

## Article

# Public service productivity: total, UK, 2016

Updated measures of output, inputs and productivity for public services in the UK between 1997 and 2015, in addition to new estimates for 2016. Includes service area breakdown, as well as impact of quality adjustment and latest revisions.



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Release date:  
9 January 2019

Next release:  
To be announced

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# 1 . Main points

- In 2016, total public service productivity grew by 1.4% compared with 2015; above the average annual growth rate for the last 19 years of 0.2%.
- This is the sixth successive year of improving productivity and marks the longest consecutive period of productivity growth for total public services for which estimates are available.
- Growth in 2016 was driven by growth in total quality adjusted output (1.1%), while inputs contracted by 0.2%.
- Rising productivity for healthcare and education services accounted for the largest upward contributions to total public service productivity growth between 2015 and 2016.
- Overall growth was partly offset by falling productivity in public order and safety services in 2016.
- Improved measurement of adult social care, including new quality adjustments, have led upward revisions in total public service productivity.

## 2 . Things you need to know about this release

This release contains updated estimates of output, inputs and productivity for public services in the UK between 1997 and 2015, in addition to new estimates for 2016. Estimates are published on a calendar year basis for consistency with the UK National Accounts.

Estimates in this bulletin cover the UK and, where possible, are based on data for England, Scotland, Wales and Northern Ireland. Where data are not available for all four countries, the assumption is made that the available data are representative of the UK. This can happen for quality adjustment, output and/or inputs data.

It is important to note that while these productivity estimates provide a measure of the amount of output produced for each unit of input, they do not measure value for money or the wider performance of public services. They do not indicate, for example, whether the inputs have been purchased at the lowest possible cost, or the extent to which the desired outcomes are achieved through the output provided.

We also produce more timely experimental estimates of total public service productivity. The experimental estimates, while timelier, use different sources to the official estimates, containing less detail and necessarily involving a greater degree of estimation. As a result, these experimental estimates are not replacements for the official estimates presented in this article and are intended to provide a timelier estimate for the more recent period. More detail on experimental total output, inputs and productivity can be found in the [Quarterly UK public service productivity \(Experimental Statistics\): July to September 2018](#), as well as in [New nowcasting methods for timelier quarterly estimates of UK total public service productivity](#).

### What drives productivity

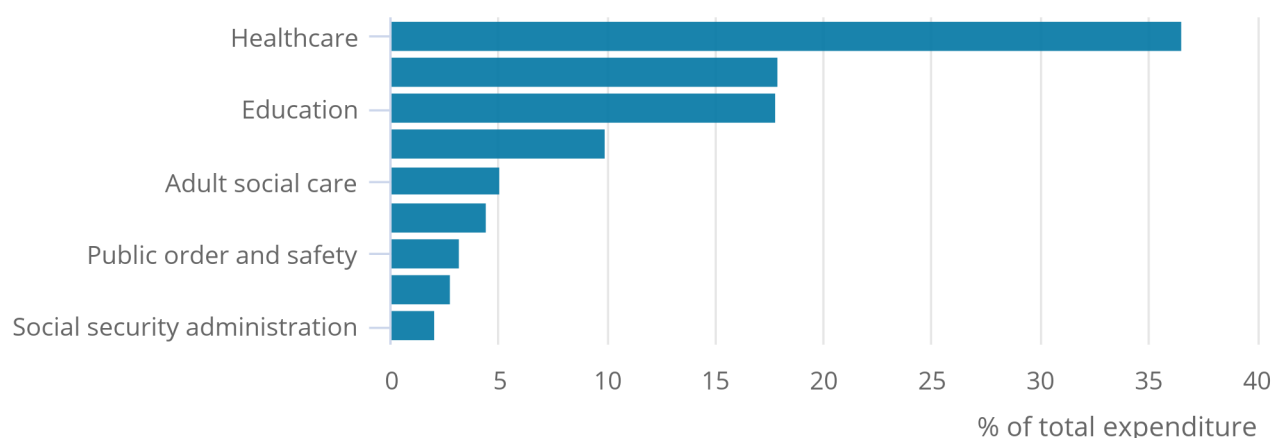
Productivity of public services is estimated by comparing growth in the total amount of output with growth in the total amount of inputs used. Productivity will increase when more output is being produced for each unit of input compared with the previous year.

Growth rates of output and inputs for individual service areas are aggregated by their relative share of total government expenditure (expenditure weight) to produce estimates of total public service output, inputs and productivity. Service areas are defined by [Classification of the Functions of Government \(COFOG\)](#) rather than administrative departments or devolved administrations. As a result, estimates presented cannot be taken as direct estimates of departmental productivity.

The contribution an individual service area makes to growth in total public services is dependent on not only the growth in that service area, but also its weight relative to total expenditure. Therefore, where service areas experience productivity growing at the same rate, a service area that accounts for a greater share of total expenditure will have a greater effect on the overall growth rate for total public services. The breakdown of expenditure between service areas for 2016 can be seen in Figure 1.

**Figure 1: Expenditure weights by service area, 2016, UK**

Figure 1: Expenditure weights by service area, 2016, UK



**Source: Office for National Statistics**

**Notes:**

1. Sum of components may not equal 100 due to rounding.
2. Other refers to other government services which include services such as economic affairs, recreation and housing.
3. Public order and safety includes courts and probation services, the prison service and the fire service.

## Measuring inputs

Inputs can be broken down into three components. They are labour (which can either be measured directly through means such as number of staff or indirectly by measuring service area expenditure on staff), intermediate consumption (expenditure on goods and services) and consumption of fixed capital. These inputs, as appropriate, are adjusted for inflation using a suitable deflator.

Expenditure data used to estimate inputs growth are based on annually published [Maastricht \(MAAST\) supplementary data tables](#). These tables are consistent with estimates of government deficit and debt reported to the European Commission under the terms of the Maastricht Treaty. They are published on a calendar-year basis and provide the required detailed breakdown by COFOG.

## Measuring output

The method of measuring output is done in a variety of ways, both between and within service areas as shown in Figure 2. The approaches are categorised broadly into four types.

### “Output-equals-inputs”

“Output-equals-inputs” represents around 38.1% of total public service output. This approach assumes that the volume of output is equal to the volume of inputs used to create them. This convention is used when the output of a service area cannot be measured by recording individual activities. As a result, productivity is assumed to remain constant and growth will always be zero. This is, therefore, the weakest of the methods.

Service areas measured using this approach are also referred to as being indirectly measured.

### Quality adjusted “output-equals-inputs”

Quality adjusted “output-equals-inputs” represents around 3.0% of total public service output. Calculated in the same way as “output-equals-inputs”, an adjustment is subsequently applied to account for changes in the quality of services delivered. While output is still measured indirectly, changes in productivity can be observed as the service quality improves or declines.

### Quantity output

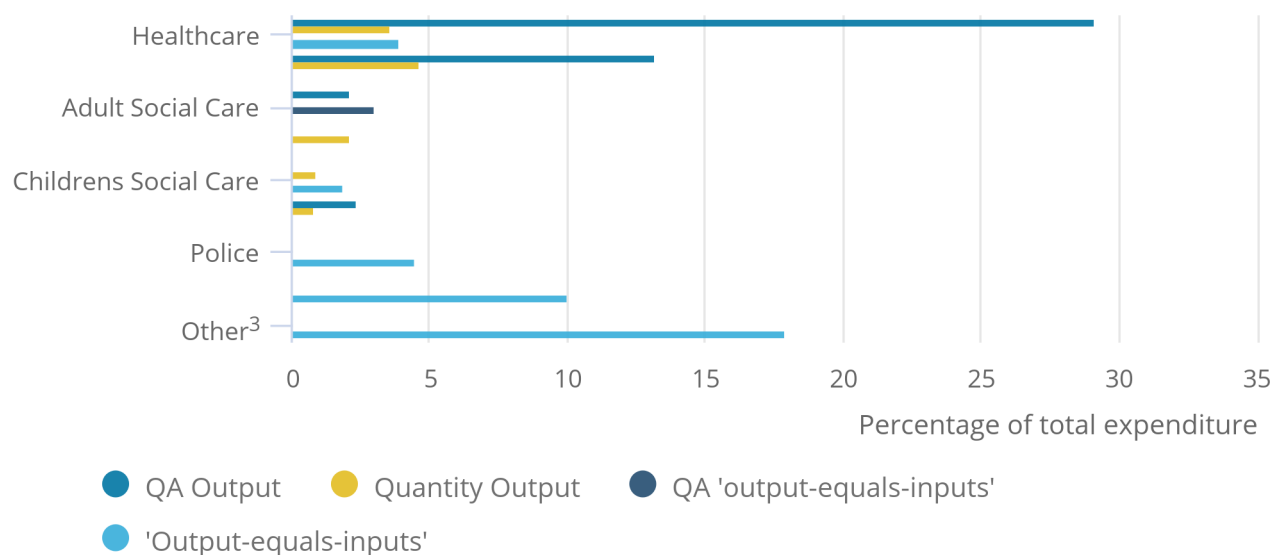
Quantity output represents around 12.1% of total public service output. Capturing the number of activities performed and services delivered, growth in individual activities are weighted together using their relative cost of delivery, to reflect growth in the output of the service area.

### Quality-adjusted output

Quality-adjusted output represents around 46.8% of total public service output. Calculated in the same way as quantity output, an adjustment is subsequently applied to account for changes in the quality of the services delivered. If the quality adjustment is positive, estimates of quality-adjusted output growth will increase faster than the quantity of output. This is the preferred method.

**Figure 2: Output-type share by service area, 2016, UK**

Figure 2: Output-type share by service area, 2016, UK



**Source: Office for National Statistics**

**Notes:**

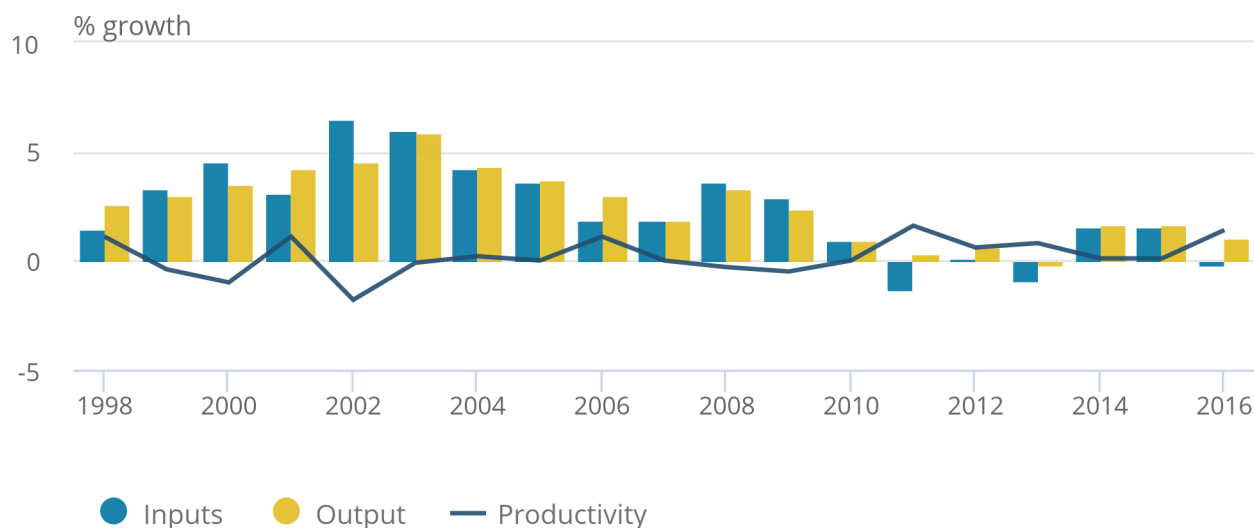
1. Output in some service areas (for example, healthcare) comprise a mix of the different output measures.
2. Sum of components may not equal 100 due to rounding.
3. Other refers to other government services which include services such as economic affairs, recreation and housing.
4. Public order and safety includes courts and probation services, the prison service and the fire service.
5. QA refers to quality adjusted.

### 3 . Total public service productivity rises as output grows and inputs fall

In 2016, productivity for total public services was estimated to have increased by 1.4%, as output grew by 1.1% and inputs fell by 0.2%. This is the sixth consecutive year of growth and its fastest rate since 2011.

**Figure 3: Total public service inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 3: Total public service inputs, output and productivity growth rates, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Output growth minus inputs growth does not necessarily equal productivity growth due to rounding.

While experiencing weak growth over the period, averaging 0.2% per year between 1997 and 2016, total public service productivity has been on an upward trend in recent years, increasing consecutively over the last six years and averaging growth of 0.8% per year in this period.

Breaking down the productivity estimates into the underlying changes in inputs and output of total public services, Figure 3 shows that, throughout much of the period, growth rates for both series have followed each other closely. Accordingly, growth in productivity has been relatively slow.

Experiencing an upward trend and growing at a faster rate than output for much of the early 2000s, growth in inputs slowed over the latest decade, contracting for the first time in 2011. This coincided with spending reductions in some departments as part of the Spending Review 2010. Since then growth of inputs has remained relatively weak and volatile, growing on average by 0.1% per year between 2010 and 2016.

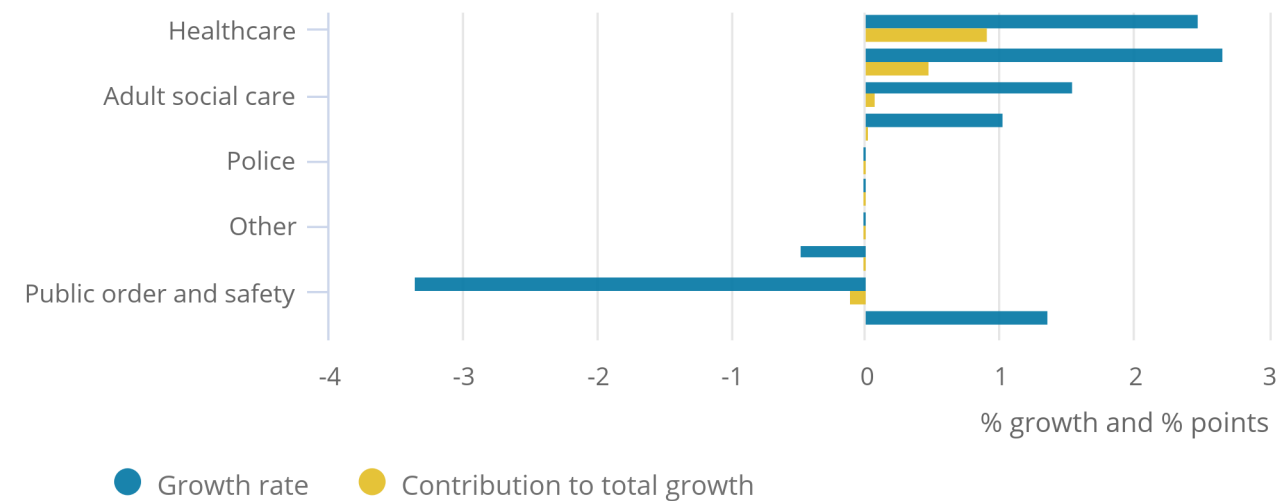
Output, on the other hand, while experiencing slower growth in recent years, relative to earlier in the series, has consistently outperformed inputs since 2010. It has grown on average by 0.9% per year between 2010 and 2016, with a slightly greater growth rate of 1.1% in 2016.

## 4 . Healthcare and education services drive growth in public service productivity in 2016

In 2016, total public service productivity grew, year-on-year, by 1.4%, following on from a 0.1% increase in the previous year. Figure 4 breaks down the growth in overall productivity into the contributions from the different service areas, as well as shows the growth rate of each service area in 2016.

**Figure 4: Productivity growth rates and contributions to total public service productivity growth by service area, 2016, UK**

Figure 4: Productivity growth rates and contributions to total public service productivity growth by service area, 2016, UK



Source: Office for National Statistics

Notes:

- 1. Contributions may not sum to total due to rounding.
- 2. Observations for police, defence and other government services are zero because they are measured using the “output-equals-inputs” convention, meaning that their productivity growth is always zero.

The healthcare service was the main positive contributor to overall productivity growth in 2016, with inputs for the service area growing at a slower rate than in recent years. As a result, productivity in the service area grew by 2.5% contributing 0.9 percentage points.

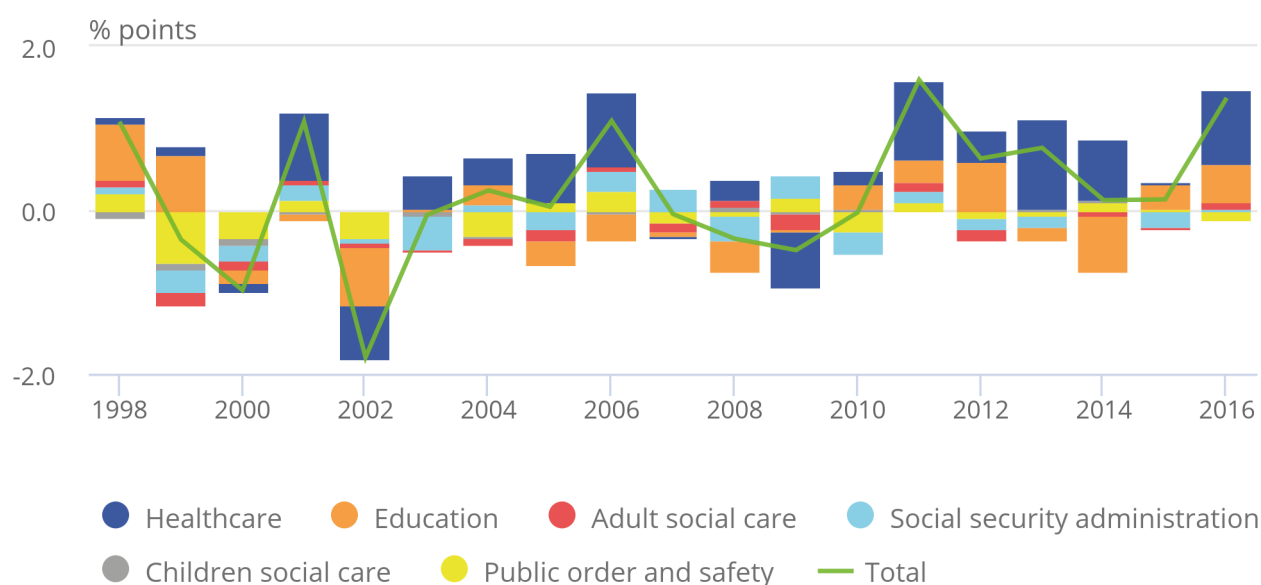
Growth to overall productivity was further bolstered by positive contributions from education services, as well as adult social care and social security administration<sup>1</sup>.

This was partially offset by negative contributions from remaining service areas, with public order and safety (POS) making the largest negative contribution throughout 2016. The recent fall in POS productivity was driven by output falling faster than inputs.

Figure 5 looks at the long-run trend in the decomposition of total public service productivity, carrying the series in Figure 4 back to 1998. It shows that public service productivity has grown consecutively over the last six years, with changes across the years being driven, predominantly, by changes in the healthcare and education services. This is partly a function of their relatively large share of public service expenditure.

**Figure 5: Contributions to growth of total public service productivity by service area, 1998 to 2016, UK**

Figure 5: Contributions to growth of total public service productivity by service area, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Contributions may not sum to total due to rounding.

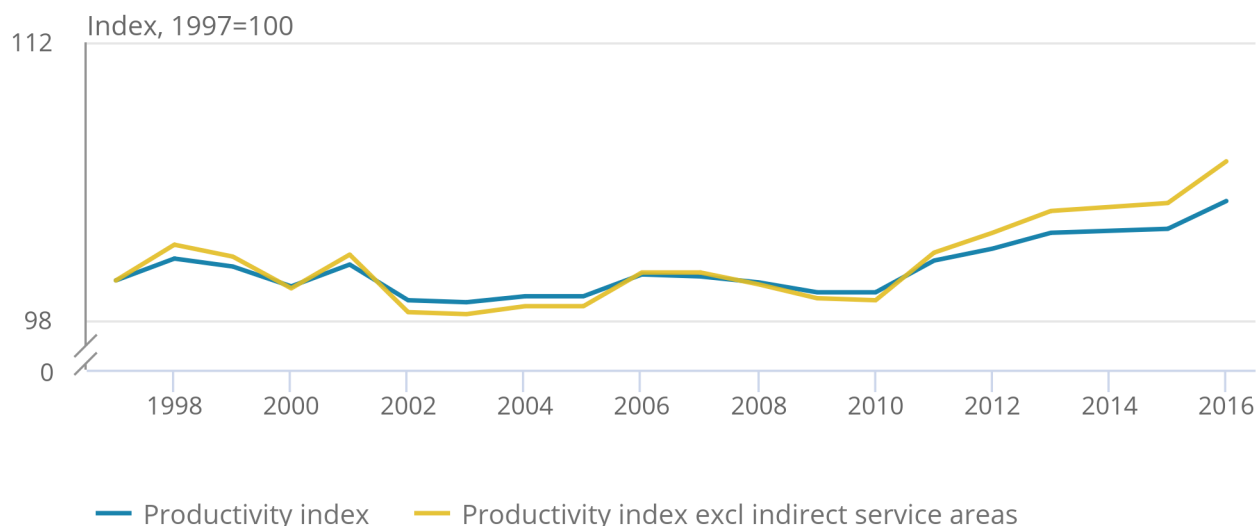
As stated earlier, for service areas where it is hard to estimate the quantity of output (due to the lack of market transactions and/or the services being collectively consumed (for example, defence)) it is assumed that the volume of output is equal to the volume of inputs used in producing them. Also referred to as indirectly measured service areas, police, defence and other government services service areas fall into this category. As a result, and as shown in Figure 4 and 5, they will subsequently contribute nothing to changes in this measure of total productivity.

These zero contributions to productivity growth from indirectly measured or “output-equals-inputs” service areas limit the growth in total public service productivity. The extent to which they affect growth of total public service productivity is proportional to their share of total expenditure. If we remove these indirectly measured service areas, where output is wholly measured on this basis, we see that total public service productivity grew by 2.0% in 2016 – faster than if these service areas were included.

To show the effect of these service areas on overall total UK public service productivity, Figure 6 compares total public service productivity with how total public service productivity would have appeared if the indirectly measured service areas were not included.

**Figure 6: Total public service productivity indices including and excluding indirectly measured service areas, 1997 to 2016, UK**

Figure 6: Total public service productivity indices including and excluding indirectly measured service areas, 1997 to 2016, UK



Source: Office for National Statistics

Figure 6 shows that between 1997 and 2016, if these indirectly measured service areas are excluded, total public service productivity would have grown by 6.0%. Compared with the headline measure of total public service productivity, which grew by 4.0% over the same period, this suggests that the impact of indirectly measured service areas has dampened productivity growth.

For much of the period, however, the two series have followed each other quite closely and only since 2011 have they begun to diverge significantly. The cause of this divergence has been due to the consistent combined net positive impacts of the remaining service areas (for example, healthcare and education), where preferred measurement methodologies have been used.

## Notes for: Healthcare and education services drive growth in public service productivity in 2016

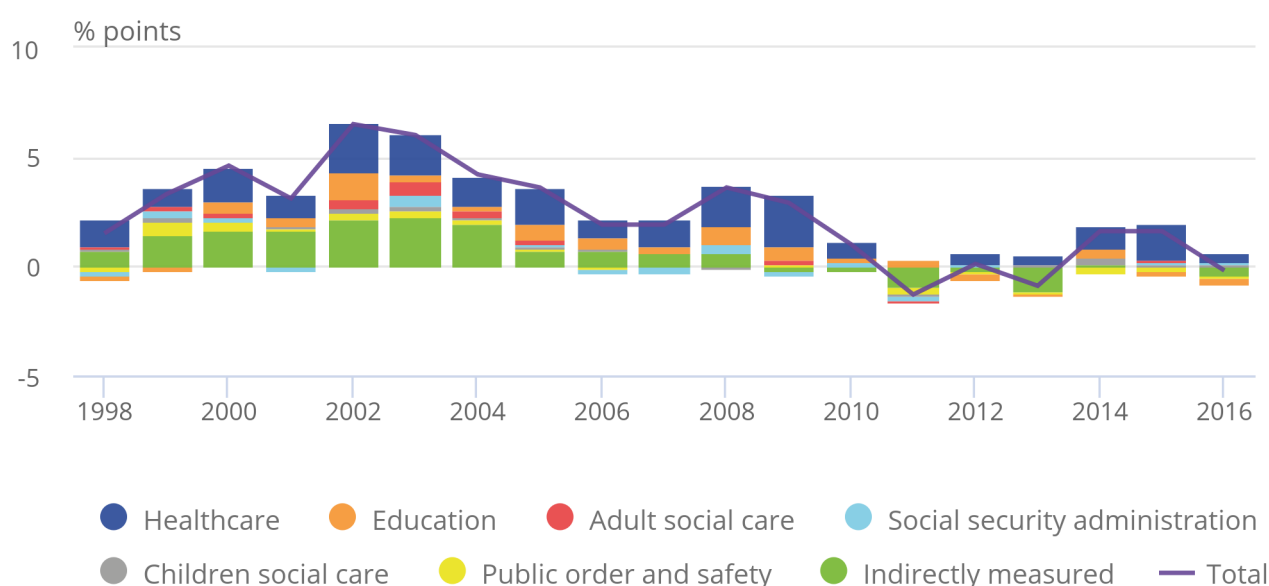
1. Social security administration includes some activities carried out by the Department for Work and Pensions (DWP) and activities carried out by other government departments such as the administration of tax credits and child benefits by Her Majesty's Revenue and Customs (HMRC).

## 5 . Total public service inputs fall for the first time since 2013

In 2016, the volume of total public service inputs fell for the first time since 2013, contracting by 0.2%. Figure 7 decomposes annual total public service inputs growth from 1998 to 2016 into contributions from individual service area inputs growth. It shows that contractions in inputs of both education and the indirectly measured service areas acted as the main drags on overall growth in 2016.

**Figure 7: Contributions to growth of total public service inputs by service area, 1998 to 2016, UK**

Figure 7: Contributions to growth of total public service inputs by service area, 1998 to 2016, UK



Source: Office for National Statistics

Notes:

1. Contributions may not sum to total due to rounding.
2. Indirectly measured service areas include police, defence and other government services.

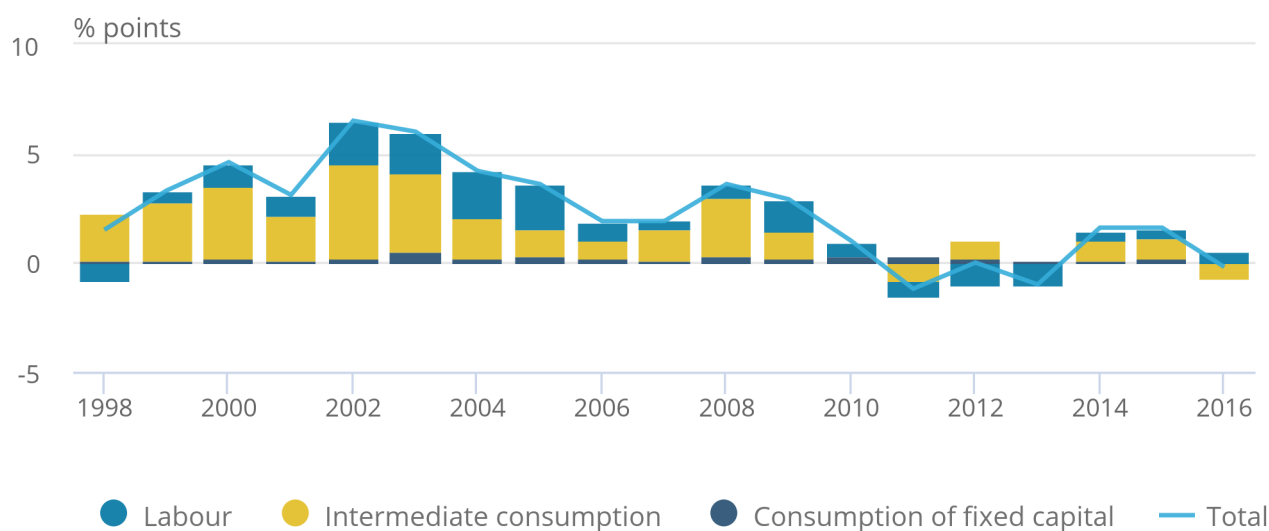
Prior to 2009, most service areas made positive contributions toward growth in total inputs — which grew on average by 3.6% per year. Since 2010, however, the picture has become more variable with all service areas, barring healthcare, making both positive and negative contributions over the last six years. As a result, average growth between 2009 and 2016 slowed to just 0.3% per year.

The weakness of total public service inputs growth since 2010 has been a defining feature of recent growth in total UK public service productivity.

Additionally, the accounting framework can be re-arranged to offer a breakdown of movements in total public service inputs into components, as shown in Figure 8. In this format, the contraction in inputs experienced in 2016 was driven by a fall in total public service intermediate consumption, having experienced growth in the previous two years. This most recent contraction was partially offset by growth in both labour and capital consumption.

**Figure 8: Contributions to growth of public service inputs by component, 1998 to 2016, UK**

Figure 8: Contributions to growth of public service inputs by component, 1998 to 2016, UK



Source: Office for National Statistics

Notes:

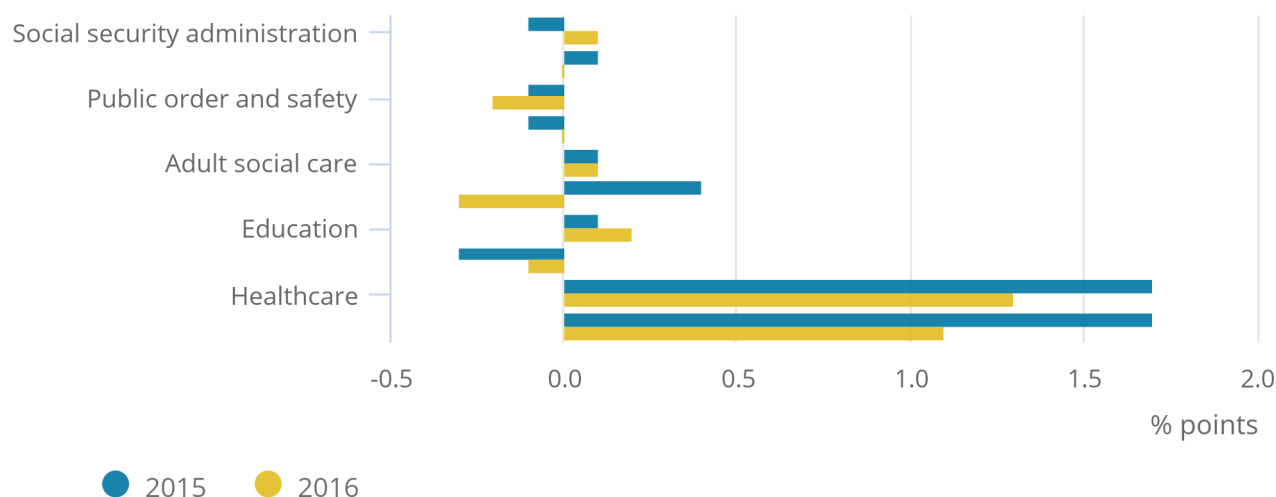
- Contributions may not sum to total due to rounding.

## 6 . Quality adjusted total public service output continues to rise

In 2016, quality adjusted output grew for the third consecutive year, growing at a rate of 1.1%, although this was slower than the 1.7% growth in 2015. Figure 9 shows total public service quality adjusted output in terms of annual changes, decomposed into contributions from the service areas. Similar to total inputs, there was a mixture of positive and negative contributions to total output in both years.

**Figure 9: Contributions to growth of total public service output by service area, 2015 and 2016, UK**

Figure 9: Contributions to growth of total public service output by service area, 2015 and 2016, UK



**Source:** Office for National Statistics

**Notes:**

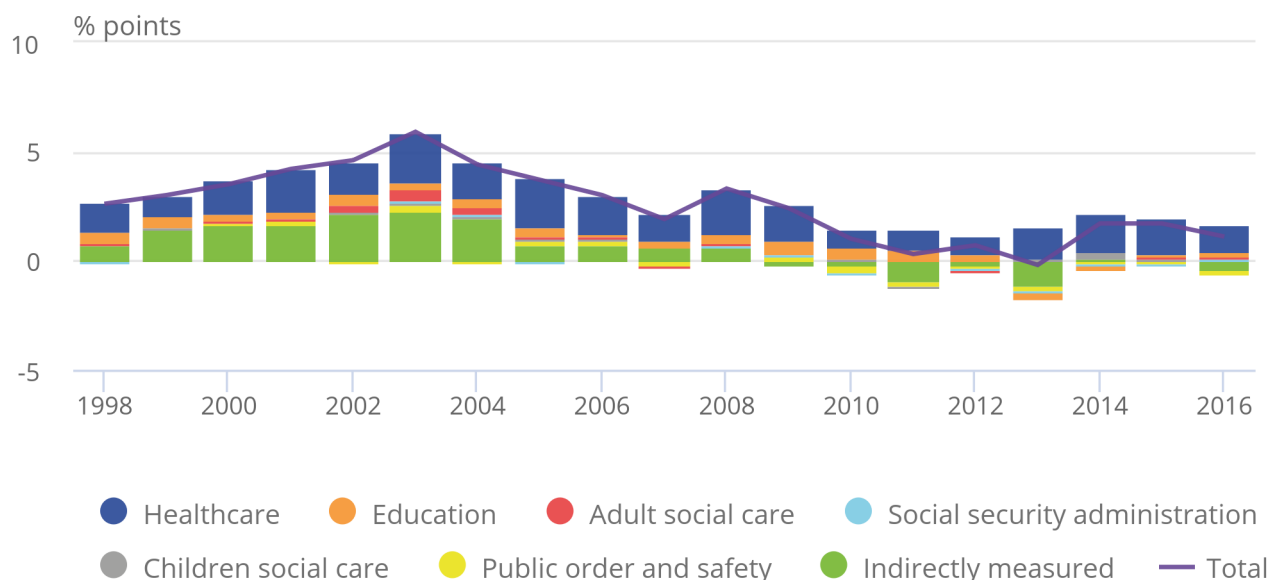
- Contributions may not sum to total due to rounding.

Healthcare services were the main positive contributor to growth in total output in 2016, although smaller than in 2015, contributing 1.3 percentage points compared with 1.7 percentage points respectively. This was partly offset by negative contributions from defence, public order and safety, and other government services.

Figure 10, looking over the entire period, shows the contributions to output growth by service area from 1998 to 2016.

**Figure 10: Contributions to growth of total public service output by service area, 1998 and 2016, UK**

Figure 10: Contributions to growth of total public service output by service area, 1998 and 2016, UK



Source: Office for National Statistics

#### Notes:

1. Contributions may not sum to total due to rounding.
2. Indirectly measured service areas include police, defence and other government services.

Post-2009, output has seen lower growth rates than the rest of the time series. While this same trend was observed for inputs, it was to a much smaller extent, which has facilitated positive productivity growth through this period. A dominant feature of Figure 10 is the consistency of healthcare's positive contributions to output growth. This chiefly reflects growth in the quantity of healthcare provided. A fuller analysis of this service area can be found in [Public service productivity: healthcare, UK, 2016](#), containing greater detail on both the estimates and the methods used to create them. The experience of all other service areas has been more variable, making both positive and negative contributions over the last six years.

## 7 . Quality change

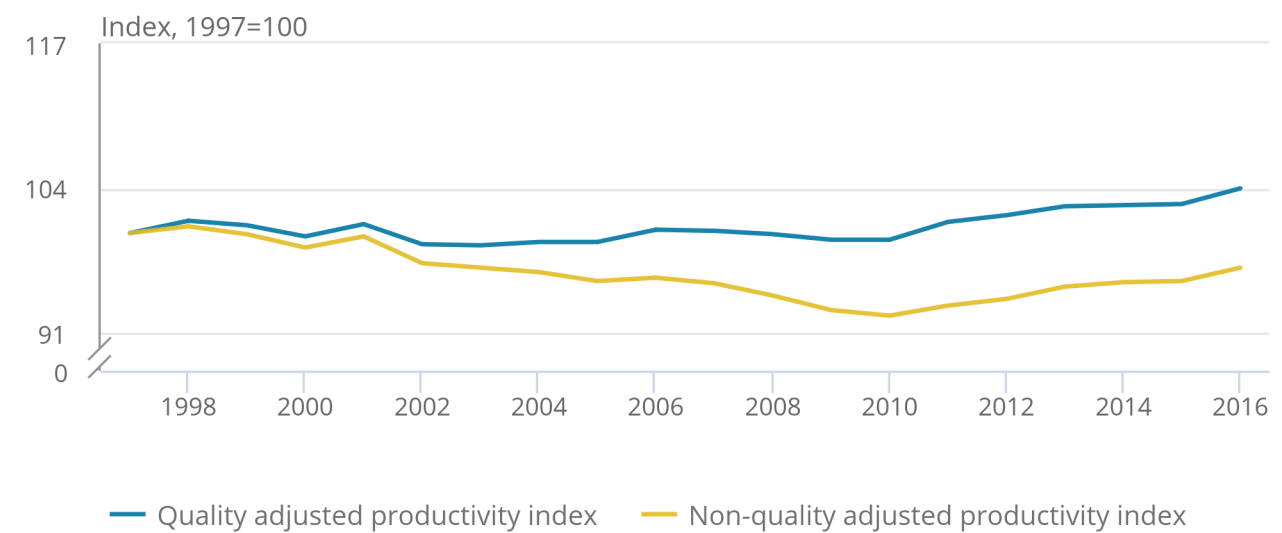
In line with recommendations from the [Atkinson Review](#), quality adjustments are applied to the measures of output for four service areas: healthcare, adult social care (ASC), education, and public order and safety. This is the first year in which estimates of ASC output have been quality adjusted.

The purpose of these quality adjustments is to reflect the extent to which the goods and services provided either succeed in delivering their intended outcome or are responsive to users' needs, which we otherwise do not capture. The statistics contained within this bulletin subsequently include quality adjustments for just under 50% of total public service output and we continue to work to expand and improve this set.

To show the effect of these quality adjustments on overall total UK public service productivity, Figure 11 compares total public service productivity with and without these quality adjustments applied.

**Figure 11: Total public service productivity index, quality adjusted and non-quality adjusted, 1997 to 2016, UK**

Figure 11: Total public service productivity index, quality adjusted and non-quality adjusted, 1997 to 2016, UK



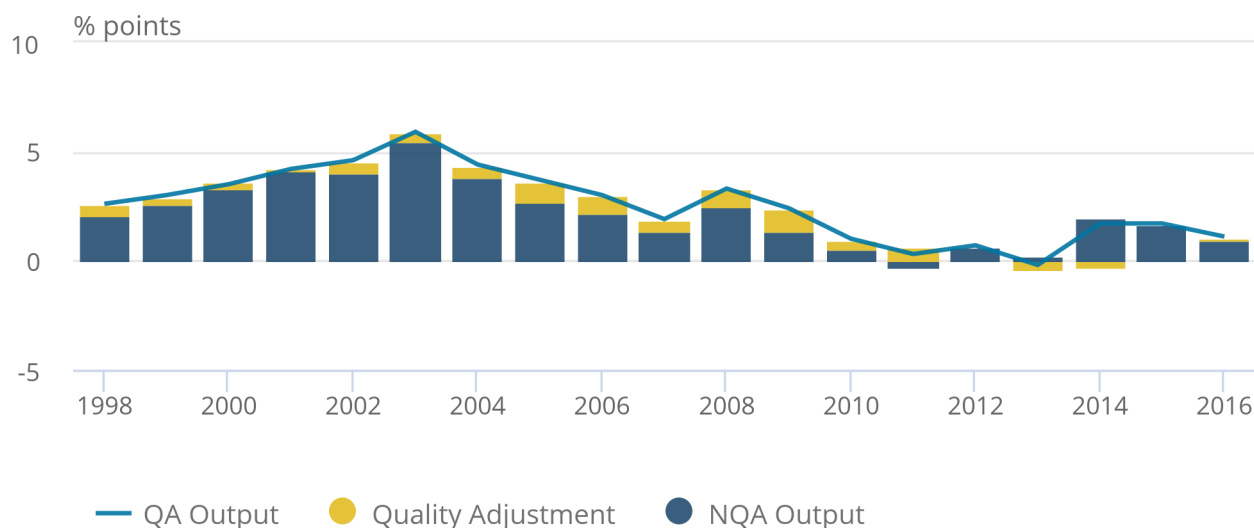
Source: Office for National Statistics

Figure 11 shows that between 1997 and 2016, if total public service output had not been quality adjusted, productivity would have fallen by 3.1%. Compared with quality adjusted total public service productivity, which grew by 4.0% over the same period, this shows that the impact of overall quality in public services has been positive, with the quality of total output improving.

Figure 12 isolates this impact, showing the year-on-year growth in the quality adjusted output for total UK public services since 1998. The bars represent the contribution to changes in quality adjusted output from changes in quantity and changes in quality.

**Figure 12: Contribution to quality adjusted output growth by component, 1998 to 2016, UK**

Figure 12: Contribution to quality adjusted output growth by component, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

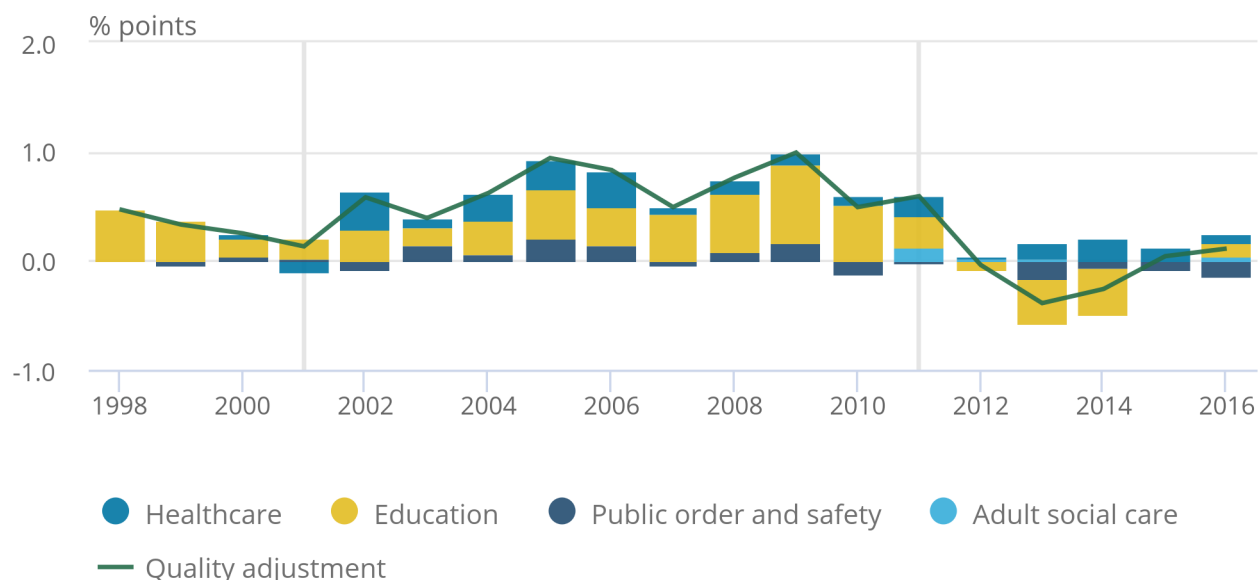
1. Sum of components may not equal total due to rounding.
2. QA refers to quality adjusted.
3. NQA refers to non-quality adjusted.

Quality adjusted output has been broadly positive throughout the period, averaging around 2.6% per year since 1997. During much of the series, quality improved, averaging growth of around 0.5% per year between 1998 and 2011, as shown in Figure 11. Following this, between 2012 and 2014 the quality adjustment had a negative impact on quality adjusted output growth; however, the overall quality adjusted output growth remained mostly positive in this period, contracting only in 2013. In 2016, the overall quality in public services is estimated to have increased by 0.1%, having a positive contribution to growth in quality adjusted total public service output.

Figure 13 expands on Figure 12, decomposing the contribution of total quality adjustment into the changes in quality by service area. From this, we can observe the experience of each service area and the extent to which they have contributed to the overall change in total public service quality adjusted output.

**Figure 13: Contribution to total quality adjustment growth by service area, 1998 to 2016, UK**

Figure 13: Contribution to total quality adjustment growth by service area, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Sum of components may not equal the total due to rounding.
2. Healthcare quality adjustment applied 2001 and onwards.
3. Adult social care quality adjustment applied 2011 and onwards.

The education quality adjustment has been the largest contributor to overall public service quality and as such any fluctuations in this service area have a substantial impact on total public service productivity.

On average, the education quality adjustment has added 0.2 percentage points per year to growth in total quality adjusted output between 1998 and 2016. However, it acted as the main driver of decline of overall quality between 2012 and 2015, averaging a negative contribution of 0.2 percentage points in this period. In 2016, it did return to having a positive contribution of 0.1 percentage points.

For healthcare, the impact of its quality adjustment has been positive, with some variation in size of effect, contributing upwards in all years, with the exception of 2001. The public order and safety quality adjustment, on the other hand, has generally made upward contributions to the total rate up until 2010, but has since made consecutive downward contributions. This was due largely to the negative impact of the prison safety adjustment, reflecting increases in the number of reported self-harm and assault incidents in prisons.

Finally, quality in services relating to ASC continue to improve, contributing positively towards improvements in overall growth in total quality adjusted output. Applied from 2011 onwards, based on the Adult Social Care Outcomes Framework and the concept of adjusted social care-related quality of life introduced within, this is the first bulletin in which estimates of ASC output have been quality adjusted.

Further information on the sources and methods used, as well as the impact on ASC output, can be found in our article [Measuring adult social care productivity in the UK and England: 2016](#).

## 8 . What's changed in this release

In line with the [published revisions policy \(PDF, 60KB\)](#), revisions have been made to estimates in this release for all service areas due to:

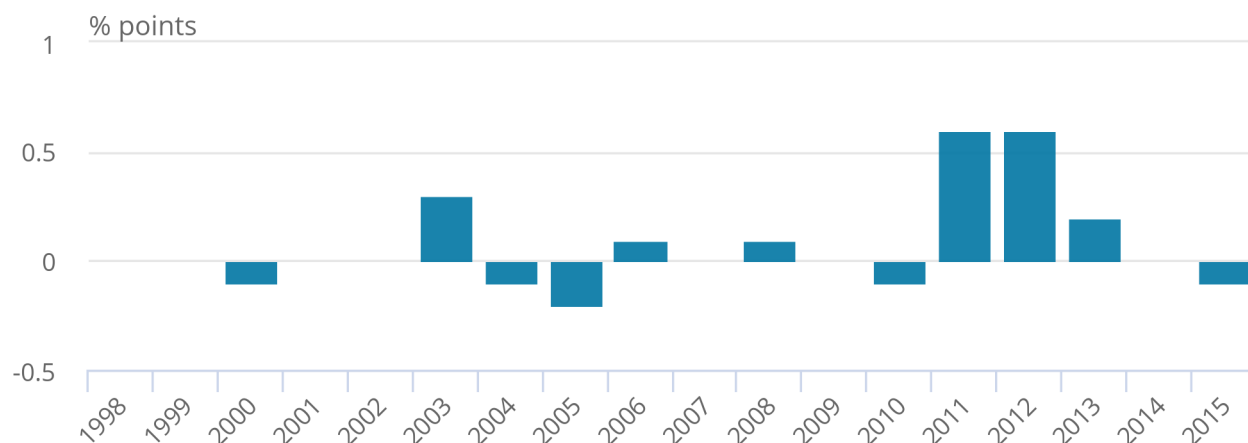
- improved methods resulting from the Office for National Statistics (ONS) development programme for public service productivity
- revisions made to data by data providers
- the replacement of projected data with actual data
- re-estimation of forecasts

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.

Figures 14 and 15 show the combined effect of the changes in data and methodology relative to the previous publication. These revisions suggest that total public service productivity growth in 2015 was slower than previously estimated, growing by 0.1%. The largest revisions, as shown in Figure 14, are to the 2003, 2011 and 2012 growth rates, due partly to improved methodologies in measuring the productivity of adult social care (ASC) – this is covered in more detail later in the section.

**Figure 14: Revisions to total public service productivity growth rates, 1998 to 2015, UK**

Figure 14: Revisions to total public service productivity growth rates, 1998 to 2015, UK



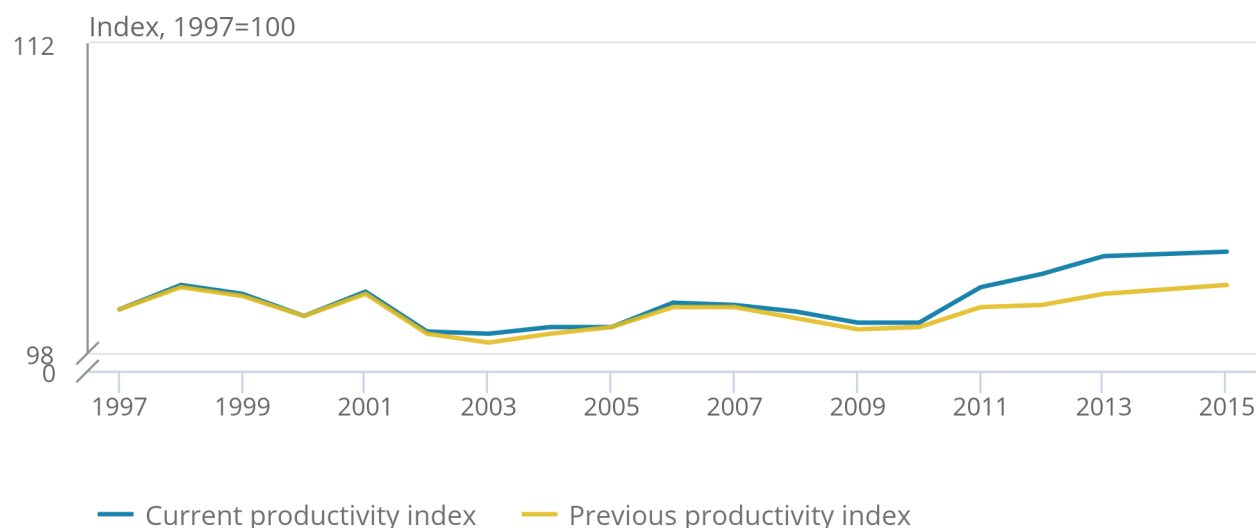
**Source: Office for National Statistics**

Overall, the revisions have resulted in an increase in the average annual growth rate for total public service productivity, most notably, over the period 2010 to 2015. For this period, the average annual growth rate was estimated to be 0.6%, compared with the previous estimate of 0.4%.

As such, productivity growth between 1997 and 2015 was 1.5 percentage points higher relative to previous estimates – as shown in Figure 15.

**Figure 15: Revisions to indices of total public service productivity from previously published estimates , 1997 to 2015, UK**

Figure 15: Revisions to indices of total public service productivity from previously published estimates , 1997 to 2015, UK



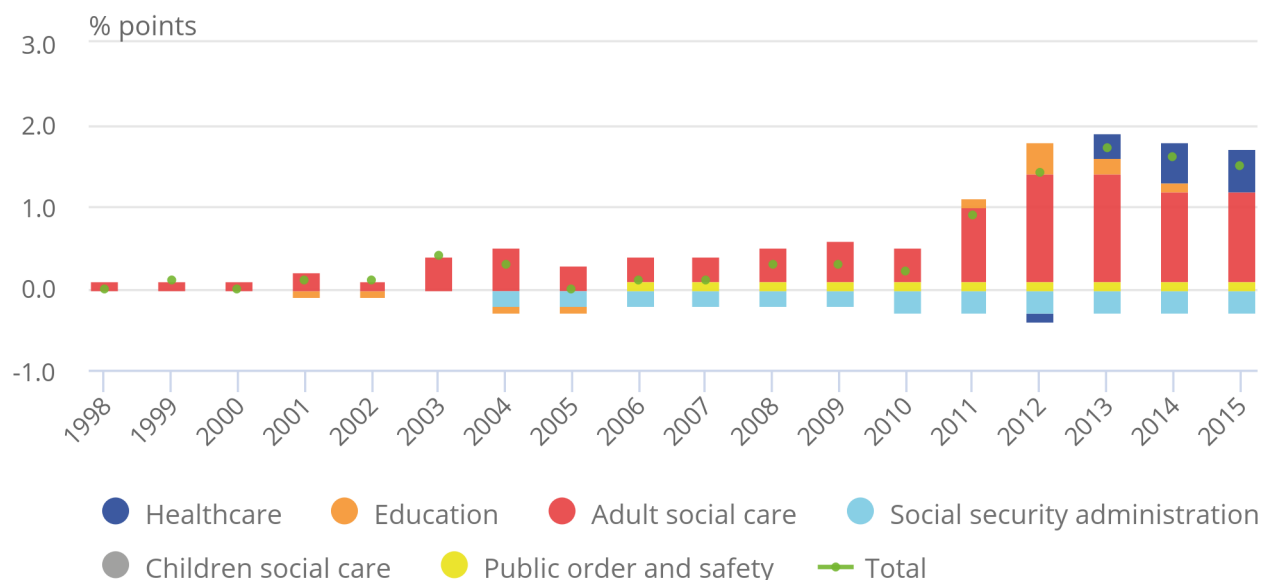
**Source: Office for National Statistics**

Figure 16 decomposes how individual service areas have contributed to this difference (illustrated by the circles). We can see that revisions to ASC have had a consistently positive contribution to revisions in total UK public service productivity, the size of which varies by year. As a result, the service area has acted as the single-largest cause of revisions, accounting for 1.1 of the 1.5 total percentage point change between 1997 and 2015.

Conversely, downward revisions to the productivity of social security administration (SSA) have caused estimates of overall public service productivity to be revised downwards. The relatively small weighting of SSA, however, means that total productivity is influenced more by the changes to ASC and as such has been revised upwards.

**Figure 16: Cumulative contributions to revisions of total public service productivity, 1998 to 2015, UK**

Figure 16: Cumulative contributions to revisions of total public service productivity, 1998 to 2015, UK



Source: Office for National Statistics

Notes:

- Contributions may not sum to total due to rounding.

## Methods changes to adult social care quantity measures

For this year's publication, improved methodologies for measuring inputs and output have led to a number of revisions to ASC productivity and subsequently led to revisions to total public service productivity.

Revisions to estimates of inputs growth are due to a combination of new sources of related expenditure and changes in the deflators used. This has resulted in the series growing faster overall.

There have been several developments on ASC output. In addition to improvements being made as to how the series is produced prior to financial year ending (FYE) 2015, a new index from FYE 2015 has been introduced, replacing the previous forecast. The new series experiences stronger growth than the previously published series, particularly after 2002.

More information on these changes to measures of adult social care as well as the sources and methods used and their impact are given in [Measuring adult social care productivity in the UK and England: 2016](#).

As a result of the proposed data source and methods improvements, the productivity of public service ASC is estimated to have fallen more slowly between 1997 and 2015 than had previously been published. This was driven by stronger performance in the service area's output, although partly offset by changes to growth in its inputs series. This has subsequently led to total public service series of inputs, output and productivity to be revised upwards.

## **Incorporation of quality adjustment for adult social care output**

In line with recommendations from the [Atkinson Review \(PDF, 1.1MB\)](#), quality adjustments are applied to measures of public service output where appropriate, to counter the limitations of using cost weights to value different types of activity in quantity output measures. Estimates in this release mark the first year in which estimates of ASC output have been quality adjusted.

The quality adjustment uses the concept of adjusted social care-related quality of life, which is established within the Adult Social Care Outcomes Framework (ASCOF) and uses data from the Adult Social Care Survey in England. As no equivalent data source measuring care-related quality of life is available for the devolved administrations, the quality adjustment for ASC is applied to UK output, under the equivalent convention to current quality adjustments in other public service productivity sectors<sup>1</sup>.

The impact of this quality adjustment, implemented from 2011 onwards, has led to estimates of ASC productivity to fall by a lesser extent (although they remain on a downward trend). As a result, and as we can see from Figure 16, this has led to estimates of public service productivity to be revised further upwards in the respective years.

Further information on the sources and methods used, as well as the impact on ASC output, can be found in our article [Measuring adult social care productivity in the UK and England: 2016](#).

## **Calendarisation method of data reported in financial and academic year**

In order to convert reported data into calendar year data, a recognised statistical technique, known as cubic splining, is used. This technique allows academic year volume estimates and annual financial spending measures to be split and subsequently re-aggregated into calendar year figures. To improve the accuracy of the splining, the series is initially forecast and back-cast using ARIMA SEATS, software produced by the US Census Bureau for use in seasonal adjustment and regARIMA forecasting. We use both X-11 ARIMA and the newer X-13 ARIMA in forecasting.

In the previous annual release - [Public service productivity estimates: total public service, UK: 2015](#) - a combination of software packages [X-13ARIMA-SEATS \(PDF, 1.8MB\)](#) for stock data and X-11ARIMA-SEATS for flow data, were used; a development itself from prior calendarisation methods used. For this publication, the method used will be updated, with X-13ARIMA-SEATS used throughout, for both stock and flow data, in line with latest national accounts practices. X-13ARIMA-SEATS has improved methods for forecasting and backcasting data as well as an updated method for interpolating a trend within a data series.

Because of incorporating these changes, some of the annual growth rates may change as the volume of output and inputs calculated from reported data will be apportioned between calendar years in a slightly different manner. For the most part, this has led to only minor changes.

## **Classification of funded pension schemes**

Improvements have been made to the data and methods used to calculate figures for funded public sector employee pensions in the financial corporations sector, where the employer or "pension manager" is in local government or central government. These changes follow on from decisions made by our economic statistics classifications committee (ESCC) and improve the method for calculating employers' imputed social contributions, as defined in the European System of Accounts 2010.

These [improvements to funded public sector employee pension schemes](#) were implemented in the [national accounts](#) in June 2018.

The improved method calculates employers' imputed social contributions to funded defined benefit pension schemes as a residual after accounting for balances, transactions and other flows on an actuarial basis, whereas the previous method involved modelling them as a percentage of wages and salaries. Because of these changes, the estimate of labour-related expenditure to social security administration (SSA) services have been revised.

The impact of these changes, as related estimates of output have remained unaltered, has led to estimates of SSA productivity being revised downwards. This has subsequently led total public service productivity, as we can see from Figure 16, to be revised downwards.

## **Note for: What's changed in this release**

1. It should be noted, we intend to review the current approach to the geographical application of quality adjustment across all quality adjusted sectors and future changes could result in quality adjustments only being applied to output from the same constituent nations as the quality adjustment data is obtained from.

## **9 . Public service productivity by service area**

The preceding sections explained how the movements in individual service areas contributed to changes in total UK public service inputs, output and productivity. Those contributions depend on the growth rates and relative sizes of the service areas. The following sections will cover the individual service areas, in isolation to each other, that make up total public services and will provide more detail on what is driving the change in them. Some of the movements in inputs, output and productivity of individual service areas may be large and volatile. However, as alluded to in the preceding sections, these large movements in service areas may appear larger when looked at in isolation and without considering the relative sizes of the service areas.

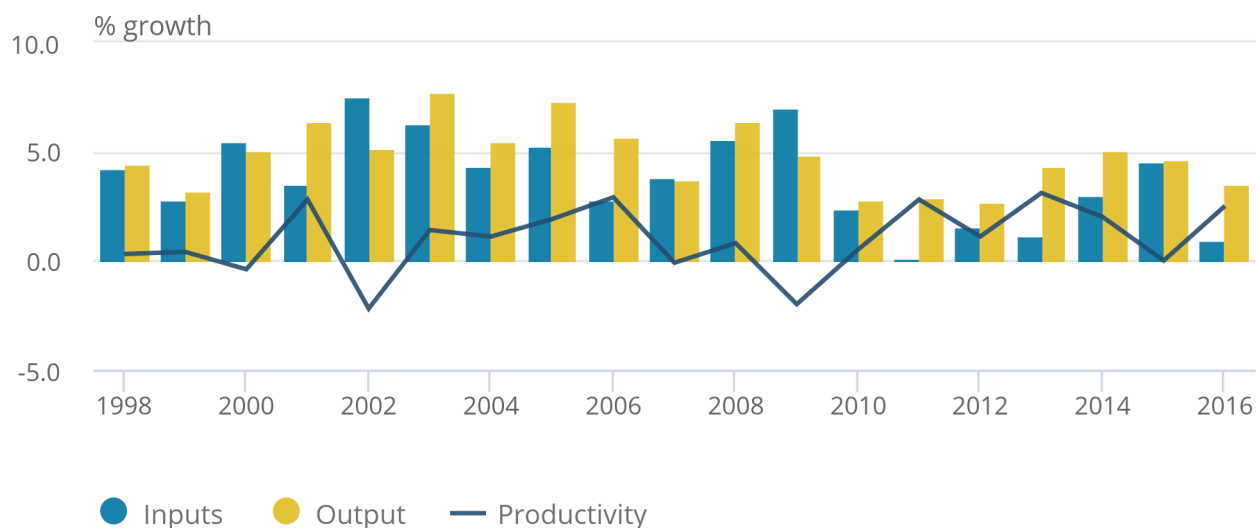
The service areas that make up total UK public services are measured in accordance to the framework set out by the [Atkinson Review](#). The method of measurement differs across service areas due to data availability and/or the nature of collective provision of those services. As an example, healthcare and education are measured by the preferred methods (quality adjusted output), whereas defence and other government services use methods at the less desirable end of the framework ("output-equals-inputs"). More detailed information on how inputs, output and productivity of all the service areas are measured can be found in the [Quality and methodology information report](#).

## **10 . Healthcare**

Healthcare productivity grew in 2016, by 2.5%, driven by growth in output of 3.5%, with a 1.0% increase in inputs. This is the seventh consecutive year of productivity growth, with productivity growing on average 1.0% each year between 1997 and 2016 (Figure 17).

**Figure 17: Healthcare inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 17: Healthcare inputs, output and productivity growth rates, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Output growth minus inputs growth does not necessarily equal productivity growth due to rounding.

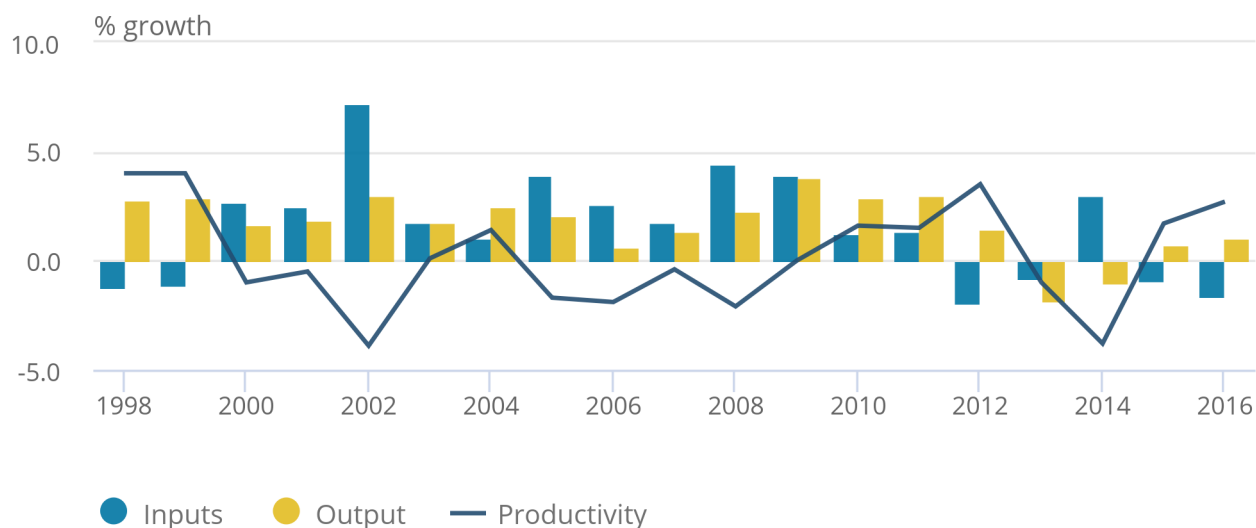
A fuller analysis of healthcare productivity can be found in the article [Public service productivity estimates: healthcare, UK, 2016](#) that contains greater detailed information on both the estimates and methods used to create them.

## 11 . Education

In 2016, productivity of UK education services is estimated to have grown by 2.7%. As shown in Figure 18, this was because of inputs falling by 1.6%, while quality adjusted output for the service area grew by 1.1%. This is similar to changes experienced in 2015.

**Figure 18: Education inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 18: Education inputs, output and productivity growth rates, 1998 to 2016, UK



**Source:** Office for National Statistics

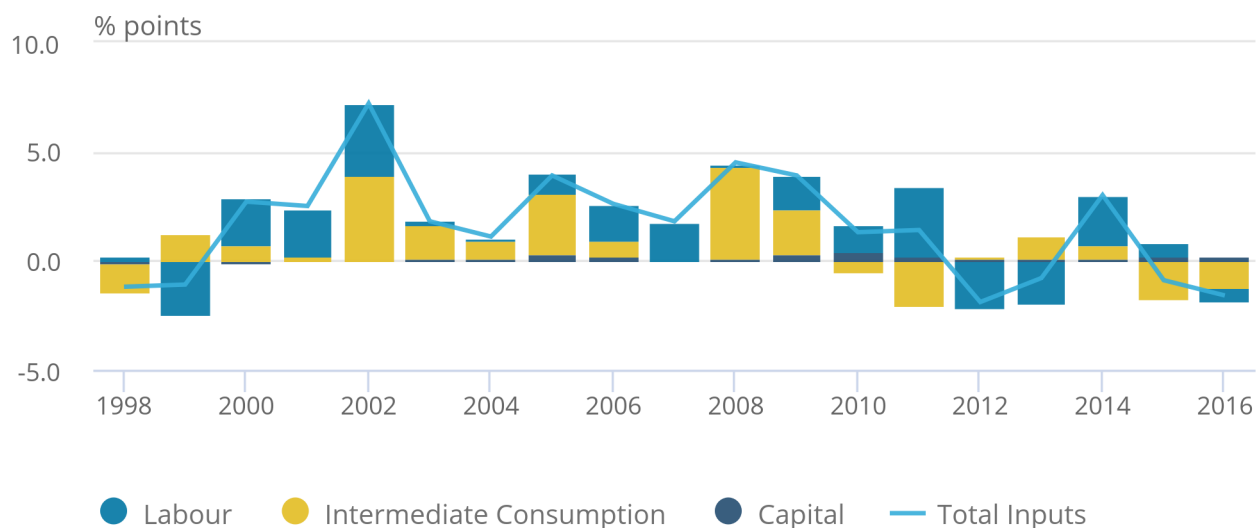
**Notes:**

1. Output growth minus inputs growth does not necessarily equal productivity growth due to rounding.

Investigating both inputs and output separately, Figure 19 shows growth of education services inputs by component. This illustrates how growth in one type of input (for example, labour) contributes to the growth in total education service inputs.

**Figure 19: Contributions to education inputs growth by component, 1998 to 2016, UK**

Figure 19: Contributions to education inputs growth by component, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Sum of components may not equal total due to rounding.

Figure 19 shows that, in both 2015 and 2016, inputs fell, driven by contractions in intermediate consumption, contributing a decrease of 1.7 and 1.2 percentage points respectively. We can also see that this is relatively common throughout the period, with changes in intermediate consumption driving growth in a number of years.

Similarly, we can see that changes in education inputs are also driven by labour-related inputs. In 2016, a negative contribution from labour-related inputs further bolstered the fall in total education inputs.

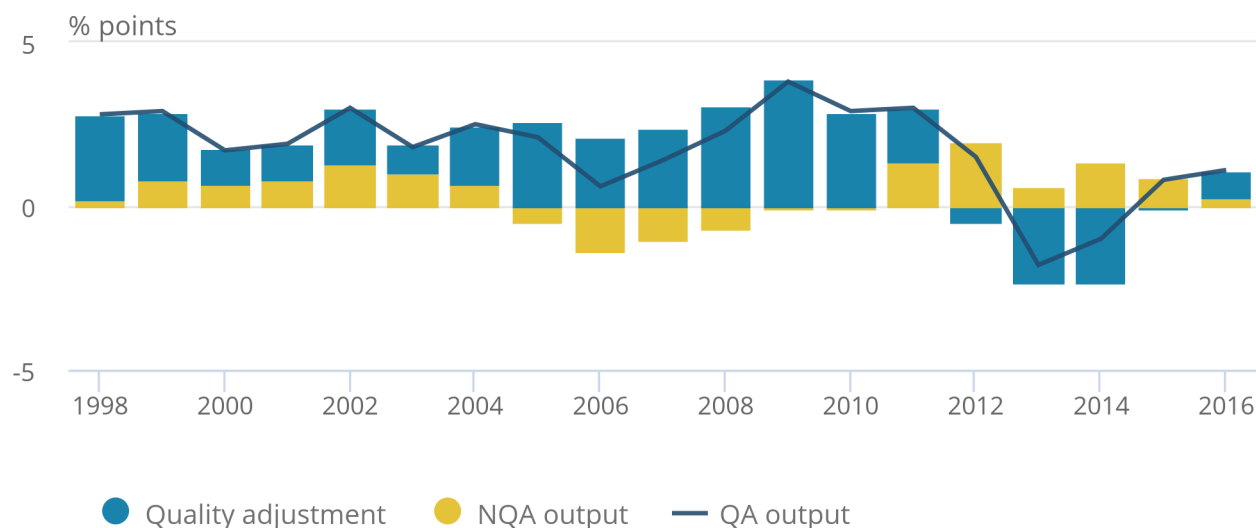
Labour and intermediate consumption have been the largest contributors to growth over the 1997 to 2016 period, with varied impacts. In 2016, labour and intermediate consumption both fell, contributing negative 0.6 percentage points and negative 1.2 percentage points respectively towards the total education inputs growth of negative 1.6%.

Consumption of fixed capital, on the other hand, has had a relatively smaller effect on overall growth, with an average contribution to growth of 0.1 percentage points from 1997 to 2016. Its largest contribution was seen in 2010, at 0.4 percentage points.

Focusing on education output, Figure 20 shows quality adjusted output growth of education services, split into quantity output and changes in overall quality of public education services.

**Figure 20: Contributions to quality adjusted education output growth by component, 1998 to 2016, UK**

Figure 20: Contributions to quality adjusted education output growth by component, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Sum of components may not equal total due to rounding.
2. QA refers to quality adjusted.
3. NQA refers to non-quality adjusted.

Improvements in the quality of education output drove the most recent change, decomposing growth of 1.1% in 2016, while the quantity of output increased.

Overall, the quality adjustment for education output has been positive, increasing the annual average growth rate of output between 1997 and 2016. This adjustment provided positive contributions to output growth from 1997 to 2011. When observing the mid- to late-2000s we can see that it negated the negative contribution of quantity output, resulting in an overall positive output growth for those years. However, between 2012 and 2015, quality in educational output is estimated to have fallen and had a negative contribution to education quality adjusted output.

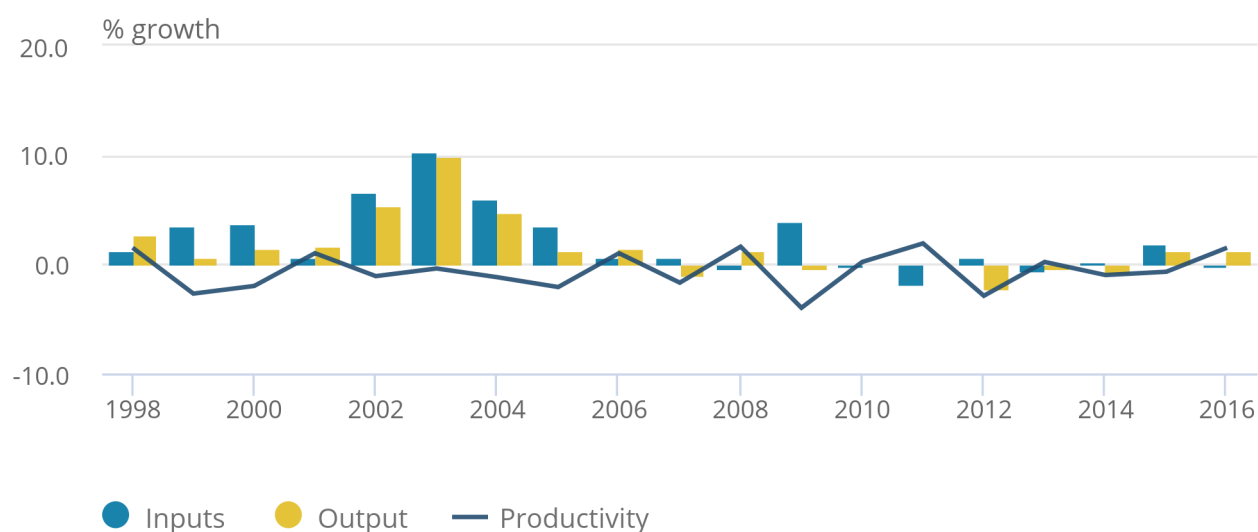
The combination of the negative contribution of the quality adjustments in 2013 and 2014 to output, along with the increase in inputs in 2014, resulted in a fall in productivity for these two years. However, as there was positive growth in output and negative growth in inputs for both 2015 and 2016, the productivity within education has demonstrated positive growth for these two consecutive years.

## 12 . Adult social care

Adult social care (ASC) services include activities such as nursing and residential care, and domiciliary home care; provided to clients with old age, disability, and mental health-related reasons. Adult social care output is estimated with a quality adjustment for the first time this year.

**Figure 21: Adult social care inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 21: Adult social care inputs, output and productivity growth rates, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Output growth minus inputs growth does not necessarily equal productivity growth.

ASC productivity has fallen by 10.7% between 1997 and 2016. Figure 21 shows that between 1997 and 2006, inputs and output both grew, but inputs grew at a faster rate than output, resulting in falling productivity.

This is the first time a new methodology has been used to calculate ASC, for more information on these changes and further analysis of the new measure see [Measuring adult social care productivity in the UK and England: 2016](#). The main changes are:

- improvements to inputs include improvements to the data source for NHS funding and improvements to the deflators
- improvements to output include a new output index for 2014 onwards and the incorporation of output coverage for services where activity data are not available, such as direct payments
- a new quality adjustment is added, applying the concept of adjusted social care-related quality of life and data from the Adult Social Care Survey

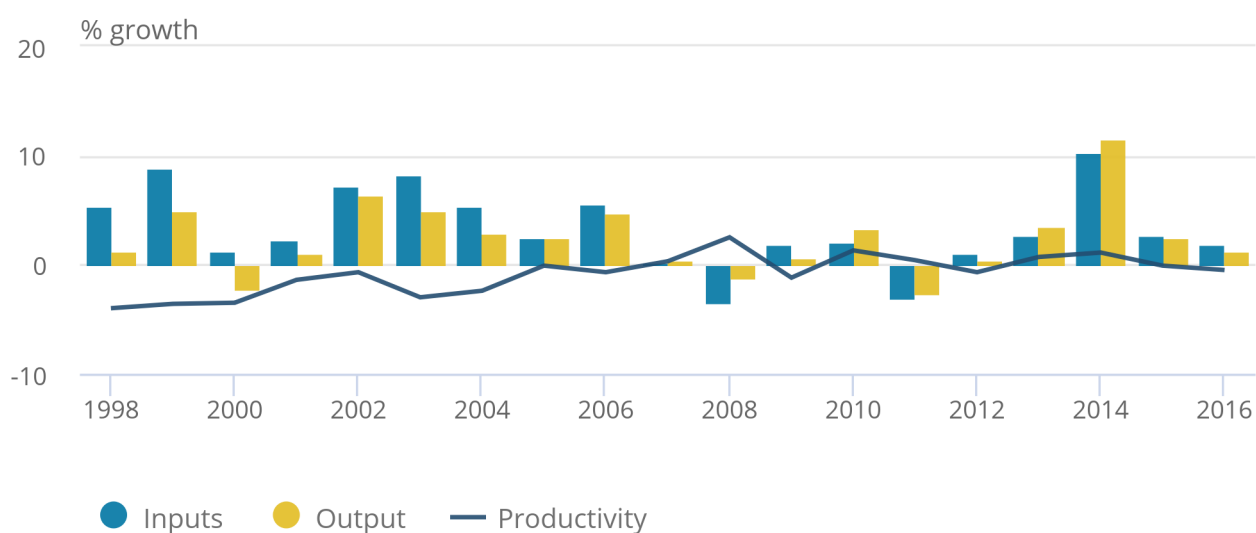
Because of the changes to methodology, revisions in the ASC have been made throughout the entire time series relative to those included in [Public service productivity estimates: Total public service, 2015](#)

## 13 . Children's social care

Accounting for around 2.8% of total expenditure in 2016, productivity of children's social care (CSC) contracted for the second consecutive year, falling by 0.5%. Similar to its experience in 2015, while output of the service area grew in 2016 (1.4%), its respective inputs grew faster (1.9%) – leading to a fall in CSC productivity (negative 0.5%).

**Figure 22: Children's social care inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 22: Children's social care inputs, output and productivity growth rates, 1998 to 2016, UK



Source: Office for National Statistics

Notes:

1. Output growth minus inputs growth does not necessarily equal productivity growth due to rounding.

Figure 22 shows inputs, output and productivity growth for CSC from 1998 to 2016. From 1998 to 2006, inputs and output grew on average by 5.2% and 3.0% per year respectively. Growth in both components slowed between 2007 and 2013, being on average 0.2% and 0.7% per year for inputs and output respectively.

Inputs and output experienced above-average growth in 2014. Inputs grew 10.3% in 2014, while output grew 11.5%. Some of this growth in children's social services inputs is due to a reclassification of "Services to young people" in England ([local authority revenue expenditure final 2014 to 2015](#)). In 2015 and 2016, growth in inputs and output returned to the rate experienced in the earlier part of the series.

As shown in Figure 22, output has increased each year since 2012, increasing by 1.4% in 2016. However, the larger increase in inputs (1.9%) resulted in estimated productivity for children's social care to fall by 0.5%.

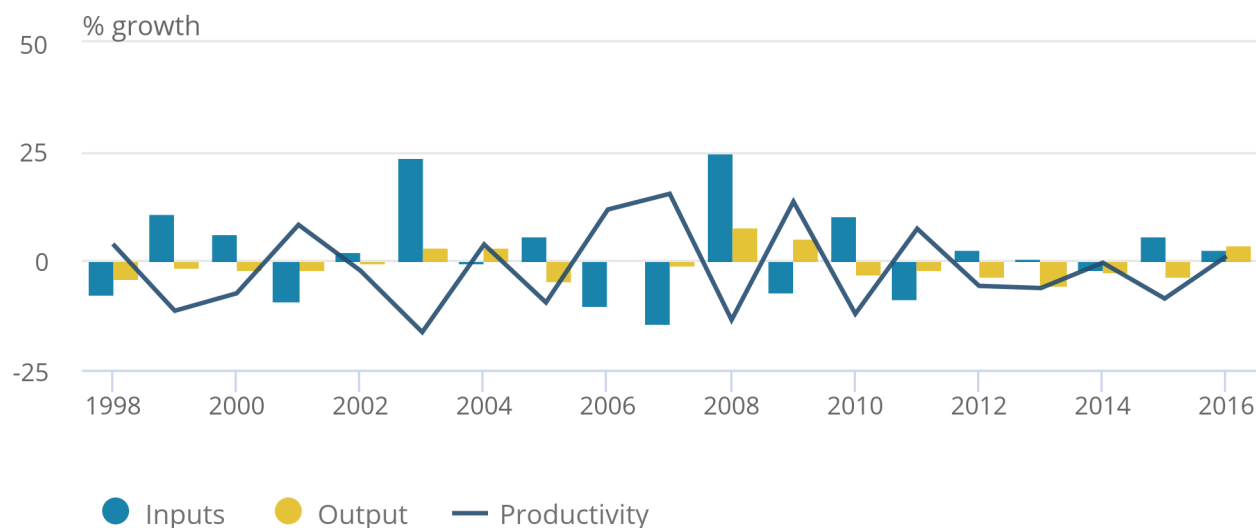
Estimates of CSC output are not quality adjusted and therefore do not capture any improvement in the suitability and quality of care, consequently the productivity measure does not reflect changes in quality of services.

## 14 . Social security administration

Productivity in social security administration (SSA) grew by 1.0% in 2016. This increase in SSA productivity reflects output growing by more than inputs, as shown in Figure 23. Output grew by 3.7% whereas inputs only grew by 2.6%.

**Figure 23: Social security administration inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 23: Social security administration inputs, output and productivity growth rates, 1998 to 2016, UK



**Source:** Office for National Statistics

**Notes:**

1. Output growth minus inputs growth does not necessarily equal productivity growth due to rounding.

Historically, growth in SSA output has been slower and less volatile than inputs and has averaged a growth of negative 0.6% from 1997 to 2016. Output growth for SSA is partly driven by the UK's economic climate, as this influences the number of benefit claims. For example, output growth in 2008 and 2009 coincides with the economic downturn, a period in which claims for unemployment-related benefits experienced rapid growth. Recent falls, on the other hand, are linked with a decrease in both new and existing benefit claims administered by the Department for Work and Pensions (DWP).

Inputs have experienced much more volatility over the same period as can be seen in Figure 23. Some of the volatility in the series may be caused by changes in the benefits provided, which affected inputs through additional expenditure on administration and output through changes in eligibility and thus number of applications. Examples of this would include growth in inputs coinciding with the replacement of the Minimum Income Guarantee with Pension Credit in 2003, while 2013 saw both the first stage rollout of Universal Credit and the introduction of Personal Independence Payments. However, recent falls or slow growth following the 2010 Spending Review were driven by factors such as reductions in staff numbers and the launch of digital services.

While a large proportion of social security administration covers activities undertaken in the administration of benefits by DWP, these estimates presented here cannot be taken as direct estimates of DWP productivity. As well as activities carried out by DWP, social security administration includes activities carried out by other government departments such as the administration of tax credits by Her Majesty's Revenue and Customs.

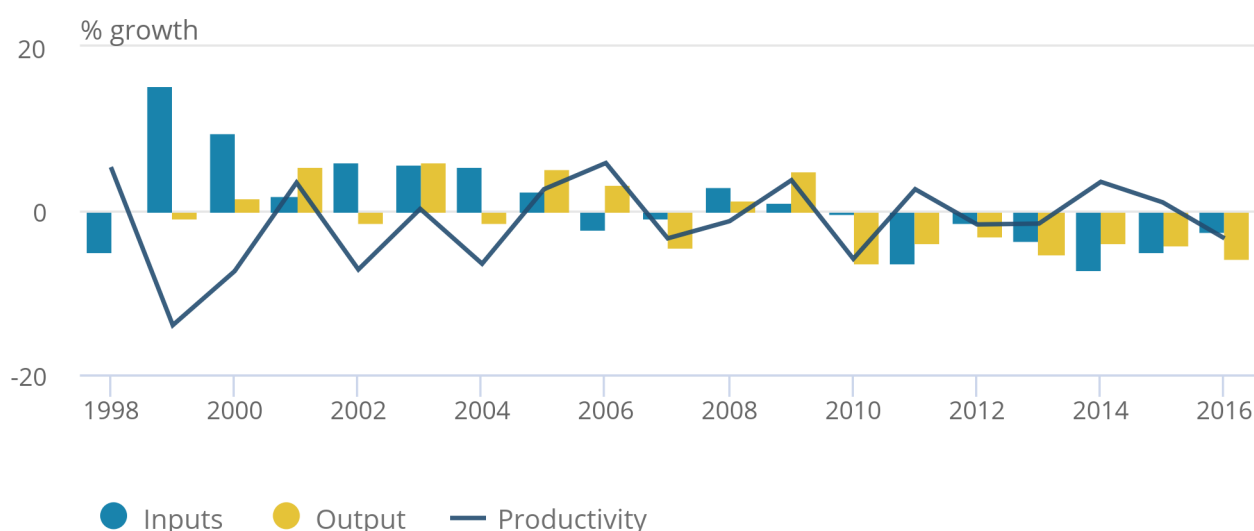
Equally, estimates of social security administration productivity exclude a number of activities undertaken by DWP. These are subsequently classified as other forms of government expenditure and captured within other service areas.

## 15 . Public order and safety

Public order and safety (POS) saw productivity decrease in 2016, falling by 3.3%. This fall comes after two consecutive years of growth; 1.0% in 2015 and 3.4% in 2014. The most recent contraction was driven by output for the service area falling quicker than its respective inputs – negative 5.8% and negative 2.6% respectively. As a result, productivity for POS has fallen between 1997 and 2016, averaging negative 1.4% growth per year (Figure 24).

**Figure 24: Public order and safety inputs, output and productivity growth rates, 1998 to 2016, UK**

Figure 24: Public order and safety inputs, output and productivity growth rates, 1998 to 2016, UK



Source: Office for National Statistics

**Notes:**

1. Output growth minus inputs growth does not necessarily equal productivity growth due to rounding.

Estimates for POS presented here include activities carried out by the fire services, courts (including probation) and the prison service. While a part of the public order and safety government expenditure classification (as defined by the [Classification of Function of Government](#)), the police service is treated as a separate service area within this publication. Other elements of public order and safety not listed as above (that is, public order and safety not elsewhere classified) are captured within estimates for other government services.

The fall in output growth from 2009 onwards has been driven mostly by falling quantity output from courts and its quality. From 2013 onwards, prison services also contributed negatively toward POS output growth. The fall in prison output is almost entirely driven by the falling quality of prison services.

Looking at inputs over time, prior to 2006, POS inputs were on a general upward trend, driven by increasing spend on courts. However, a 2.6% fall in 2016 marks the seventh consecutive contraction in POS inputs, with the fall being predominantly driven by falling inputs into court services.

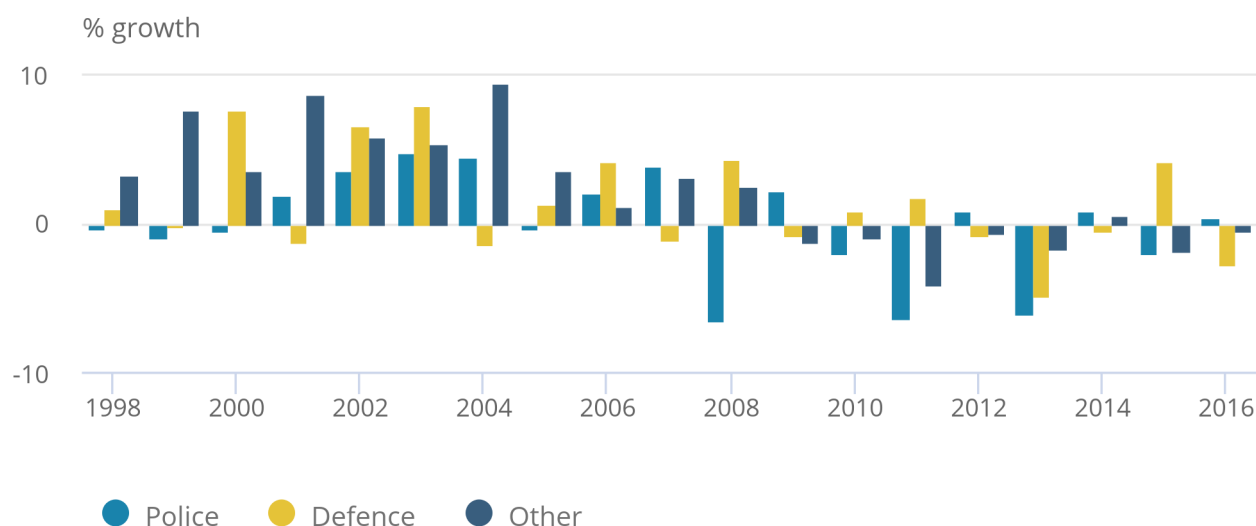
## 16 . Police, defence and other government services

Output for police services, defence and other government services is measured using the “output-equals-inputs” convention, which assumes that the volume of output is equal to the volume of inputs used in producing the output. As output will always be equal to inputs under this convention, productivity remains constant with a growth rate of zero.

Combined, police, defence and other government services accounted for an expenditure share of 32.4% in 2016 (Figure 25).

**Figure 25: Police, defence and other government services inputs growth rates, 1998 to 2016, UK**

Figure 25: Police, defence and other government services inputs growth rates, 1998 to 2016, UK



Source: Office for National Statistics

Breaking down the three individual service areas, Figure 25 shows that while experiencing negative growth over the entire period – being 1.4% smaller in 2016 compared with 1997, police inputs in 2016 have experienced positive growth of 0.4%.

Defence, on the other hand, has experienced positive inputs growth over the time series, being 28% larger in 2016 relative to 1997. In contrast to the long-run trend, in 2016 inputs fell by 2.8%. For comparison, in 2015 inputs grew by 4.1%.

Finally, in 2016 other government services – comprising services such as economic affairs, recreation and housing – fell by 0.5%. Overall, other government services have experienced the strong inputs growth over the time series relative to other indirectly-measured service areas, being 51.5% larger in 2016 compared with 1997. However, this is chiefly attributable to strong growth in the early part of the series and since 2005, inputs growth has been relatively weak, averaging negative 0.4% each year between 2005 and 2016.

## 17 . Authors

Stephen Campbell and Fred Foxtan, Office for National Statistics.

## 18 . Quality and methodology

The [Quarterly public service productivity estimates: total public services Quality and Methodology Information report](#) contains important information on:

- the strengths and limitations of the data and how they compare with related data
- users and uses of the data
- how the output was created
- the quality of the output including the accuracy of the data

## 19 . Links to related statistics

- [Productivity economic commentary: July to September 2018](#) draws together the main findings from official statistics and analysis of UK productivity to present a summary of recent developments (published 9 January 2019)
- [Labour productivity, UK: July to September 2018](#) contains the latest estimates of labour productivity for the whole economy, the UK regions at NUTS1 level and a range of industries, together with estimates of unit labour costs (published 9 January 2019).
- [Multi-factor productivity estimates: Experimental estimates to quarter 3](#) (July to September) 2018 presents quarterly estimates of multi-factor productivity (MFP), capital services and quality-adjusted labour input (QALI), including a range of industry breakdowns and analysis (published 9 January 2019).
- [A simple guide to multi-factor productivity](#) explains the concept and measurement of multi-factor productivity through simple stylised examples (published 5 October 2018).
- [Quarterly UK public service productivity \(Experimental Statistics\): July to September 2018](#) contains the latest experimental estimates for quarterly UK total public service productivity, inputs and output (published 9 January 2019).
- [Public service productivity: total, UK, 2016](#) 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 (published 9 January 2019).
- [Public service productivity: healthcare, UK, 2016](#) presents updated estimates of output, inputs and productivity for public service healthcare in the UK between 1995 and 2015, and new estimates for 2016 (published 9 January 2019).
- [Public service productivity: healthcare, FYE 2017](#) presents estimates of output, inputs and productivity for public service healthcare in England on a financial year basis up to FYE 2017 (published 9 January 2019).
- [Improving estimates of Labour Productivity and International Comparisons](#) discusses recent OECD 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 (published 9 January 2019).
- [Productivity development plan: 2018 to 2020](#) builds on recent improvements to our productivity statistics and looks at introducing new outputs, further improving our productivity statistics and consolidating our improvements to date (published 6 July 2018).
- [How productive is your business?](#) is an interactive tool which aids businesses to calculate their productivity and compare their performance to other businesses in Great Britain (published 6 July 2018).

## Related content

In October 2018 the ONS [informed](#) users we will no longer be publishing estimates on International comparisons of UK productivity, due to an ongoing review of the methodology. In December 2018 the OECD published a working paper "[International productivity gaps: Are labour input measures comparable?](#)" which showed the methodologies, data sources and adjustments used to estimate labour inputs varied significantly across countries. The ONS published an [article](#) exploring these differences and the impact they had on our international comparisons of UK productivity (ICP) statistics.

We publish experimental estimates of [multi-factor productivity](#) (MFP), which decompose output growth into the contributions that can be accounted for by labour and capital inputs. In these estimates, the contribution of labour is further decomposed into quantity (hours worked) and quality dimensions.

The [Economic Review](#) covers recent developments in the UK economy, featuring our latest economic statistics as well as in-depth analysis of current issues.

[Experimental indices of labour costs per hour](#) differ from the concept of labour costs used in the unit labour cost estimates in the labour productivity release. The main difference is that experimental indices of labour costs per hour relate to employees only, whereas unit labour costs also include the labour remuneration of the self-employed.

Lastly, we publish a range of [Public service productivity measures](#) and related articles. These measures define productivity differently from that used in our labour productivity and MFP estimates. Further information can be found in the [Economic and Labour Market Review, No. 5, May 2010](#) and in an [information note](#) published on 4 June 2015.

More information on the range of our productivity estimates can be found in the ONS [Productivity Handbook](#).