

Public service productivity: quarterly, UK QMI (Experimental Statistics)

Quality and Methodology Information for Experimental estimates of Quarterly UK public service productivity, detailing the strengths and limitations of the data, methods used, and data uses and users.

Contact:
Josh Martin
productivity@ons.gov.uk
+44 (0)1633 455425

Release date:
5 July 2019

Next release:
To be announced

Table of contents

1. [Output information](#)
2. [About this Quality and Methodology Information report](#)
3. [Important points about the data](#)
4. [Quality summary](#)
5. [Quality characteristics of the data](#)
6. [Methods used to produce the data](#)

1 . Output information

National Statistic	No
Frequency	Quarterly
How compiled	Administrative and ONS National Accounts Data
Geographic coverage	UK
Related publications	Public service productivity: quarterly, UK
Last revised	5 July 2019

2 . About this Quality and Methodology Information report

This quality and methodology report contains information on the quality characteristics of the data (including the European Statistical System five dimensions of quality) as well as the methods used to create it. The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about existing uses and users of the data
- understand the methods used to create the data
- decide suitable uses for the data
- reduce the risk of misusing data

3 . Important points about the data

- Public service productivity measures the level of output produced for each unit of input in public services.
- Quarterly public service productivity uses a degree of estimation to provide timelier estimates compared with our annual public service productivity release.
- To remove the effect of price changes over time, public service output and inputs are measured in quantity terms (also referred to as volume terms), instead of expenditure terms.
- These estimates are produced to measure the productivity of UK public services, but do not measure value for money or the wider performance of public services.

4 . Quality summary

Overview

Quarterly public service productivity (QPSP) uses measures of public services inputs and output, from a range of sources including the National Accounts and other ONS data. Estimates are published on the same regular quarterly timetable as other productivity measures, shortly after the quarterly national accounts. The included data are provided on a UK geographical basis, and report on a quarterly basis, starting after the latest National Statistic annual estimates in [Public Service Productivity: Total](#) (National Statistic) up to the latest available quarter.

QPSP is estimated by comparing growth of the total output produced by public services with the growth of the total inputs used. If the growth rate of output exceeds the growth rate of inputs, productivity increases, meaning that more output is being produced for each unit of input. Conversely, if the growth rate of inputs exceeds the growth rate of output, then productivity will fall, indicating that less output is being produced for each unit of input.

For total UK public services, estimates of output and inputs are made up of aggregated series for individual public services, weighted together by their relative share of total expenditure on public services (expenditure weights).

Uses and users

Users of QPSP measures include:

- UK government departments such as the Cabinet Office, HM Treasury, and the Department for Business, Energy and Industrial Strategy
- academia
- international statistical bodies and think tanks
- press and general public

The publication is a regular input into briefings for Cabinet Office's ministers and permanent secretaries. We also work with government departments, so they can incorporate the general methodology of the estimates into their own work.

The release relies on feedback from stakeholders and users to make improvements and alterations to the publication; ensuring maximum utility to its users. All questions and feedback can be sent via email to productivity@ons.gov.uk.

Strengths and limitations

Strengths:

- the publication provides timely estimates – soon after the source data becomes available
- while timely releases involve a greater degree of estimation, QPSP tracks closely to the National Statistic annual estimate
- inputs and output are seasonally adjusted, reducing volatility and fluctuations
- we continuously improve the estimates and operate an open revisions policy

Limitations:

- the accuracy of QPSP estimates are dependent on the accuracy of the source data
- productivity estimates for individual services are not currently published
- revisions to source data will lead to revisions in QPSP estimates
- trends in output, inputs and productivity estimates are mostly determined by the largest service areas where quarterly data are readily available
- unlike the annual estimates in [Public Service Productivity: Total](#) (National Statistic), quarterly estimates of inputs and output are not adjusted for quality

5 . Quality characteristics of the data

This report provides a range of information that describes the quality of the data and identifies the issues that should be noted when using the output.

The UK Statistics Authority has developed a [Code of Practice for Statistics](#), incorporating the principals of the five European Statistical System (ESS) quality dimensions. This report addresses the quality dimensions and important quality characteristics, which are:

- relevance
- accuracy and reliability
- coherence and comparability
- accessibility and clarity
- timeliness and punctuality
- concepts and definitions

Relevance

(The degree to which the statistical product meets user needs for both coverage and content.)

Quarterly public service productivity (QPSP) uses a “nowcasting” method to provide estimates for the most recent quarters. The estimates are currently published as [experimental statistics](#) with a lag of one quarter – shortly following the release of the [quarterly national accounts](#) and in line with other [productivity releases](#).

In combination with other economic indicators, up-to-date productivity estimates help build a comprehensive picture of the UK economy. Data for these estimates are sourced from a range of administrative and National Accounts data sources.

It expands upon the [Public Service Productivity: Total](#) (National Statistic), which provides the basis for analysing inputs, output and the productivity of UK Public Services based on the Classification of Functions of Government (COFOG) expenditure. However, these annual estimates are produced with a two-year lag. The QPSP release provides more timely estimates to inform public sector planning – though trading off some of the accuracy in the annual estimates.

Accuracy and reliability

(The degree of closeness between an estimate and the true value.)

As there is no other source of public service productivity estimates that is comparable in methodology, validating our results is difficult. The closest comparison publications are the [Public Service Productivity: Total](#) (National Statistic). While using similar data sources, methodologies differ slightly, and each release covers a different stretch of time.

Quarterly estimates will be updated by annual estimates as they become available and this will help inform the accuracy of the quarterly series.

The accuracy of the derived series depends on the accuracy of the source data. Unless we have introduced substantial methodological changes, the main source of revisions to each service area's productivity estimates will be changes in source data and expenditure weights.

It is difficult for ONS to provide a confidence interval around its estimates given the multiple sources of data on which the estimates are based. There will inevitably be some margin for error from a "true" measure of productivity, which is unknown.

The [New nowcasting methods for more timely quarterly estimates of UK total public service productivity](#) methodology article compares growth rates in the quarterly release with their counterparts from the National Statistic annual release, finding comparable estimates. A similar trend can be seen with more recent data. Quarterly figures for 2016 (as published at the time) suggest that productivity increased by 1.1%, with inputs falling 0.3% and output rising 0.8%. This tracks closely with the subsequent National Statistic annual release, that estimates productivity growing by 1.4%, inputs falling by 0.2%, and output rising by 1.1%.

We assessed the accuracy and reliability of QPSP in [historical revisions analysis and nowcast evaluation](#). This compares quarterly estimates in successive publications, to assess the revisions. It finds that published early quarterly estimates do not systematically underestimate or overestimate growth rates for inputs, output and productivity.

Coherence and comparability

(Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain for example, geographic level.)

There are no other estimates that are exactly comparable in geographic or time series coverage to the QPSP estimates, in order to compare. The closest measure is the [Public Service Productivity: Total](#) (National Statistic), which uses similar data sources although the methods differ to a degree and provide only estimates on an annual basis. As noted under "Accuracy and reliability", QPSP follows comparable trends to the National Statistic annual article.

To publish estimates of QPSP, we convert some source data from financial year to calendar year, and aggregates results to a UK level, which makes it difficult to make comparisons.

Quarterly public service productivity estimates are published on the same day as other ONS productivity estimates, aiding users in comparing across releases. Due to the bespoke methodology employed to measure the public service productivity, there is difficulty in [comparing public service productivity estimates with other productivity estimates](#) (PDF, 0.43MB) due to different definitions of inputs and output.

Accessibility and clarity

(Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the release details, illustrations and accompanying advice.)

Our recommended format for accessible content is a combination of HTML web pages for narrative, charts and graphs, with data being provided in usable formats such as CSV and Excel. Our website also offers users the option to download the narrative in PDF format. In some instances, other software may be used, or may be available on request. Available formats for content published on our website but not produced by the ONS, or referenced on the website but stored elsewhere, may vary. For further information please refer to the contact details at the beginning of this publication.

For information regarding conditions of access to data, please refer to the following links:

- [Terms and conditions \(for data on the website\)](#)
- [Accessibility](#)

In addition to this Quality and Methodology Information, Basic Quality Information relevant to each release is available in the background notes of the relevant Statistical Bulletin.

Notification of changes in methodology is published on the [public service productivity page](#) on the ONS website. In depth, initial investigations and estimates are published in ONS' methodological article, [New nowcasting methods for more timely quarterly estimates of UK total public service productivity](#).

Timeliness and punctuality

(Timeliness refers to the lapse of time between publication and the period to which the data refer. Punctuality refers to the gap between planned and actual publication dates.)

In March 2016, Sir Charles Bean's [Independent Review of UK Economic Statistics](#) (PDF, 5.26MB) identified the need for improvement in the timeliness of public service productivity estimates (2.60). The report accepted that early estimates – based on incomplete data – will contain greater scope for revisions, but that the less timely the statistic, the less useful they are likely to be. In addition to this, we have actively engaged with its users and established groups in the field of public service productivity in developing the methodology for these estimates.

Estimates of output, inputs and productivity for total public services are published on a quarterly basis and are published around three months after the end of the reference period.

For more details on related releases, the [Office for National Statistics release calendar](#) is available online and provides 12 months' notice of release dates. In the unlikely event of a change to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully at the same time, as set out in the [Code of Practice for Official Statistics](#).

Concepts and definitions

(Concepts and definitions describe the legislation governing the output and a description of the classifications used in the output.)

Our analysis of productivity in the public services in the UK is world-leading. Measurement of output (including the need to measure changes in quality), inputs and productivity follows the principles in the [Atkinson Review \(2005\)](#) (PDF, 1.07MB).

Raw data used for inputs is broken down into four main components: labour, intermediate consumption, capital, and social transfers in kind. More information on these definitions can be found in the [System of National Accounts 2008](#) and [European System of Accounts 2010](#).

While service area breakdowns are not provided in the release, raw data used for inputs, output, and productivity figures are broken down by service areas defined by the [Classification of the Functions of Government \(COFOG\)](#) (PDF, 0.044MB).

Quality trade-offs

- QPSP is an experimental statistic, using a degree of estimation to deliver timelier estimates compared with our National Statistic public service productivity figures, which are published with a two-year lag.
- There is a trade-off between timeliness of release and level of detail in the publication; quarterly public service releases do not provide breakdowns into component or service area.
- The quarterly release seasonally adjusts data to better allow for analysis of the underlying trend; however, the nature of quarterly releases means that its time series will appear more erratic than its annual counterpart.

Why you can trust our data

The QPSP statistic is produced in accordance with the best practices set out in the [Statistics Authority's Code of Practice](#) and the [ONS's Data Policies](#).

Any revisions to the data are clearly identified as such and limitations are made known to all users.

6 . Methods used to produce the data

How we collect the data, main data sources and accuracy

Inputs data

Inputs are composed of labour, goods and services (intermediate consumption), and consumption of fixed capital. For some labour inputs, direct quantity measures, such as full-time equivalents (FTEs), can be observed and are used to measure growth in the quantity of inputs. FTE data are sourced from the [Public Sector Employment Survey](#).

For the other areas of labour, and all areas of goods and services and consumption of fixed capital, the quantity of inputs are not directly available. In these cases, the volume of inputs is estimated by taking associated current price expenditure data and adjusting for inflation using a suitable price index (deflator). Current price expenditure data are consistent with the quarterly national accounts (QNA), and deflators are chosen that best reflect the changing prices of different inputs for each underlying service area.

In the QNA, central government expenditure data are sourced in current prices from HM Treasury's public spending database – Online System for Central Accounting and Reporting (OSCAR) – which collects financial information from across central government departments. Quarterly estimates are derived from monthly profiles of spending for the current financial year and modified to meet National Accounts requirements.

Most local government expenditure data are sourced from financial year returns by local authorities, collated by the Ministry for Housing, Communities and Local Government. To this are added data from the devolved administrations in Wales, Scotland and Northern Ireland. To derive quarterly expenditure, the annual spend is apportioned equally among the calendar quarters. For the current financial year, data is based on forecasted budgets which are replaced by provisional outturn data in the September following the end of the financial year. Final outturn data are typically available by the following December.

Deflators (price indices)

A suitable deflator (price index), or composite deflator, is applied to each current price expenditure, so as to estimate a volume series. The [Atkinson Review \(2005\)](#) (PDF, 1.07MB) recommends that deflators (price indices) are applied separately for each input component and that the price indices should be specific for each service area. In particular, price indices for labour and procurements should be sufficiently distinct to allow for changes in the compositions of the inputs. Updates and improvements are consistently implemented to the deflators as new data sources become available.

For Defence and Other government services¹, a volume of inputs series is produced by deflating each service's respective output. A derived deflator is used for defence expenditure and the GDP deflator is used for the Other services.

These series are aggregated to form an overall estimate of the volume of inputs used to provide each of the public services identified in the total public services.

Output data

The measure of public service output in this release is equivalent to General Government Final Consumption Expenditure (GGFCE), as published in the QNA. The published estimate of growth in GGFCE in the quarterly national accounts sometimes differs from the measure of total public service output used in the QPSP release due to differences in the seasonal adjustment methodology.

Given that the majority of public services are supplied free or at cost price, they are considered non-market output. The output of most services is measured by the number of activities or services delivered. These are often referred to as "direct output measures" and are, by their nature, measured on a volume basis. These activities are aggregated into a single volume output index for total public services by weighting growth rates in these together according to their share of input costs. This is also referred to as a Cost Weighted Activity Index (CWAI).

For "collective services" – those provided and consumed collectively, such as Defence, rather than those provided to individuals, such as Education – it is difficult to define and measure the nature of their output using activities, so they are often measured indirectly. Indirect measures of service output assume that the volume of output is equal to the volume of inputs used to create them. This is referred to as the "output-equals-inputs" convention and means that productivity growth will always be zero where indirect measures are used.

Quality adjustment

In contrast to the annual estimates in [Public Service Productivity: Total](#) (National Statistic), output data in the quarterly statistics are not adjusted for quality. The need for quality-adjustment is made clear in the [Atkinson Review \(2005\)](#) (PDF, 1.07MB). More details about how we adjust for quality in the annual estimates are available in [Sources and Methods for Public Service Productivity Estimates](#) (PDF, 0.11MB).

Data used for quality adjustments in the annual estimates are often not available on the same timetable as QPSP. For instance, one measure of quality for the public order and safety service area is recidivism (severity-weighted re-offending rates) – data on re-offending is not available until the relevant time horizon has passed, in this case one year. As the data are often not available, the quarterly estimates assume that the quality of public services does not change over the experimental period since the latest year covered in [Public Service Productivity: Total](#) (National Statistic).

Quality adjustment has contributed an average of 0.4 percentage points increase to output growth between 1997 and 2016, as presented in our annual releases. If the quality of public services increased over the experimental period, QPSP would understate the true growth in output and productivity. The reverse would be true if quality fell over the period. Until the necessary data are available, it is not possible to assess which is more likely.

How we process the data

Calculating productivity

At the most aggregate level, our estimates of total public service productivity are based on the ratio of output to inputs. Productivity will, therefore, increase when more output is being produced for each unit of inputs used. Estimates of inputs, output and productivity are given both as growth rates between consecutive periods and as indices, showing the cumulative trend over time.

Aggregating output

Estimates of total public sector output are produced by weighting and then aggregating the volume of output in each service area (defined by the Classifications of the Functions of Government (COFOG)). The weights used in this process are the service area expenditure weights, which are applied to form a chain-linked Laspeyres volume index of total public service output. This can be represented as follows:

$$O_{t+1} = O_t \times \sum_j \left(\frac{O_{j,t+1}}{O_{j,t}} \times \frac{e_{j,t}}{\sum_i e_{j,t}} \right)$$

Where:

- O is a Laspeyres index of output
- e is expenditure
- t and j index time and services respectively
- At starting point t=0, $O_t=0$ is set equal to 100

Aggregating inputs

Estimates of total public sector inputs are produced in a similar manner to output. This involves weighting and then aggregating the volume of inputs in each service area, using the same COFOG expenditure weights as in the calculation of aggregate output. This produces a chain-linked Laspeyres volume index of inputs for total public services. This can be represented as follows:

$$I_{t+1} = I_t \times \sum_j \left(\frac{I_{j,t+1}}{I_{j,t}} \times \frac{e_{j,t}}{\sum_i e_{j,t}} \right)$$

Where:

- I is a Laspeyres index of input
- e is expenditure
- t and j index time and services respectively
- At starting point t=0, I_{t=0} is set equal to 100

Seasonal adjustment

Once aggregated, output and inputs are seasonally adjusted to minimise cyclical trends. See the [Office for National Statistics seasonal adjustment publication](#) for more details.

How we quality assure and validate the data

A number of procedures are undertaken to quality assure both the processing of the data and the creation of the article. These include checks for unusual growth rates between periods, quality-assurance of calculations and visual inspection of the data. These processes are applied at every stage of production – from granular to the aggregate levels.

Quality assurance is performed on all stages of processing of the data and the article. The data, processing system and article are shared internally with ONS colleagues in productivity and government statistics teams.

How we disseminate the data

The quarterly UK public service productivity release is published free of charge on our website. They are published every quarter, within the [Public services productivity](#) section. Information on the next release is supplied on each publication, in addition to supporting documents. Additional data can be provided on request.

How we review and maintain the data processes

Further revisions to the estimates may be required in accordance with, for example, changes to source data. This follows our [Revisions Policy \(PDF, 0.059MB\)](#). A [guide to statistical revisions](#) is also available.

Notes for: Methods used to produce the data

1. Other government services consist of: general public services; economic affairs; recreation, culture and religion; environmental protection; housing and community amenities; research and development (across a range of other categories); and other.