal transport equipment without driver (S)	77.11 | Rental and leasing services of cars and light motor vehicles
07.2.4.1	Services for parking (S)	68.20 | Rental and operating services of own or leased real estate
07.2.4.1	Services for parking (S)	52.21.24 | Parking lot services
07.2.4.2	Toll facilities (S)	52.21.22 | Highway operation services
07.3.1.1	Passenger transport by train (S)	49.10 | Passenger rail transport services, interurban
07.3.2.1	Passenger transport by bus and coach (S)	49.39 | Other passenger land transport services n.e.c.
07.3.2.1	Passenger transport by bus and coach (S)	49.31 | Urban and suburban passenger land transport services
07.3.2.2	Passenger transport by taxi and hired car with driver (S)	49.32 | Taxi operation services
07.3.3	Passenger transport by air	51.10 | Passenger air transport services
07.3.4.0	Passenger transport by sea and inland waterway (S)	50.10 | Sea and coastal passenger water transport services
07.3.4.0	Passenger transport by sea and inland waterway (S)	50.30 | Inland passenger water transport services
07.3.5.0	Combined passenger transport (S)	49.31 | Urban and suburban passenger land transport services
07.3.6.0	Other purchased transport services (S)	49.42 | Removal services
07.4.1	Postal and courier services (S)	53.10 | Postal services under universal service obligation

COICOP 2018	COICOP HEADING	SPPIs
08.3.1.0	Fixed communication services (S)	61.10 | Wired telecommunications services
08.3.2.0	Mobile communication services (S)	61.20 | Wireless telecommunications services
09.4.2.1	Hire, maintenance and repair of camper vans and caravans (S)	59.14 | Motion picture projection services
09.4.1.0	Hire and repair of photographic and cinematographic equipment and optical instruments (S)	74.20 | Photographic services
11.1.1.1	Restaurants, cafés and the like – with full service (S)	55.90 | Other accommodation services
11.1.1.1	Restaurants, cafés and the like – with full service (S)	56.30 | Beverage serving services
11.1.1.1	Restaurants, cafés and the like – with full service (S)	56.10 | Restaurant and mobile food serving services
11.1.1.2	Restaurants, cafés and the like – with limited service (S)	56.10 | Restaurant and mobile food serving services
11.1.1.2	Restaurants, cafés and the like – with limited service (S)	56.29 | Other food serving services
11.1.2.1	Canteens, cafeterias of universities, schools, and kindergartens (S)	56.29 | Other food serving services
11.1.2.9	Other canteens, cafeterias and refectories (S)	56.29 | Other food serving services
11.2.0.1	Hotels, motels, inns and similar accommodation services (S)	55.10 | Hotel and similar accommodation services
11.2.0.2	Holiday centres, camping sites, youth hostels and similar accommodation services (S)	55.20 | Holiday and other short stay accommodation services
11.2.0.3	Accommodation services of boarding schools and other educational establishments (S)	55.30 | Camping ground, recreational and vacation camp services

Highlighted in blue: CPIs used for several SPPIs – B2C.

Highlighted in yellow: SPPIs – B2C calculated partially with the corresponding CPIs.

8.2 Appendix B: Supply and Use Table Example Analysis

The following example is a heat map analysis providing a visualization of where potential gains from CPI may be found.

Product (use)	Australia B2C	Australia B2E	Australia Import	Austria B2C	Austria B2E	Austria Import	Denmark B2C	Denmark B2E	Denmark Import	France B2C	France B2E	France Import
Total product at purchaser's prices	27%	9%	…	22%	20%	…	20%	23%	…	24%	13%	…
Total product at basic prices (bp)	26%	9%	10%	20%	21%	20%	17%	24%	21%	23%	14%	21%
Products of agriculture, forestry and fishing, bp	12%	17%	2%	20%	8%	31%	11%	34%	25%	19%	14%	15%
Products of agriculture, hunting and related services, bp	11%	17%	2%	22%	10%	33%	12%	34%	23%	19%	15%	14%
Products of forestry, logging and related services, bp	2%	10%	3%	14%	2%	24%	5%	8%	8%	22%	3%	4%
Fish and aquaculture products, support serv. to fishing, bp	32%	17%	3%	43%	3%	56%	4%	46%	45%	21%	14%	41%
Mining and quarrying, bp	2%	59%	7%	0%	7%	78%	4%	33%	30%	0%	5%	89%
Coal and lignite, bp	0%	92%	0%	…	…	…	…	…	…	…	…	…
Crude petroleum and natural gas, bp	10%	51%	20%	…	…	…	…	…	…	…	…	…
Metal ores, bp	0%	63%	6%	…	…	…	…	…	…	…	…	…
Other mining and quarrying products, bp	0%	16%	10%	…	…	…	…	…	…	…	…	…
Mining support services, bp	0%	1%	2%	…	…	…	…	…	…	…	…	…
Manufactured products, bp	26%	15%	42%	11%	42%	42%	10%	41%	44%	18%	31%	38%
Food, beverages and tobacco products, bp	47%	22%	20%	36%	35%	29%	21%	42%	32%	48%	17%	19%
Food products, bp	43%	23%	18%	…	…	…	…	…	…	…	…	…
Beverages, bp	66%	17%	27%	…	…	…	…	…	…	…	…	…
Textiles, wearing apparel, leather and related products, bp	58%	9%	81%	48%	32%	72%	25%	58%	83%	30%	37%	69%
Textiles, bp	34%	5%	58%	…	…	…	…	…	…	…	…	…
Wearing apparel, bp	79%	5%	95%	…	…	…	…	…	…	…	…	…
Leather and related products, bp	40%	22%	77%	…	…	…	…	…	…	…	…	…
Wood & prod. of wood & cork, exc. furniture, of straw & plaiting mat.., bp	1%	7%	15%	2%	38%	17%	4%	18%	42%	5%	12%	26%
Paper and paper products, bp	24%	9%	32%	3%	49%	31%	6%	30%	53%	13%	22%	36%
Printing and recording services, bp	4%	2%	2%	0%	21%	5%	0%	10%	13%	0%	1%	0%
Coke and refined petroleum products, bp	26%	6%	50%	25%	21%	57%	11%	26%	65%	36%	15%	37%
Chemicals and chemical products, bp	21%	17%	48%	5%	46%	50%	4%	43%	58%	6%	40%	40%
Basic pharmaceutical products and pharmaceutical preparations, bp	34%	9%	57%	12%	44%	61%	4%	75%	26%	13%	42%	50%
Rubber and plastic products, bp	16%	5%	48%	5%	42%	47%	3%	34%	51%	6%	25%	37%
Other non-metallic mineral products, bp	5%	2%	18%	3%	28%	29%	6%	22%	31%	7%	13%	24%
Basic metals, bp	0%	67%	15%	0%	42%	36%	0%	32%	72%	0%	35%	42%
Fabricated metal products, except machinery and equipment, bp	6%	3%	26%	2%	37%	33%	2%	26%	32%	4%	14%	22%
Computer, electronic and optical products, bp	27%	8%	81%	11%	44%	61%	12%	43%	66%	14%	38%	65%
Electrical equipment, bp	25%	4%	73%	6%	52%	47%	9%	40%	59%	12%	37%	55%
Machinery and equipment n.e.c., bp	5%	7%	67%	1%	52%	42%	0%	51%	34%	1%	43%	52%
Motor vehicles, trailers and semi-trailers, bp	42%	5%	74%	10%	51%	51%	28%	24%	87%	30%	39%	47%
Other transport equipment, bp	6%	10%	39%	6%	63%	36%	8%	38%	83%	2%	57%	32%
Furniture and other manufactured goods, bp	41%	12%	57%	29%	34%	46%	11%	62%	38%	32%	27%	60%
Furniture, bp	43%	2%	52%	…	…	…	…	…	…	…	…	…
Other manufactured goods, bp	40%	20%	61%	…	…	…	…	…	…	…	…	…
Repair and installation services of machinery and equipment, bp	5%	0%	0%	0%	13%	17%	4%	6%	4%	1%	9%	7%
Electricity, gas, steam and air conditioning, bp	22%	0%	0%	15%	5%	5%	48%	10%	6%	31%	3%	0%
Water supply, sewerage, waste management and remediation services, bp	30%	0%	0%	1%	9%	17%	42%	7%	8%	24%	8%	4%
Natural water, water treatment and supply services, bp	48%	0%	0%	0%	0%	0%	64%	0%	0%	39%	0%	0%
Sewerage services, sewage sludge, waste collection & management serv., bp	4%	0%	0%	1%	10%	19%	39%	9%	9%	20%	10%	5%
Waste collection, treatment & disposal serv., materials recovery serv., bp	4%	0%	0%	…	…	…	…	…	…	…	…	…
Constructions and construction works, bp	0%	0%	2%	1%	1%	1%	1%	11%	7%	6%	0%	0%
Buildings and building construction works, bp	0%	0%	0%	…	…	…	…	…	…	…	…	…
Constructions and construction works for civil engineering, bp	0%	0%	7%	…	…	…	…	…	…	…	…	…
Specialised construction works, bp	0%	0%	0%	…	…	…	…	…	…	…	…	…
Wholesale&retail trade serv., repair serv. of motor vehicles & cycles, bp	56%	7%	0%	45%	18%	2%	34%	28%	3%	43%	18%	2%
Wholesale and retail trade and repair serv. of motor vehicles & cycles, bp	58%	0%	0%	50%	10%	1%	57%	6%	4%	58%	8%	0%
Wholesale trade services, except of motor vehicles and motorcycles, bp	31%	12%	0%	17%	32%	3%	14%	41%	3%	15%	29%	4%
Retail trade services, except of motor vehicles and motorcycles, bp	88%	1%	0%	89%	0%	0%	82%	0%	0%	83%	4%	0%
Transportation and storage services, bp	25%	16%	8%	17%	27%	25%	4%	45%	32%	19%	19%	15%
Land transport services and transport services via pipelines, bp	24%	25%	2%	21%	31%	26%	15%	19%	16%	23%	14%	14%
Water transport services, bp	36%	13%	3%	2%	34%	93%	1%	92%	6%	4%	90%	9%
Air transport services, bp	…	…	30%	37%	22%	24%	3%	46%	41%	38%	34%	22%
Warehousing and support services for transportation, bp	3%	4%	2%	7%	23%	19%	1%	8%	73%	10%	8%	14%
Postal and courier services, bp	…	…	2%	9%	19%	10%	2%	8%	2%	12%	11%	10%
Accommodation and food services, bp	71%	12%	14%	77%	9%	6%	68%	2%	0%	71%	0%	0%
Accommodation services, bp	46%	32%	41%	…	…	…	…	…	…	…	…	…
Food and beverage serving services, bp	78%	6%	7%	…	…	…	…	…	…	…	…	…
Information and communication services, bp	17%	4%	7%	13%	18%	18%	14%	13%	18%	17%	9%	9%
Publishing services, bp	32%	10%	31%	29%	17%	35%	20%	19%	31%	32%	6%	8%
Audiovisual and broadcasting services, bp	16%	2%	12%	13%	10%	24%	16%	4%	9%	9%	10%	9%
Motion picture, video & TV programme production serv., etc., bp	15%	3%	24%	…	…	…	…	…	…	…	…	…
Programming and broadcasting services, bp	18%	2%	0%	…	…	…	…	…	…	…	…	…
Telecommunications services, bp	32%	3%	3%	36%	9%	9%	40%	7%	10%	37%	7%	7%
Computer programming, consultancy and related serv., Information serv., bp	6%	3%	3%	0%	23%	16%	1%	14%	17%	1%	11%	10%
Computer programming, consultancy and related services, bp	0%	4%	3%	…	…	…	…	…	…	…	…	…
Information services, bp	17%	2%	2%	…	…	…	…	…	…	…	…	…
Financial and insurance services, bp	35%	2%	2%	25%	11%	8%	36%	5%	4%	24%	6%	3%
Financial services, except insurance and pension funding, bp	29%	2%	1%	14%	13%	9%	32%	5%	3%	11%	9%	4%
Insurance, reinsurance & pension funding services, exc. compulsory S.S., bp	83%	1%	1%	58%	11%	9%	66%	5%	6%	66%	4%	2%
Services auxiliary to financial services and insurance services, bp	6%	2%	2%	9%	3%	2%	15%	6%	7%	0%	0%	0%
Real estate services, bp	64%	1%	0%	62%	0%	0%	73%	0%	0%	73%	0%	0%
Imputed rents of owner-occupied dwellings, bp	98%	1%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%
Real estate services excluding imputed rents, bp	0%	0%	0%	32%	0%	1%	52%	0%	0%	39%	0%	0%
Professional, scientific and technical services, bp	3%	4%	4%	1%	16%	12%	1%	14%	13%	3%	10%	10%
Legal, accounting, head offices services, management consultancy serv., bp	…	…	…	2%	13%	11%	0%	12%	10%	3%	7%	6%
Architectural, engineering, tech. testing and analysis services, bp	…	…	…	0%	21%	11%	0%	24%	14%	1%	15%	17%
Scientific research and development services, bp	…	…	…	0%	18%	7%	0%	10%	12%	0%	10%	12%
Advertising and market research services, bp	…	…	…	0%	15%	27%	0%	11%	26%	0%	15%	21%
Other professional, scientific, technical and veterinary services, bp	…	…	…	15%	11%	8%	8%	3%	3%	24%	0%	0%
Administrative and support services, bp	5%	3%	5%	16%	6%	7%	15%	11%	19%	4%	18%	17%
Rental and leasing services, bp	4%	4%	10%	13%	12%	10%	26%	4%	3%	5%	20%	23%
Employment services, bp	5%	3%	3%	0%	2%	5%	1%	2%	2%	1%	0%	0%
Travel agency, tour operator & other reservation services & related, bp	…	…	0%	82%	4%	4%	43%	1%	50%	33%	0%	0%
Security & investigation serv., serv. to buildings & other bus. support, bp	6%	0%	…	12%	3%	5%	3%	21%	19%	2%	24%	19%
Public administration and defence services, compulsory S.S. services, bp	1%	0%	0%	0%	1%	0%	1%	1%	1%	0%	0%	0%
Education services, bp	40%	11%	0%	9%	0%	1%	7%	0%	1%	6%	0%	0%
Human health and social work services, bp	35%	0%	1%	19%	1%	2%	11%	0%	0%	22%	0%	0%
Human health services, bp	36%	0%	1%	17%	1%	1%	11%	0%	1%	18%	1%	1%
Residential care services, social work services without accommodation, bp	34%	0%	0%	26%	0%	4%	11%	0%	0%	29%	0%	0%
Arts, entertainment and recreation services, bp	57%	4%	5%	60%	6%	6%	45%	1%	6%	34%	3%	1%
Creative, arts, entmnt, library, museum, other cult. serv., gambling, bp	60%	3%	6%	55%	8%	9%	46%	1%	9%	38%	5%	3%
Creative, arts and entertainment services, bp	17%	3%	4%	…	…	…	…	…	…	…	…	…
Gambling and betting services, bp	92%	4%	7%	…	…	…	…	…	…	…	…	…
Sporting services and amusement and recreation services, bp	54%	4%	5%	71%	2%	1%	42%	1%	0%	29%	0%	0%
Other services, bp	83%	1%	1%	40%	0%	1%	30%	1%	10%	37%	6%	5%
Services furnished by membership organisations, bp	…	…	…	3%	0%	0%	12%	1%	0%	0%	0%	0%
Repair services of computers and personal and household goods, bp	…	…	…	27%	1%	2%	100%	0%	0%	44%	0%	0%
Other personal services, bp	83%	1%	1%	84%	0%	1%	54%	0%	27%	64%	14%	12%
Services of HH as employers, undif. G&S prod. by HH for own use, bp	…	…	…	100%	0%	0%	6%	0%	0%	88%	0%	0%
Services provided by extraterritorial organisations and bodies, bp	…	…	…	…	…	…	…	…	…	…	…	…
Taxes less subsidies on products	58%	0%	…	65%	1%	…	59%	0%	…	58%	0%	…

Product (use)	Australia B2C	Australia B2E	Australia Import	Austria B2C	Austria B2E	Austria Import	Denmark B2C	Denmark B2E	Denmark Import	France B2C	France B2E	France Import
Electricity, gas, steam and air conditioning, bp	22%	0%	0%	15%	5%	5%	48%	10%	6%	31%	3%	0%
Water supply, sewerage, waste management and remediation services, bp	30%	0%	0%	1%	9%	17%	42%	7%	8%	24%	8%	4%
Natural water, water treatment and supply services, bp	48%	0%	0%	0%	0%	0%	64%	0%	0%	38%	0%	0%
Sewerage services, sewage sludge, waste collection & management serv., bp	4%	0%	0%	1%	10%	19%	39%	9%	9%	20%	10%	5%
Waste collection, treatment & disposal serv., materials recovery serv., bp	4%	0%	0%	---	---	---	---	---	---	---	---	---

The price statistician can review each output on a classification-by-classification basis to determine the appropriateness of a CPI replacement. This example shows that in the case of *Electricity, gas, steam and air conditioning* the potential impacts of price change and/or coverage divergence of exports and imports are minimal and the potential coverage gain within each respective output considerable. This is a win-win scenario for the use of a CPI replacement. For the remaining utilities, *water supply, sewerage, waste management and remediation services* the same hypothesis can be made for Australia, Denmark and France. In the example of Austria, an alternative market structure is being utilized where services are being imported to a much higher degree and transactions that are direct to consumer are minimal. This highlights the importance of assessing the applicability of CPI as a replacement both on a classification basis and based on the national setting being put into focus.

8.3 APPENDIX C: VOORBURG GROUP ALTERNATIVE DATA SURVEY

This table shows the frequency of CPI usage per 4-digit class as per industry classification. The survey was based on a sample of 15 countries: Australia, Canada, China, Denmark, Ireland, Japan, Latvia, México, Poland, Republic of Korea, Spain, Sweden, Switzerland, United Kingdom and United States.

CPI (as an alternative data source) was the dominant non-traditional method. CPIs were utilized as both the primary source and in combination with other sources.

CPI frequency as an alternative data source for a particular 4-digit classification.

Class	Name	Frequency
H	**Transportation and storage**	
4911	Passenger rail transport, interurban	8
4912	Freight rail transport	1
4921	Urban and suburban passenger land transport	9
4922	Other passenger land transport	7
4923	Freight transport by road	2
5011	Sea and coastal passenger water transport	6
5021	Inland passenger water transport	1
5110	Passenger air transport	6
5221	Service activities incidental to land transportation	4
5310	Postal activities	3
5320	Courier activities	2
I	**Accommodation and food service activities**	
5510	Short term accommodation activities	7
5520	Camping grounds, recreational vehicle parks and trailer parks	4
5590	Other accommodation	2
5610	Restaurants and mobile food service activities	11
5621	Event catering	1
5629	Other food service activities	4
5630	Beverage serving activities	5
J	**Information and communication**	
5811	Book publishing	4
5813	Publishing of newspapers, journals and periodicals	5
5819	Other publishing activities	1
5820	Software publishing	1
5911	Motion picture, video and television programme production activities	2
5913	Motion picture, video and television programme distribution activities	1
5914	Motion picture projection activities	4
5920	Sound recording and music publishing activities	1
6020	Television programming and broadcasting activities	2
6110	Wired telecommunications activities	5
6120	Wireless telecommunications activities	3
6312	Web portals	1
6399	Other information service activities n.e.c.	1
K	Financial and insurance activities	
6419	Other monetary intermediation	3
6430	Trusts, funds and similar financial entities	1
6492	Other credit granting	1
6499	Other financial service activities, except insurance and pension funding activities, n.e.c.	1
6512	Non-life insurance	1
6612	Security and commodity contracts brokerage	1
L	**Real estate activities**	
6810	Real estate activities with own or leased property	3
6820	Real estate activities on a fee or contract basis	4
M	**Professional, scientific and technical activities**	
6910	Legal activities	3
6920	Accounting, bookkeeping and auditing activities; tax consultancy	1
7020	Management consultancy activities	1
7110	Architectural and engineering activities and related technical consultancy	1
7120	Technical testing and analysis	2
7310	Advertising	1
7320	Market research and public opinion polling	1
7410	Specialized design activities	1
7420	Photographic activities	2
7490	Other professional, scientific and technical activities n.e.c.	1
N	**Administrative and support service activities**	
7710	Renting and leasing of motor vehicles	1
7722	Renting of video tapes and disks	1
7729	Renting and leasing of other personal and household goods	2
7740	Leasing of intellectual property and similar products, except copyrighted works	1
7911	Travel agency activities	2
7912	Tour operator activities	3
7990	Other reservation service and related activities	1
8121	General cleaning of buildings	1
8129	Other building and industrial cleaning activities	1
P	**Education**	
8510	Pre-primary and primary education	2
8521	General secondary education	2
8522	Technical and vocational secondary education	3
8530	Higher education	1
8541	Sports and recreation education	1
8542	Cultural education	1
8550	Educational support activities	1
Q	Human health and social work activities	
8610	Hospital activities	1
8620	Medical and dental practice activities	1
8710	Residential nursing care facilities	1
8890	Other social work activities without accommodation	1
R	Arts, entertainment and recreation	
9311	Operation of sports facilities	4
9312	Activities of sports clubs	2
9321	Activities of amusement parks and theme parks	1
9329	Other amusement and recreation activities n.e.c.	1
S	**Other service activities**	
9511	Repair of computers and peripheral equipment	1
9512	Repair of communication equipment	1
9521	Repair of consumer electronics	1
9522	Repair of household appliances and home and garden equipment	1
9523	Repair of footwear and leather goods	1
9601	Washing and (dry-) cleaning of textile and fur products	3
9602	Hairdressing and other beauty treatment	5
9603	Funeral and related activities	4
9609	Other personal service activities n.e.c.	2