

Article

# Public service productivity: quarterly, UK, January to March 2019 (Experimental Statistics)

Experimental estimates for UK total public service productivity, inputs and output to provide a short-term, timely indicator of the future path of the annual productivity estimates.

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# 1 . Main Points

- Compared with the same quarter in the previous year, productivity for total public services decreased by 3.1% in Quarter 1 (Jan to Mar) 2019, the largest decrease since Quarter 3 (July to Sept) 2009.
- This was due to an unusually large increase in inputs of 5.3% over the four quarters, while output only increased by 2.2%.
- In Quarter 1 2019, productivity decreased by 1.1% compared with the previous quarter; this was driven by inputs increasing at a faster rate (2.2%) than output (1.1%).
- Despite some revisions to the source data, the annualised productivity growth for 2018 was unrevised at negative 0.3%.
- Compared with our [National Statistic public service productivity](#) figures, this suggests the first annual decline since 2010, due primarily to a sharp fall in mid-2018.
- Compared with our National Statistics, which are published with a two-year lag, these [experimental](#) timelier estimates are delivered using nowcasting.
- The methodology used in these experimental quarterly estimates is explained in [New nowcasting methods for more timely quarterly estimates of UK total public service productivity](#).

## 2 . Quarterly public service productivity decreases as inputs rise

In general, because productivity is a long-term structural trend, we advise looking at changes in productivity between periods that are further apart, which can help to smooth any fluctuations in growth rates. The trend over the last year is an example of why this is important.

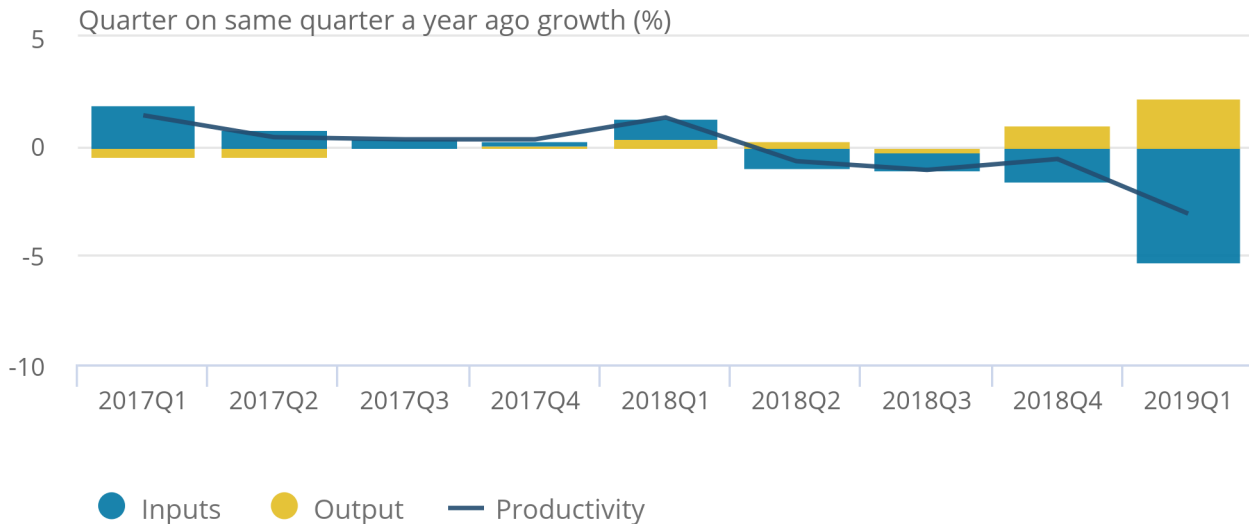
Compared with the same quarter in the previous year (Figure 1), productivity for total public services decreased by 3.1% in Quarter 1 (Jan to Mar) 2019. Over this period, inputs increased by 5.3% while output increased by less (2.2%), causing productivity to fall. The latest quarter continues a trend of negative productivity growth that began in 2018.

**Figure 1: Productivity falls in Quarter 1 (Jan to Mar) 2019 when compared with the same quarter of the previous year**

Public service productivity, inputs and output, quarter on same quarter a year ago growth rates, UK, Quarter 1 (Jan to Mar) 2017 to Quarter 1 (Jan to Mar) 2019

Figure 1: Productivity falls in Quarter 1 (Jan to Mar) 2019 when compared with the same quarter of the previous year

Public service productivity, inputs and output, quarter on same quarter a year ago growth rates, UK, Quarter 1 (Jan to Mar) 2017 to Quarter 1 (Jan to Mar) 2019



Source: Office for National Statistics

Notes:

1. Data are from this experimental quarterly release.
2. Experimental quarterly estimates of productivity are indirectly seasonally adjusted, calculated using seasonally adjusted inputs and seasonally adjusted output.
3. Growth rates have been expressed in (natural) logarithm changes such that output growth and (inverted) input growth can be added to exactly equal changes in productivity. Further information on log changes can be found in Section 3 of [A simple guide to multi-factor productivity](#).

As inputs growth has a negative effect on productivity growth, both Figure 1 and Figure 2 show the inverted growth rates of inputs – as such, the sum of the stacked bars (output, and inverted inputs) is equal to productivity growth.

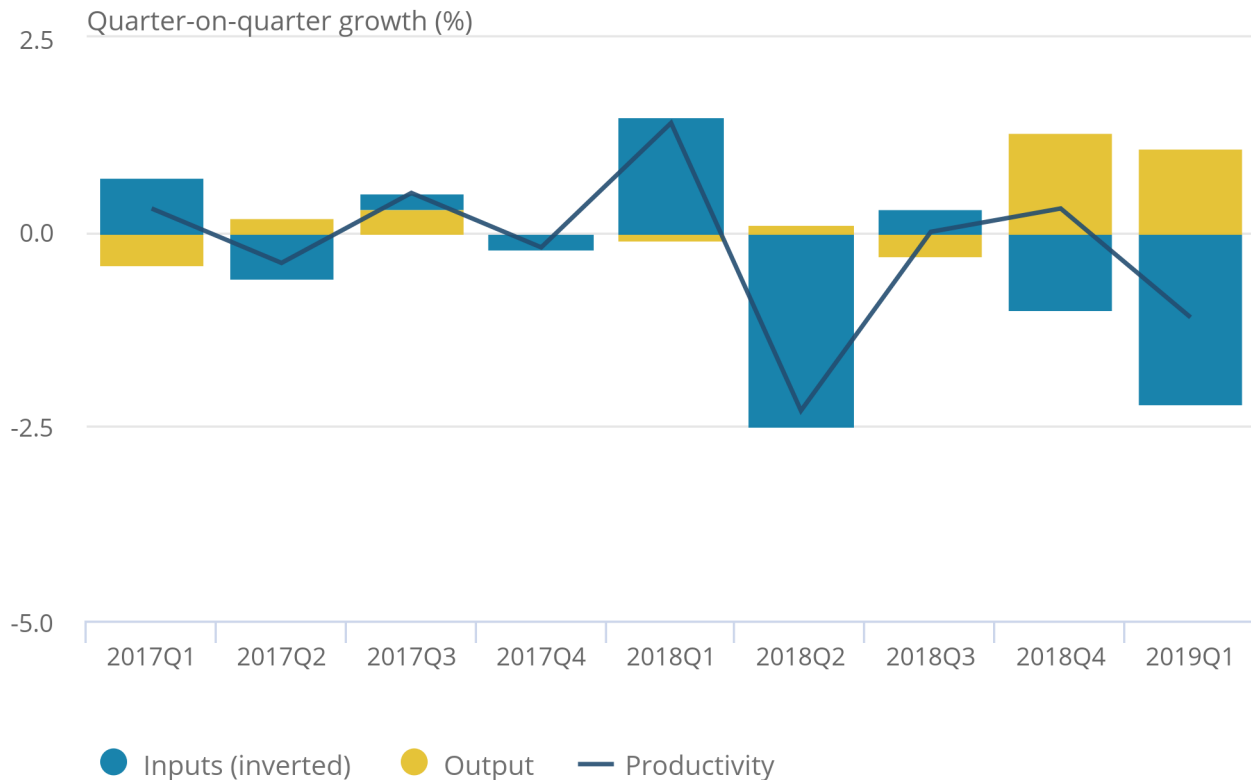
Figure 2 shows that public service productivity growth (quarter-on-quarter) has been volatile over the last year. It decreased by 1.1% in Quarter 1 2019 compared with the previous quarter, following two quarters of marginally positive growth. Incorporating data revisions in this release, the latest estimates suggest productivity grew by 0.3% in Quarter 4 (Oct to Dec) 2018 but was relatively flat in Quarter 3 (July to Sept) 2018 on the same basis.

**Figure 2: Productivity falls in Quarter 1 2019 when compared with Quarter 4 2018**

Public service productivity, inputs and output, quarter on quarter growth rates, UK, Quarter 1 (Jan to Mar) 2017 to Quarter 1 (Jan to Mar) 2019

## Figure 2: Productivity falls in Quarter 1 2019 when compared with Quarter 4 2018

Public service productivity, inputs and output, quarter on quarter growth rates, UK, Quarter 1 (Jan to Mar) 2017 to Quarter 1 (Jan to Mar) 2019



**Source:** Office for National Statistics

**Notes:**

1. Data are from this experimental quarterly release.
2. Experimental quarterly estimates of productivity are indirectly seasonally adjusted, calculated using seasonally adjusted inputs and seasonally adjusted output.
3. Growth rates have been expressed in (natural) logarithm changes such that output growth and (inverted) input growth can be added to exactly equal changes in productivity. Further information on log changes can be found in Section 3 of [A simple guide to multi-factor productivity](#).

The fall in productivity in Quarter 1 2019 was driven by a large increase in inputs of 2.2%, with output increasing comparatively less at 1.1%. This was similar to Quarter 2 (Apr to June) 2018, where a productivity decrease of 2.3% was driven by a large increase in inputs (2.5%) compared with output (0.1%). An increase in inputs of greater than 2.0% has not occurred prior to this since Quarter 4 2013.

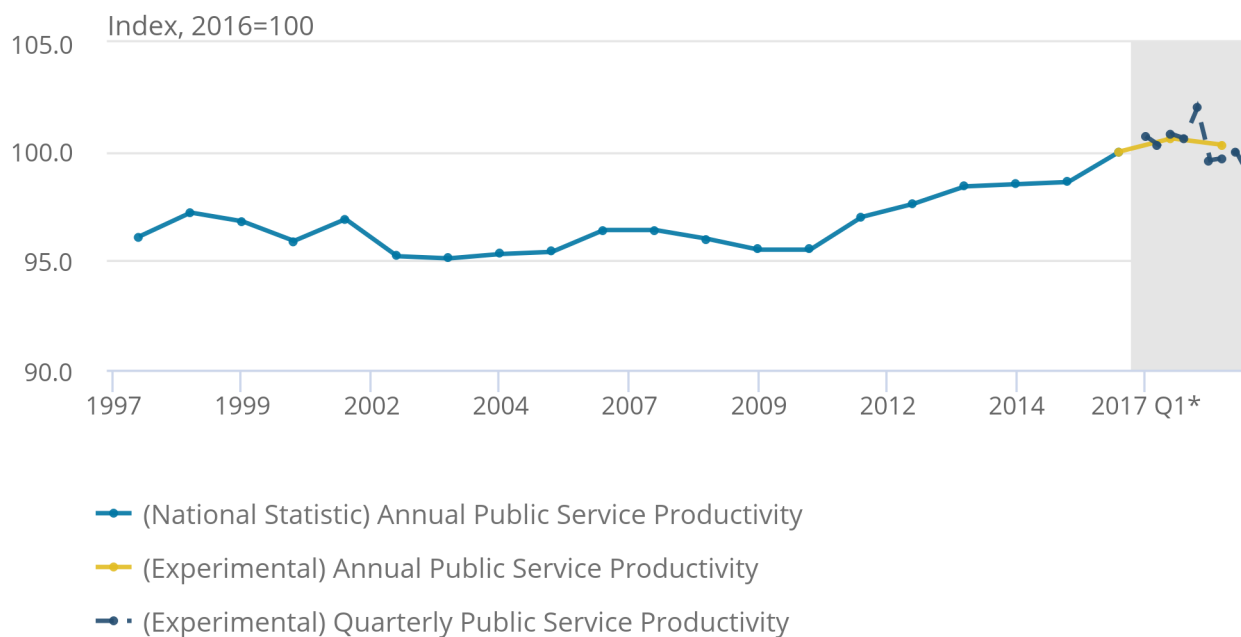
In the context of a longer time series, Figure 3 combines the experimental quarterly data in this release, and the annualised versions of these for 2017 and 2018, with estimates between 1997 and 2016. These are taken from our latest annual [Public service productivity: total, UK, 2016](#) release.

### Figure 3: Productivity is volatile from Quarter 1 2017 to Quarter 1 2019 but overall declines

Total public service productivity, UK, 1997 to 2018

## Figure 3: Productivity is volatile from Quarter 1 2017 to Quarter 1 2019 but overall declines

Total public service productivity, UK, 1997 to 2018



Source: Office for National Statistics

#### Notes:

1. Estimates from 1997 to 2016 are based on the latest annual public service productivity release.
2. Estimates from Quarter 1 2017 to Quarter 1 2019 (in dark blue dashes) are the experimental quarterly estimates in this article and are annualised (in yellow) for 2017 and 2018.
3. Estimates of productivity for the experimental period are indirectly seasonally adjusted, calculated using seasonally adjusted inputs and seasonally adjusted output.

The latest annualised quarterly data suggest that 2018 saw the first annual fall in public service productivity since 2010, but this should be treated as an experimental estimate until the more robust annual estimate for 2018 is available. In particular, the data in this release are not adjusted for changes in quality during the experimental period. Nonetheless, public service productivity is estimated to have increased by a total of 4.9% between 2010 and 2018 (an average of 0.6% per year).

### 3 . Quarter 1 2019 saw an unusual increase in inputs

Inputs are composed of labour, procurement of goods and services, and capital used in delivering public services. Compared with the previous quarter, Quarter 1 (Jan to Mar) 2019 saw an unusually strong growth in inputs. This was also true in Quarter 2 (Apr to June) 2018, compared with Quarter 1 2018. This section provides some explanation for this.

Public service productivity is calculated using seasonally adjusted measures of inputs and output. Seasonal adjustment removes the regular seasonal pattern in the data, such that the underlying trend can be observed. The seasonally adjusted series is therefore typically smoother than its non-seasonally adjusted counterpart. The ONS website contains an [explanatory article on seasonal adjustment](#) with more information.

On a non-seasonally adjusted basis, public service inputs grew by 4.7% in Quarter 1 2019 compared with the previous quarter (Figure 4). This was the largest quarter-on-quarter growth rate in non-seasonally adjusted inputs since Quarter 1 2012. Public service inputs usually grow fastest in Quarter 1 of each year, as shown by the shaded areas in Figure 4. This could be because of spending patterns around the end of the financial year.

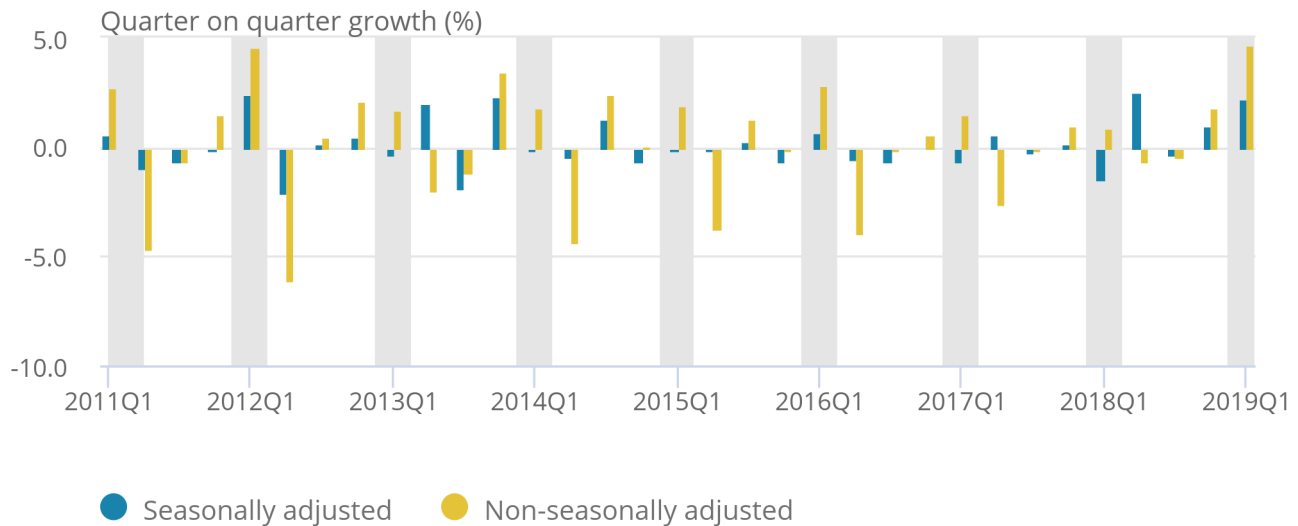
On a seasonally adjusted basis, inputs grew by 2.2% compared with the previous quarter. Other than in Quarter 2 2018, when seasonally adjusted inputs grew by 2.5% compared with the previous quarter, this was the fastest growth in seasonally adjusted inputs since Quarter 4 (Oct to Dec) 2013. As seasonal adjustment removes these regular spending patterns it reinforces the point that this was an unusually large increase in inputs.

## Figure 4: Comparing seasonality of total public service inputs

Non-seasonally adjusted and seasonally adjusted inputs growth, total public services, UK, Quarter 1 (Jan to Mar) 2011 to Quarter 1 (Jan to Mar) 2019

### Figure 4: Comparing seasonality of total public service inputs

Non-seasonally adjusted and seasonally adjusted inputs growth, total public services, UK, Quarter 1 (Jan to Mar) 2011 to Quarter 1 (Jan to Mar) 2019



Source: Office for National Statistics

#### Notes:

1. Quarter 1 values are highlighted in grey.
2. Growth rates have been expressed in (natural) logarithm changes. Further information on log changes can be found in Section 3 of [A simple guide to multi-factor productivity](#).

Much of the growth in inputs in Quarter 1 2019 was attributed to defence and “central government other” service areas. Central government other covers all central government activity except for health, education, public order and safety, and social security administration. However, since the output of both of these service areas follows the “inputs equals output” convention, changes in inputs of these service areas also change output by the same amount, and so do not impact productivity. Growth in output of these indirectly measured service areas, as well as growth in inputs, were large contributors to the strong growth observed this quarter in total output.

Of the service areas that have direct measures of output, and so can influence productivity, healthcare and education are the largest and so have the most impact. Education inputs increased notably in Quarter 1 2019 compared with the previous quarter, while output growth was slower, contributing to the fall in productivity. Healthcare inputs also increased on the quarter, but output growth was slower, following a large increase in output in Quarter 4 2018 (as noted in [last quarter's release](#)). This also contributed to the fall in productivity.

Over a longer period, healthcare inputs increased by a large margin compared with Quarter 1 2018. Inputs also grew for most other service areas over the year. While output increased for total public services over the year, the large increase in inputs drove the fall in productivity (Figure 1).

## 4 . Annualised productivity falls in 2018 as inputs increase

Figure 5 illustrates annual growth rates for inputs, output and productivity. The longer-term trends in both components from 1997 to 2016 are taken from the [Public service productivity: total, UK, 2016](#) release, while annual growth rates after this are generated from the experimental quarterly series.

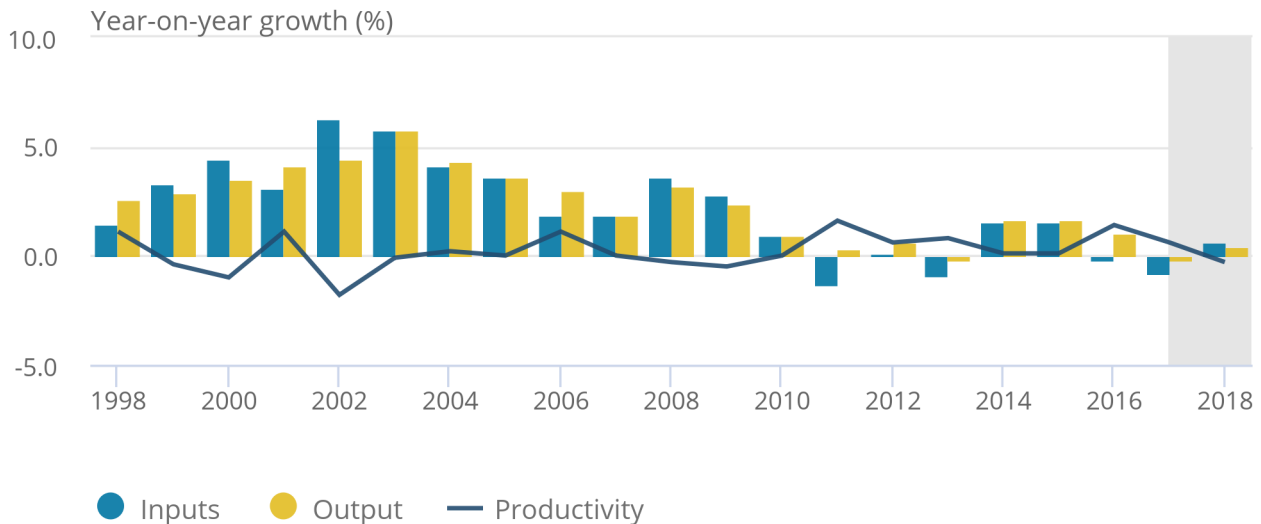
Since 2010, growth in inputs and output has been low compared with the pre-2010 norm. Inputs increased by 0.6% since 2010 (an average of 0.1% per year), while output rose by 5.6% (an average of 0.7% per year).

### Figure 5: Inputs and output growth on an annual basis remain subdued in 2018

Inputs, output, and productivity, year-on-year growth, UK, 1998 to 2018

#### Figure 5: Inputs and output growth on an annual basis remain subdued in 2018

Inputs, output, and productivity, year-on-year growth, UK, 1998 to 2018



Source: Office for National Statistics

#### Notes:

1. Estimates from 1997 to 2016 are based on the latest annual public service productivity release.
2. Estimates for 2017 and 2018 (in grey) are based on the experimental data in this release, using annualised quarterly data. These use different data sources, and do not adjust for quality.
3. Growth rates have been expressed in (natural) logarithm changes. Further information on log changes can be found in Section 3 of [A simple guide to multi-factor productivity](#).

Productivity grew every year between 2010 and 2017 but is estimated to have fallen by 0.3% in 2018 – the first annual productivity decrease since 2010. However, it should be noted that the quarterly estimates in this article, and the annual estimates derived from these, are not adjusted for quality.



The experimental quarterly series hold the quality adjustment constant, at the level of the latest National Statistic release (that is, with a lag of two years). However, weak or negative annual growth is not unprecedented – for instance, productivity growth in 2014 and 2015 was close to zero despite quality adjustment. The National Statistics include quality adjustments based on the method described in the [Atkinson Review \(PDF, 1.07MB\)](#).

## 5 . What's changed in this release?

Revisions have been implemented to the quarterly experimental series since the previous release published on 5 April 2019. These include minor revisions to some price deflators across the entire series.

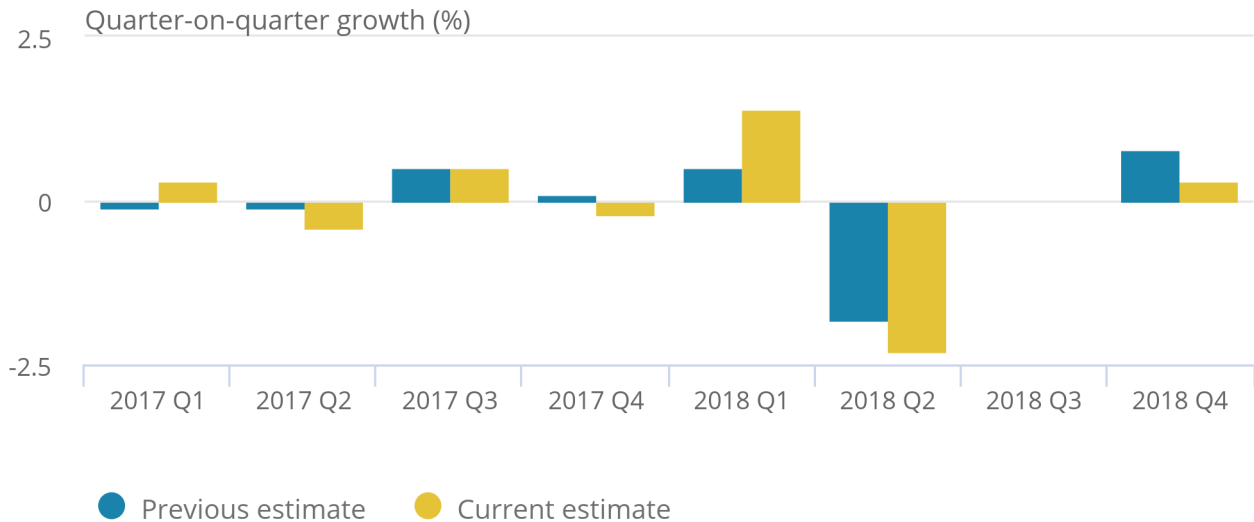
These changes mean that growth in productivity and its components – inputs and output – have been revised slightly since our last publication of these statistics. While this affects the pattern of productivity growth over 2017 and 2018, there are no effects on the estimates of annual productivity growth in either year, since the revisions balance out. The impacts are illustrated in Figure 6.

**Figure 6: Productivity saw minor revisions to some quarters, but remained unchanged over 2018 as a whole**

Productivity revisions, UK, Quarter 1 (Jan to Mar) 2017 to Quarter 4 (Oct to Dec) 2018

Figure 6: Productivity saw minor revisions to some quarters, but remained unchanged over 2018 as a whole

Productivity revisions, UK, Quarter 1 (Jan to Mar) 2017 to Quarter 4 (Oct to Dec) 2018



Source: Office for National Statistics

Notes:

1. All estimates are based on experimental quarterly total public service productivity.
2. Estimates of productivity are indirectly seasonally adjusted, calculated using seasonally adjusted inputs and seasonally adjusted output.
3. "Previous" refers to estimates included in the publication on 5 April 2019.
4. Growth rates have been expressed in (natural) logarithm changes. Further information on log changes can be found in Section 3 of [A simple guide to multi-factor productivity](#).

Public service productivity estimates operate an open revisions policy. This means that new data or methods can be incorporated at any time and will be implemented for the entire time series. Revisions to estimates of productivity growth in recent periods are common, as new data improve the estimates.

Analysis carried out in [Historical revisions analysis of quarterly UK public service productivity \(Experimental Statistics\) and nowcast evaluation](#) suggests that previous preliminary estimates of quarterly UK public service productivity, inputs and output did not systematically under or overestimate the growth rate relative to the later estimates.

## 6 . Background to public service productivity measurement

Productivity is calculated by dividing output by the respective inputs used to produce it. 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.

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 weight). Inputs are composed of labour, goods and services, and consumption of fixed capital. Expenditure data, used to estimate most inputs growth, are taken from the quarterly national accounts (QNA). The QNA also provide estimates of government output, based on direct measures where they are available and indirect measures where they are not.

Users should be aware that all growth rates in this release are expressed as changes in (natural) logarithms, including previous estimates. These can differ slightly from the discrete percentage changes typically used in our other statistical releases and previous public service productivity publications. The use of log changes allows decompositions of productivity to be exactly additive between inputs and output. In general, when the growth rates are smaller, the deviation of log changes from discrete percentage change is small.

Further information on log changes can be found in Section 3 of [A simple guide to multi-factor productivity](#).

## 7 . Quality, methodology and future improvements

Due to recent developments to our processes, we have revised the [Quality and Methodology Information \(QMI\) report](#) for this release. We are continuously looking to improve our processing, and have the following future plans to ensure accurate and robust measures:

- we have recently begun providing more detail on the drivers of quarterly public service productivity in these releases, while we explore the feasibility of providing regular service area breakdowns
- as well as the QMI report, in August 2019 we intend to publish new guides for users on the methods and data sources we use, and how to interpret these statistics
- we have recently upgraded our processing system to improve error checks and the feasibility for analysis; this is the first step in reviewing our methodology, as we hope to make improvements for future releases, and in future, we will be using this to review our methodology and implement improvements

This release presents experimental estimates for total public service productivity, inputs and output, providing a short-term timely indicator of the future path for the national statistic estimates of total public service productivity, which are produced with a two-year lag. Estimates of output, inputs and productivity up to 2016 are reported on an annual basis and use data from [Public service productivity: total, UK, 2016](#). Further information about the annual, national statistic release can be found in the [QMI report](#).

Differences between the national statistic and experimental releases and information on data sources for quarterly total public service productivity can be found in [New nowcasting methods for more timely quarterly estimates of UK total public service productivity](#).

Feedback on the use of these estimates and suggestions for improvements will be essential for the future development of timely estimates for public service productivity. All questions and feedback can be sent by email to [productivity@ons.gov.uk](mailto:productivity@ons.gov.uk).

## 8 . Authors

Sophie Barrand and Connor Marsland, Office for National Statistics.

## 9 . Related Links

### [Productivity economic commentary: January to March 2019](#)

Article | Released 5 July 2019

Draws together the main findings from official statistics and analysis of UK productivity to present a summary of recent developments.

### [Labour productivity, UK: January to March 2019](#)

Article | Released 5 July 2019

The latest estimates of labour productivity for the whole economy.

### [Industry by region estimates of labour productivity: 2017](#)

Article | Released 6 February 2019

Annual productivity estimates for 16 industries in Standard Industrial Classification 2007 section groups for each of the NUTS1 regions from 1997 to 2017. It compares annual productivity growth by region, as output per hour, relative to the UK and explains how manufacturing and services have grown across the regions.

### [Regional and sub-regional productivity in the UK](#)

Article | Released 6 February 2019

Estimates for measures of labour productivity using a balanced gross value added (GVA) approach for NUTS1, NUTS2 and NUTS3 sub-regions of the UK, selected city regions and English local enterprise partnerships (LEPs) up to 2017. Estimates are in both real and nominal terms.

### [A simple guide to multi-factor productivity](#)

Article | Released 5 October 2018

Explains the concept and measurement of multi-factor productivity through simple stylised examples.

### [Quarterly UK public service productivity \(Experimental Statistics\): January to March 2019](#)

Article | Released 5 July 2019

Contains the latest experimental estimates for quarterly UK total public service productivity, inputs and output.

### [Public service productivity: total, UK, 2016](#)

Article | Released 9 January 2019

Presents updated measures of output, inputs and productivity for public services in the UK between 1997 and 2015, in addition to new estimates for 2016.

### [Public service productivity: healthcare, UK, 2016](#)

Article | Released 9 January 2019

Presents updated estimates of output, inputs and productivity for public service healthcare in the UK between 1995 and 2015, and new estimates for 2016.

### [Public service productivity: healthcare, England: financial year ending 2017](#)

Article | Released 9 January 2019

Presents estimates of output, inputs and productivity for public service healthcare in England on a financial year basis up to financial year ending 2017.

[Improving estimates of labour productivity and international comparisons](#)

Article | Released 9 January 2019

Discusses recent Organisation for Economic Co-operation and Development findings showing that the methodologies, data sources and adjustments used to estimate the number of persons, jobs and hours worked varied significantly across countries, and explores these differences and the impact on our ICP.

[How productive is your business?](#)

Article | Released 6 July 2018

An interactive tool that aids businesses to calculate their productivity and compare their performance with other businesses in Great Britain.