Office for National Statistics

Article

Services Producer Price Index methods changes

The sources used to compile the weights required for chain-linking and a change to the classification framework.

Contact:
Craig Taylor
business.prices@ons.gov.uk
+44 (0)1633 456907

Release date:
20 July 2020

Next release:
To be announced

Table of contents

1 . Executive summary

We are implementing annually chain-linked business prices in line with international best practice and to improve consistency with other price indices such as the Consumer Prices Index (CPI). This is a significant improvement to the weighting and linking of business inflation statistics, which we previously announced as part of a consultation in 2017. The implementation of chain-linking is recommended by Eurostat over the current method of rebasing for price statistics, as the weighting structures are updated more frequently.

This article outlines the sources used to compile the weights required for chain-linking and a change to the classification framework. This article is part of a collection of articles we are publishing. Other articles published are:

- producer price inflation methods changes: this outlines the move from net to gross basis to measure the headline producer price index, removal of duty and the sources used to compile the weights required for chain-linking
- producer price weight change impacts: this discusses the impact of introducing chain-linking and the other new methods on weights used in the Producer Price Indices (PPIs)
- services producer price weight change impacts: this discusses the impact of introducing chain-linking and the other new methods on weights used in the Services Producer Price Index (SPPI)
- chain-linking in business prices: this focuses on the methodology and practical implementation of chain-linking for business prices, including the technical process of price updating sales data to forecast more representative weights

To complete the collection of articles, we will publish a further two articles to provide the impact of implementing the new methods on the PPI and SPPI. We are planning to publish the PPI and SPPI using the new methods towards the end of 2020.

2 . Introduction

Business prices are a collection of inflation statistics that measure the inflation across the manufacturing and service sectors and include Producer Price Index (PPI), Export Price Index (EPI), Import Price Index (IPI) and Services Producer Price Index (SPPI). To meet international regulations, the weighting structure has historically been updated every five years to reflect changes in the economy. Business prices are moving to a new annual chain-linking methodology, which is the method of updating weights on an annual basis and statistically linking them to produce a continuous time series. This article outlines the changes in other methods that have been implemented to support chain-linking and to ensure that the outputs continue to meet users' needs based on consultations completed in 2017 and 2019. This article outlines the changes in methods applied to the SPPI estimates to allow for the implementation of chain-linking.

3 . Main definitions in SPPI

The Services Producer Price Index (SPPI) measures the change in prices charged for services provided to UK-based customers. Prior to 2019, the SPPI had a "business-to-business" coverage, including only transactions between businesses and other businesses, government and non-profit institutions serving households (NPISH).

From 2019, the scope of the SPPI has been extended to cover "business-to-all" transaction that is, including also transactions to consumers (households) as a result of adopting new European legislative requirements within the Framework Regulation Integrating Business Statistics (FRIBS). This is described in further detail in Section 7.

The SPPI is focused solely on the UK domestic economy. Therefore, only prices for transactions occurring between a UK service producer and a UK customer are used in the SPPI compilation. To be selected in the SPPI sample, businesses must have offices registered for UK Value Added Tax (VAT) or Pay As You Earn (PAYE).

Finally, the UK SPPI uses product rather than industry-level turnovers to calculate the index weights. This is discussed in greater detail in Section 9.

4 . Sources used for index weights at the last rebasing

At the last Services Producer Price Index (SPPI) rebasing in 2013, when 2010 weights were implemented, a mix of data from the Services Turnover Survey (STS) and the Annual Business Survey (ABS) were used to calculate the index weights.

Improvements were made to the STS in 2010 in response to a need for a source that could more closely fulfil the sales data requirements for the SPPI, and this was the first year it was used as a main source in rebasing. Before this, the Office for National Statistics (ONS) supply and use tables had been used to produce the index weights, but there were limitations in the level of detail provided.

The 2010 STS had a sample size of 8,000 businesses and was designed to collect only the turnover of those service products classified within the business's main industry. To give an example, all museums provide museum-related services but some also have cafés, shops or entertainment. These secondary services are often classified outside the main economic activity of a business; the ONS did not consistently collect product-level turnover for these services until the introduction of the Annual Survey of Good and Services (ASGS) – see Section 5.

The 2010 STS was designed to meet the specific requirements of SPPI rebasing; however, it was still an experimental data source and as such, where concerns existed around the quality of some of its estimates, it was used in combination with data from ABS. For further details of the use of the STS and ABS at the time of the 2010 rebasing exercise, please see SPPI rebasing question and answer (Word, 33KB) and Rebasing the PPI and SPPI (2010=100). The ABS is a well-established structural annual survey with a sample size of 72,000 businesses, making it the largest business survey conducted by the ONS.

The weights calculated using STS data implemented at the last rebasing will be used between 2008 and 2013 and will have the new chain-linking methodologies applied. From 2014, weights will be calculated using the new ASGS data and use the chain-linking methodology.

5 . Changes in sources used for index weights within chain-linking

The data used to calculate the index weights required for the Services Producer Price Index (SPPI) chain-linked indices from 2014 onwards come from two data sources: the Annual Survey of Goods and Services (ASGS) and the Annual Business Survey (ABS).

The ASGS is a new annual survey that focuses on collecting the turnover of service products. It has been designed to be the service sector equivalent of the UK manufactures' sales by product (ProdCom) survey, which provides product-level sales data for manufactured goods. The first available year of ASGS data was 2016, which had a sample size of 40,000 businesses and collected turnover for 1,200 service products.

Compared to the Services Turnover Survey (STS), the ASGS offers several important benefits for use as a source of SPPI weights:

- it has a wider coverage of the service sector
- as an annual survey, it enables the frequent updating of weights, ensuring the latest available information is being used to calculate the index
- it collects product-level turnover for all services provided by a business, regardless of whether they are classified to the business' main economic activity or not (for example, turnover from services of performing artists is mainly generated by the creative arts industry, but it can also be generated as secondary activities of travel agencies, museums and hotels); this gives possibilities for further development work discussed in Section 9

The ASGS is combined with ABS in a similar way as STS was combined with ABS at the time of the last rebasing, for which further details can be found in the SPPI Methods and Guidance (PDF, 457KB). This is because the ASGS is still a new data source and is currently experimental, so this method has been put in place for quality assurance. As ABS measures industry-level turnovers, it is adjusted before being combined with ASGS, which measures product-level turnover. The future aim is to move to using ASGS only as this is more suited to the requirements of the SPPI.

6 . Imputation applied to data sources

At the time of calculating the chain-linking weights, only 2016 data were available for the Annual Survey of Goods and Services (ASGS). As discussed in Section 5, the ASGS is designed to meet the requirements of the Services Producer Price Index (SPPI) and is therefore the primary source used for the calculation of weights. Imputation has been applied to overcome the limited coverage for years 2014 to 2017. An overview of the methods used is summarised in Table 1.

Table 1: Imputation methods applied in Annual Survey of Goods and Services data
UK, 2014 to 2018

Index Year	**2014**	**2015**	**2016**	**2017**	**2018**
Source Year	2016	2016	2016	2016	2016
Method applied	Backcasting	Backcasting	Backcasting	Backcasting	Price updating

Source: Office for National Statistics – Services producer price index methods changes

Backcasting is calculated by applying the four-digit Classification of Products by Activity (CPA) level growth rates from the Annual Business Survey (ABS) to price updated 2016 ASGS data. The growth rate is calculated in the following way:

$$G_{t,i} = \frac{S_{t,i}^{ABS}}{S_{t-1,i}^{ABS}}$$

where:

$S_{t,i}^{ABS}$ is the sales for ABS for a given $4-$ digit CPA i at time t.

$S_{t-1,i}^{ABS}$ is the sales for ABS for a given $4-$ digit CPA i at $t-1$.

The backcast sales for 2016 are then calculated by dividing price updated ASGS sales by the ABS growth rate. Data are first price updated as the weights need to be referenced to Quarter 4 (Oct to Dec) in the reference year.

The price updated sales value for product I is denoted as:

$$S_{2017,i}^{ASGS}$$

The following formula is the 2016 ASGS sales for product (six-digit CPA) i price updated forward to Quarter 4 2017. See the Chain-linking in business prices article for clarification of the method used to do this.

$$S_{2016,i}^{backcast} = \frac{S_{2017,i}^{ASGS}}{G_{2017,i}}$$

To backcast sales earlier than 2016, the price updated ASGS data are divided by a product of each of the growth rates between 2017 and the year to which the sales are being backcast.

$$S_{t',i}^{backcast} = \frac{S_{2017,i}^{ASGS}}{\prod_{z=t'+1}^{z=2017} G_{z,i}}$$

From 2018, SPPIs will use the same methods as the Producer Price Indices (PPIs). Further detail on price updating can be found in the Chain-linking in business prices article.

7 . Business-to-business ratios

As described in Section 1, the indices calculated for the Services Producer Prices Index (SPPI) up to 2018 exclude transactions to consumers, but the sources used to calculate the index weights include this value. Therefore, under the chain-linking methodology, an adjustment is still required for the period 2014 to 2018. From 2019 onwards, the adjustment is not required as business-to-consumer transactions are included within the scope of the SPPI (see Section 3 for more information). An adjustment ratio is calculated to estimate the proportion of business, government and non-profit institutions serving households (NPISH) consumption in relation to consumer consumption of a product. This is then used to adjust the turnover value including sales transactions to consumers to leave an approximate business-to-business, government and NPISH sales value.

For the majority of products, this adjustment is calculated using the intermediate consumption table and the final demand table from the Input–output supply and use tables. These tables give information on intermediate demand, gross capital formation (GCF) and household consumption, so they can be used to calculate an approximate ratio excluding household consumption. This is calculated as follows:

$$B_{i,t} = \frac{GCF_{total,i} + I_{total,i}}{C_{total,i} + GCF_{total,i} + I_{total,i}}$$

where:

$\mathrm{B_{i,t}}$ is the business to business ratio.

$GCF_{i}^{total\ demand}$ is the total GCF demand for product i.

$I_{i}^{total\ demand}$ is the total intermediate consumption demand for product i.

$C_{total,i}$ is the household consumption demand for product i.

Additional adjustments are applied to remove imports and transactions from the public sector and NPISH using the data released in the 2014 input–output table. Full details about how these are calculated are available in Appendix 1.

This method is limited by the level of the supply and use table groupings, which are at approximately Classification of Products by Activity (CPA) 2.1 divisional level. This means that the same ratio is being assumed for all the products within that division, which may have different trends from each other. However, the ratios have been quality assured and where the division ratio does not appear appropriate, an alternative source such as Department for Transport has been used to calculate a more granular breakdown. In cases where there is no external source, the supply and use table ratio has been investigated and an expert decision made on whether further ad-hoc adjustments were required for specific products.

8 . Classification changes

Classifications provide a framework that are used to group products into larger groups based on common characteristics. Using an agreed framework ensures that there is consistency over time and makes comparisons between countries easier as products are grouped in the same way.

Classifications can also be thought of as a means of defining the basket of services, as they are used as the basis for price collection and determine what is and is not a central part of the UK service economy.

When the Services Producer Price Index (SPPI) was redeveloped from the Corporate Services Price Index (CSPI) at the time of the 2005 rebasing, it used a bespoke classification unique to the UK. This was broadly aligned to Standard Industrial Classification (SIC), which is an international standard classification at the industry grouping but below this, the product-level structure was determined by a panel of service sector experts. This approach was taken because the international classifications available at the time did not have the correct detail to represent the UK service economy.

Additionally, the bespoke classification was designed to meet earlier Eurostat requirements. As such, it had limited coverage as it focussed only on those service industries required by EU legislation and not on the whole service sector. For example, veterinary services were not previously included as part of the bespoke classification structure.

The earlier bespoke product classification has now been replaced by the Classification of Products by Activity (CPA) 2.1. This is a classification developed at EU level and is aligned with the UN Central Product Classification (CPC).

In combination with the introduction of the Annual Survey of Goods and Services (ASGS), the move to CPA 2.1 has meant that the weights coverage of the services sector has increased. Analysis done on the previous structure indicates that the CPA classes covered by the combined use of the Annual Business Survey (ABS) and ASGS was approximately 68% of the total. This has now increased to 84%, whereas the price coverage of the SPPI currently remains at approximately 59%.

While the bespoke classification was broadly aligned with international classification systems such as nomenclature of economic activities (NACE) in the EU at the division level, there was one exception that combined two divisional level products: computer programming, consultancy and related services (division 62) and information services (division 63) into a unique “Computer Services” division. With the full adoption of the CPA across the entire SPPI framework, the two divisions will now be published separately.

9 . Turnover aggregation: product compared with industry

Difference between product and industry

As outlined in the Services Producer Price Index (SPPI) international manual, SPPI aggregation can be carried out by industry or product level. In Europe, the two main classifications that can be used are: the Classification of Products by Activity (CPA) and the Standard Industrial Classification (SIC). These are broadly aligned with each other at the four-digit level; the CPA breaks downs SIC industries into specific products for each industry.

A business operating in a specific industry will generate most of its turnover from selling products belonging to that industry; however, they may also generate turnover from secondary activities that would be classified into different industries. These secondary activities are referred to as being on the off-diagonal.

In the UK, our aim is to measure both the SPPI and Producer Price Index (PPI) on a product basis.

Difference between on-diagonal and off-diagonal

The term on-diagonal turnover is used to describe turnover generated through the provision of products that directly map to the same industry classification of the reporting business. Off-diagonal turnover relates to the provision of products outside the main industrial classification reporting business. An example would be a business classified within the education sector providing accommodation services. This is because the business's industry is the education sector, while the product or service is in the accommodation and food services sector.

For implementation of chain-linked SPPIs, only on-diagonal turnovers have been used to calculate the weights. This approach has been chosen for several reasons:

- the Services Turnover Survey (STS) only covered on-diagonal activities
- the current SPPI sample includes on-diagonal services only
- use of Annual Survey of Good and Services (ASGS) off-diagonal activities increased the volatility of the SPPI weights over time; this could be because of ASGS data still being experimental and possibly subject to further revisions

However, the longer-term ambition is to introduce full product-level weights including both on-diagonal and off-diagonal turnovers. This methodology is currently in development and will be subject to ongoing review as more data are received.

10 . Comparability

There are several differences between the methodologies used in the 2010 rebased Services Producer Price Index (SPPI) and the chain-linked SPPI implemented from 2014. This means that the series are not completely comparable.

One of the largest differences comes from the use of the bespoke classification in 2010. As discussed in Section 8, this was not designed to be comparable to the Classification of Products by Activity (CPA) structures used by Eurostat and was unique to the UK. To produce comparisons over time, earlier series using this structure have been mapped to CPA 2.1 categories. Because of the differences between the two structures, where a product was classified under one category in the bespoke structure, in some cases it could fit into several potential categories in CPA 2.1 and vice versa. This means that both prices and weights may be grouped differently between the two classifications, and this can lead to different trends. Consequently, some series on the bespoke classification and on CPA 2.1 are approximately comparable but some differences are expected.

A second area that causes differences between the 2010 rebased weights and the chain-linked weights is the change in sources. As discussed in Section 5, the Services Turnover Survey (STS) collected service products but was designed to target only the parts of the service sector required by Eurostat. This was because of the challenges associated with measuring services, meaning that a targeted approach was deemed more practical. Much work has been done in improving the measurement of services that has led to the development of the Annual Survey of Goods and Services (ASGS). The ASGS collects data annually and offers coverage of all service area divisions. The ASGS also uses different methods of data collection and estimation compared with earlier sources. This change has an impact on the weights as it means that the source used to calculate them is not consistent.

Finally, the move to chain-linking also has an impact on the comparability. The detail of this is covered in the chain-linking article, but the main implication for the SPPI is that the service sector tends to be dynamic. Changing weights annually means that these chain-linked series are more sensitive to these changes in comparison with the rebased method.

11 . Appendix 1: Business-to-business ratios

This section describes in detail the business-to-business ratios that were applied to the Service Producer Price Index (SPPI) between 2014 and 2018. In 2019, the scope of the SPPI changed from business-to-business to include business-to-consumer (households) from 2019.

Data collected in the annually produced supply and use tables are not directly comparable with weights data used for the SPPI. However, a more detailed version of the supply and use tables is published every five years, which enables the calculation of adjustment factors to ensure the business-to-business ratio is on the same basis as SPPI weights.

One of the main differences in data from the supply and use tables is that some services can also include government and non-profit institutions serving households (NPISH). The SPPI only counts services provided by businesses, so this component of the supply and use tables is adjusted. To do this, a separate adjustment ratio is calculated for each sector involved in the calculation of business-to-business ratios.

For household consumption for supply and use table product grouping i, this ratio is calculated by taking the proportion of consumption of private sector services to the total including consumption of NPISH and government services by households.

$$R_{C,i} = \frac{C_i^{private}}{C_i^{private} + C_i^{NPISH} + C_i^{government}}$$

where:

$C_{,i}^{private}$ is private sector household consumption for product group i.

$C_{,i}^{NPISH}$ is NPISH consumption by households for product group i.

$C_{,i}^{government}$ is government consumption by households for product group i.

The ratio to determine the proportion of intermediate consumption of private services is calculated in a similar way.

$$R_{\mathrm{intermediate},i} = \frac{C_{\mathrm{intermediate},i}^{private}}{I_i^{private} + I_i^{NPISH} + I_i^{government}}$$

where:

$I_i^{private}$ is the intermediate consumption of private services for product group i.

I_i^{NPISH} is the intermediate consumption of NPISH services for product group i.

$I_i^{government}$ is the intermediate consumption of government services for product group i.

Finally, the proportion of gross capital formation (GCF) is calculated as

$$R_{GCF,i} = \frac{GCF_i^{private}}{GCF_i^{private} + GCF_i^{NPISH} + GCF_i^{government}}$$

where:

$GCF_i^{private}$, GCF_i^{NPISH} and $GCF_i^{government}$ are the use of product I in GCF from private sector sources, NPISH sources and government sources respectively.

In addition to this, a ratio is calculated to eliminate import use from the previously mentioned sectors. A separate ratio is calculated for each of the relevant sectors for the business-to-business calculation.

For household consumption for product i:

$$P_{c,i} = \frac{C_i^{domesticprivate}}{C_i^{domesticprivate} + C_i^{domesticNPISH} + C_i^{domesticgovernment}}$$

Similarly, the domestic proportion of intermediate consumption is calculated as

$$P_{\mathrm{intermediate},i} = \frac{C_{\mathrm{intermediate},i}^{domesticprivate}}{I_i^{domesticprivate} + I_i^{domesticNPISH} + I_i^{domesticgovernment}}$$

Finally, the formula for domestic GCF is as follows:

$$P_{GCF,i} = \frac{GCF_i^{domesticprivate}}{GCF_i^{domesticprivate} + GCF_i^{domesticNPISH} + GCF_i^{domesticgovernment}}$$

These adjustments are then applied to the original business-to-business ratio formula:

$$B_{i,t} = \frac{P_{GCF,i} R_{GCF,i} GCF_{total,i} + P_{\mathrm{intermediate},i} R_{\mathrm{intermediate},i} I_{total,i}}{P_{C,i} R_{C,i} C_{total,i} + P_{GCF,i} R_{GCF,i} GCF_{total,i} + P_{\mathrm{intermediate},i} R_{\mathrm{intermediate},i} I_{total,i}}$$

This formula is calculated for 2014 to 2018.

12 . Authors

Chris Bloomer, Angela Kubik, Tony Liu and Sam Roe – Economic Statistics, Office for National Statistics