

Statistical bulletin

# International comparisons of UK productivity (ICP), final estimates: 2016

A comparison of labour productivity across the G7 nations, in terms of levels of and growth in gross domestic product (GDP) per hour worked and GDP per worker.



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# 1 . Main points

- The UK's long-running nominal productivity gap with the other six G7 economies was broadly unchanged in 2016: falling from 16.4% in 2015 to 16.3% in 2016 in output per hour worked terms.
- The UK's nominal productivity gap in output per worker terms narrowed from 16.9% in 2015 to 16.6% in 2016, compared with the average for the rest of the G7.
- Compared with the rest of the G7, the UK had below average real productivity growth in both output per hour and output per worker terms in 2016.
- Output per hour was lower in all G7 countries in 2016 than would have been the case if pre-downturn trends had continued since 2007.
- The UK has the largest “productivity puzzle” – the difference between post-downturn productivity performance and the pre-downturn trend in the G7; this was 15.6% in 2016, around double the average of 8.7% across the rest of the G7.

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

This article forms part of our quarterly productivity bulletin, which also includes an overarching commentary, the Office for National Statistics' headline labour productivity statistics and quarterly estimates of public service productivity.

This bulletin contains annual estimates of labour productivity for the G7 developed countries (Canada, France, Germany, Italy, Japan, the UK and the US) up to 2016. Labour productivity measures the amount of economic output that is produced by a unit of labour input and is an important measure of economic performance. Output is measured by gross domestic product (GDP). Labour input is measured in two ways – by total hours worked and by the number of workers in employment. These two measures of labour input can yield different results, reflecting differences in working patterns across countries and compositional movements over time, such as changes in the part-time share of employment.

The Organisation for Economic Co-operation and Development (OECD) has recently discontinued the publication of their Annual Labour Force Statistics (ALFS) database total employment measure, which has historically been used as the employment measure for this release. For the missing recent years in the total employment series, Eurostat (for European countries) and an alternative OECD employment series (for non-European countries) are used to project the data. This method is being used on an interim basis pending a more detailed review of the international comparisons of productivity (ICP) labour inputs and further engagement with OECD. This review is considering differences in the compilation methods that countries use to produce their “best estimates” of labour input. These vary between administrative sources and traditional survey sources such as the Labour Force Survey (LFS) for the estimation of their national accounts-consistent labour metrics. We will report on the progress with this work later in the year.

The labour productivity measures in this bulletin are presented in terms of current prices, suitable for cross-country comparison of levels of productivity for a single year, and constant prices, suitable for analysis of productivity performance over many years. The estimates in this release update those published on 6 October 2017. This release cycle reflects the publication and revision cycles of the component data series. More information on methodology and interpretation is available in the Quality and methodology section of this bulletin.

## 3 . UK productivity shortfall with the G7 stable in 2016

## Current price GDP per hour worked

On a current price gross domestic product (GDP) per hour worked basis, UK productivity in 2016 was:

- above that of Japan by 8.7%, with the gap narrowing from 10.0% in 2015
- above that of Canada by 0.6%, with the gap widening from 0.1% lower than that of the UK in 2015
- lower than that of Italy by 10.5%, with the gap widening from 9.6% in 2015
- lower than that of the US by 22.6%, with the gap narrowing from 23.1% in 2015
- lower than that of France by 22.8%, with the gap widening from 22.2% in 2015
- lower than that of Germany by 26.2%, with the gap narrowing from 26.8% in 2015
- lower than that of the rest of the G7 by 16.3%, with the gap narrowing from 16.4% in 2015

**Figure 1: Gross domestic product per hour worked, G7 countries**

2015 to 2016

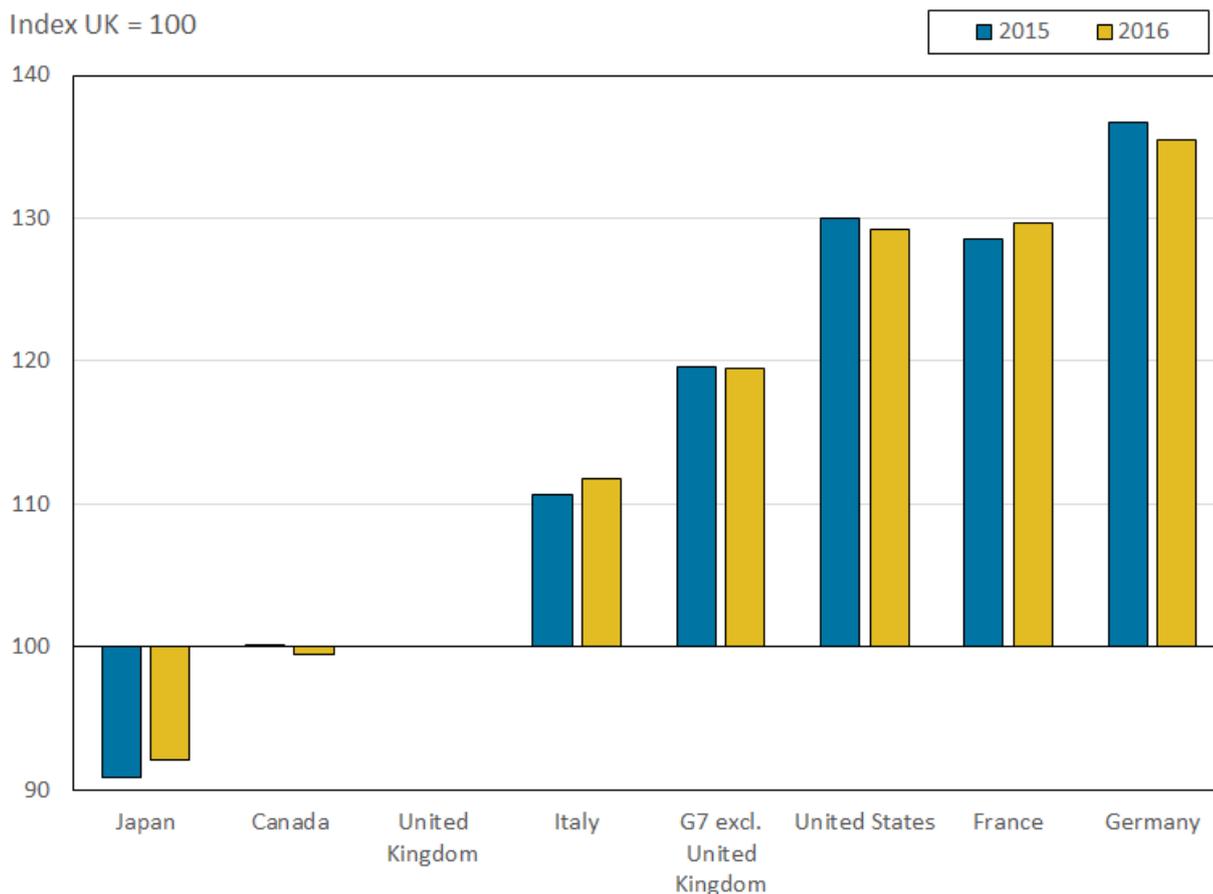


Figure 1 shows the ranking of each nation by their productivity relative to the UK productivity level on an output per hour (OPH) basis. The UK's productivity gap with the rest of the G7 fell to 16.3% in 2016, compared with 16.4% in 2015. This marginal fall reflected a narrowing of the UK's productivity gap to Germany and the US over this period, partly offset by a wider gap to France and Italy.

These trends reflect the relative growth rates of purchasing power parities (PPP)-adjusted nominal productivity in each economy: on this basis, UK productivity grew by 1.8% in 2016, faster than that in the US and Germany, but slower than that in France, Italy and Japan.

## Current price GDP per worker

Final estimates for 2016 show that UK output per worker was:

- above that of Japan by 6.3%, with the gap narrowing from 7.2% in 2015
- below that of Canada by 1.0%, with the gap narrowing from 2.1% in 2015
- below that of Germany by 9.3%, with the gap narrowing from 10.5% in 2015
- below that of France by 12.2%, with the gap widening from 12.1% in 2015
- below that of Italy by 13.3%, with the gap widening from 12.2% in 2015
- below that of the US by 27.3%, with the gap narrowing from 27.9% in 2015
- below that of the rest of the G7 by 16.6%, with the gap narrowing from 16.9% in 2015

**Figure 2: Gross domestic product per worker, G7 countries**

2015 to 2016

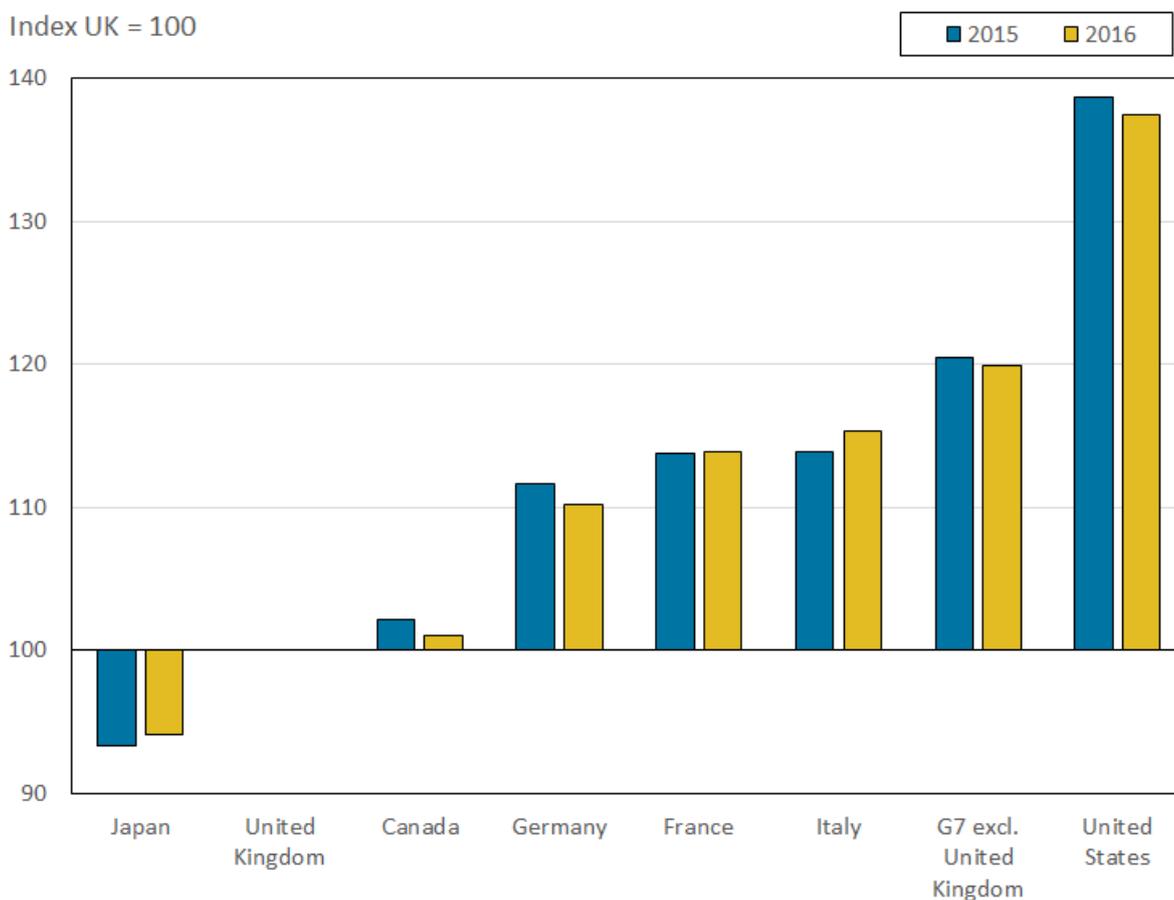


Figure 2 shows the ranking of each nation by their productivity relative to the UK productivity level on an output per worker (OPW) basis. The productivity shortfall between the UK and the rest of the G7 fell from 16.9% in 2015 to 16.6% in 2016. As with the output per hour estimates, this narrowing of the gap reflected a marginal fall in the UK's productivity deficit relative to Germany, Canada and the US, offset by a widening of the gap to Italy.

Different movements in average hours across countries account for differences in the patterns of productivity shown in Figures 1 and 2. For example, the productivity gap between the UK and the US is wider in terms of output per worker than in terms of output per hour because, on average, US workers work more hours than UK workers. On the other hand, the productivity differential between the UK, and Germany and France is wider in terms of output per hour than in terms of output per worker, as German and French workers work fewer hours than their UK counterparts.

## **4 . Productivity slowdown greater in the UK than the other G7 economies**

### **Constant price GDP per hour worked**

Labour productivity growth has slowed in both the UK and the rest of the G7 over the past decade, although this slowdown appears to have been larger in the UK. Figure 3 shows gross domestic product (GDP) per hour worked for the UK and the rest of the G7, together with simple projections based on average productivity growth over the 1997 to 2007 period (prior to the global economic downturn). It shows that the UK experienced relatively strong productivity growth up to 2007, with annual output per hour growth around 0.3 percentage points higher than the rest of the G7 countries. During the economic downturn, UK productivity growth fell more sharply than in the rest of the G7 and has been weaker over the following seven years.

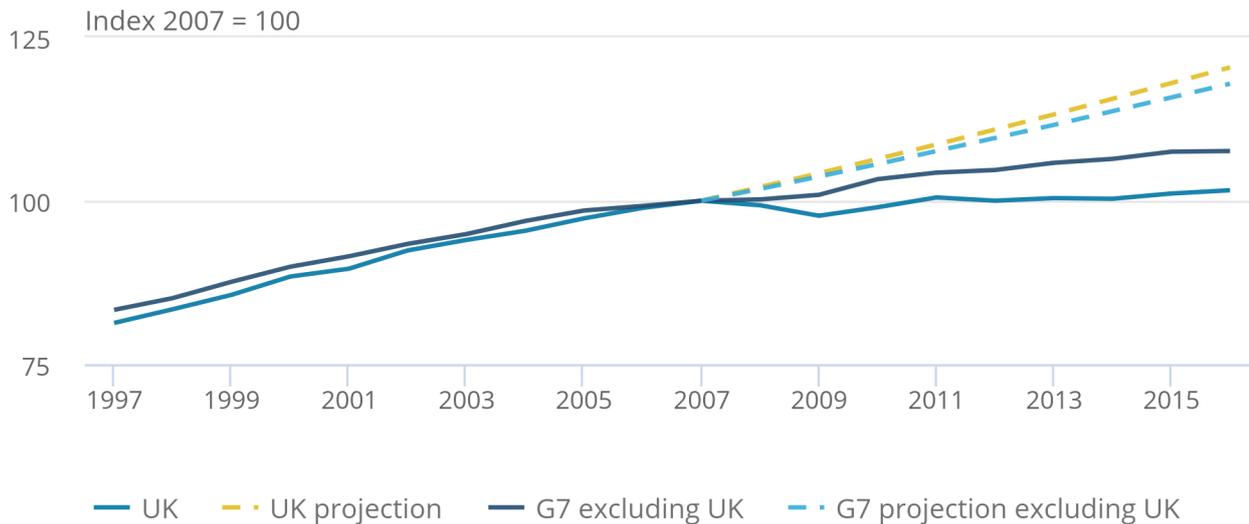
The size of the UK's "productivity puzzle" is consequently larger than that of the rest of the G7: indicating that output per hour growth has fallen more sharply and persistently in the UK than in other major economies. The gap between the UK's trend rate of productivity growth and its actual performance – commonly known as the productivity puzzle – was around 15.6% in 2016. This is shown by the gap between the UK's actual and projected performance in Figure 3. Both the slower growth of labour productivity for the rest of the G7 prior to the downturn and their relatively stronger growth since 2009 mean that the equivalent gap for other leading economies is much smaller. While these analyses are sensitive to the selection of time periods – and in particular, the productivity slowdown may have started earlier in the rest of the G7 – on this basis, the productivity gap among these other leading economies was just 8.7% in 2016.

### Figure 3: Constant price gross domestic product per hour worked, actual and projections

UK and G7 countries, 1997 to 2016

## Figure 3: Constant price gross domestic product per hour worked, actual and projections

UK and G7 countries, 1997 to 2016



Source: Organisation for Economic Co-operation and Development, Eurostat and Office for National Statistics calculations

#### Notes:

1. This figure presents annual data and uses gross domestic product (GDP) as opposed to gross value added (GVA) as the numerator. Furthermore, the OECD use non-seasonally adjusted (NSA) hours, whereas ONS use seasonally adjusted (SA) hours. NSA hours are different to SA hours primarily due to the non-working day adjustment in the seasonal adjustment process. Therefore, there may be slight differences between Figure 3 and the equivalent chart presented in the Labour productivity quarterly bulletin.

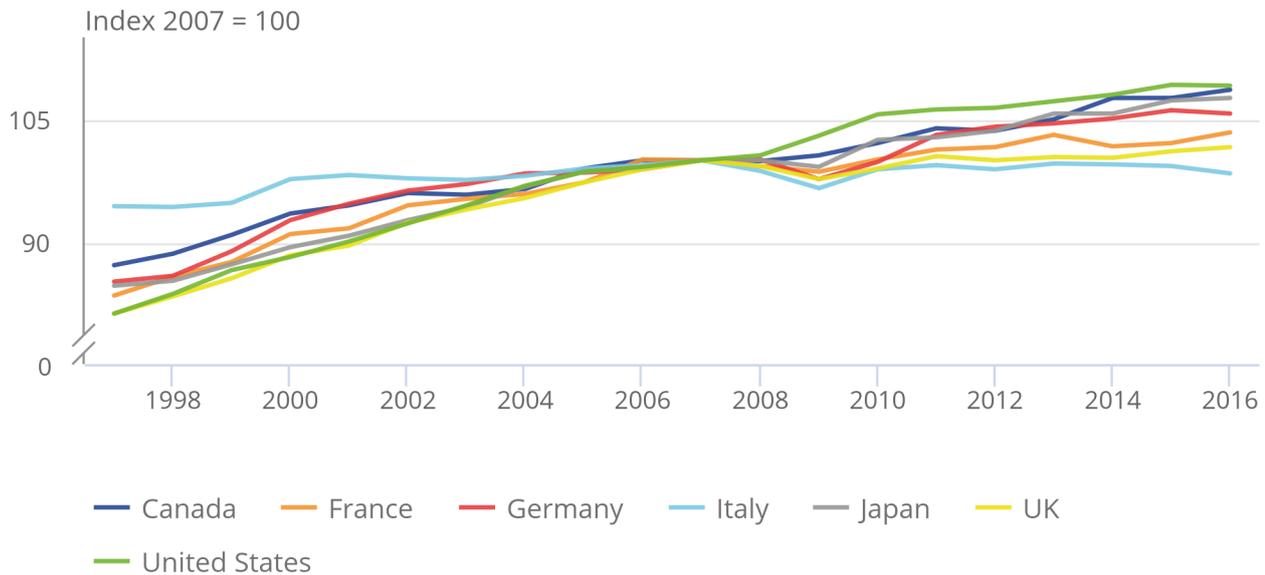
Figure 4 illustrates the difference in productivity trajectories over recent years between the G7 economies. Output per hour fell in most G7 countries during the downturn in 2008 and 2009, before rebounding sharply in Canada and the US. However, a slowdown in growth can be observed in several countries before this, with German growth slowing from 2004, while Italy has grown relatively slowly over the entire 1997 to 2016 period. Comparing average productivity growth rates since 2007, the UK ranks second bottom; only Italy had lower productivity growth over this period.

**Figure 4: Constant price gross domestic product per hour worked, G7 countries**

1997 to 2016

Figure 4: Constant price gross domestic product per hour worked, G7 countries

1997 to 2016



Source: Organisation for Economic Co-operation and Development, Eurostat and Office for National Statistics calculations

## 5. Revisions

Historical data used in this publication are subject to revision between publications. [Datasets R1 and R2](#) compare the latest estimates with estimates from the previous release on 6 October 2017. Note that because Tables 1 and 2 are indexed to UK equals 100, revisions to the UK are zero in Tables R1 and R2.

The revisions to the source data are as follows:

- Canada and Japan have seen upward revisions to gross domestic product (GDP) in 2014, 2015 and 2016
- Italy saw upward revisions to GDP in 2015 and 2016, while the UK saw upward revisions to GDP in 2016
- total actual hours worked and employment numbers are unrevised from the previous estimates
- there have been some revisions to purchasing power parities (PPPs) since the last release, with Japan showing the largest revisions to PPPs between 1995 and 2016

## 6 . Links to related statistics

[International comparisons of productivity](#) is published in levels and growth rates for the G7 countries. More international data on productivity are available from the [Organisation for Economic Co-operation and Development \(OECD\)](#), [Eurostat](#) and the [Conference Board](#).

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 sector productivity measures](#) and related articles. These measures define productivity differently from that used in our labour productivity and multi-factor productivity estimates. Further information can be found in [Comparing different estimates of productivity produced by the Office for National Statistics \(Phelps, 2010\)](#) (PDF, 253KB) 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](#).

[OECD publishes its own estimates](#) of current and constant price gross domestic product (GDP) per hour worked for member countries, the G7 and two other aggregates: the EU and OECD. The OECD current price estimates can easily be indexed to UK equals 100 and can then be compared with the estimates in Dataset table 1. While there are some differences between the two sets of estimates, the overall picture is very similar.

The OECD constant price estimates use a different base period to the estimates in Dataset table 3 and are best compared in terms of growth rates. Again, while the two sets of growth rates are not identical, the overall picture is very similar.

Differences between the estimates in this release and the OECD productivity series can be explained by the different sources used for the component data. In particular, our estimates use employment data that are based on countries' labour force surveys, whereas the OECD estimates use the national accounts as the main source of employment data for most countries. There can also be differences in the GDP data due to timing, as the OECD productivity estimates use annual national accounts whereas we use the quarterly national accounts for GDP data.

International estimates of productivity are also available from [Eurostat](#) and the [Conference Board](#).

## 7 . Recent highlights

- UK productivity introduction: October to December 2017 draws together the headlines of the productivity releases into a single release, providing additional analysis of our productivity statistics (published 6 April 2018).
- Labour productivity: October to December 2017 contains the latest estimates of labour productivity for the whole economy and a range of industries, together with estimates of unit labour costs (published 6 April 2018).
- Quarterly UK public service productivity (experimental statistics): April to June 2017 contains the latest experimental estimates for quarterly UK total public service productivity, inputs and output (published 6 April 2018).

- [International comparisons of labour productivity by industry: 2014](#) uses new production-side purchasing power parities (PPPs) to present estimates of labour productivity for 29 European countries across 10 industries on a gross value added (GVA) per hour worked basis (published 6 October 2017).
- [Quality adjusted labour input: UK estimates to 2016](#) presents updated estimates of quality adjusted labour input (QALI) for the whole economy and for the market sector (published 6 October 2017).
- [Foreign direct investment and labour productivity: a micro-data perspective: 2012 to 2015](#) examines the composition of firms with foreign direct investment (FDI) in Great Britain between 2012 and 2015, and their productivity outcomes compared with firms with no FDI relationships (published 6 October 2017).
- [Quality adjustment of public service criminal justice system output: experimental method: 1997 to 2014](#) presents new methodologies to capture changes in quality of outputs of the criminal justice system, expanding ONS's coverage of quality adjustment for public service output (published 6 October 2017).
- [Introducing industry-by-region labour metrics and productivity: July 2017](#) presents new, experimental industry-by-region productivity metrics; this includes measures of hours worked, jobs and accompanying productivity measures for the Standard Industrial Classification (SIC) letter industries in the NUTS1 regions (published 5 July 2017).
- [Introducing division level labour productivity estimates: July 2017](#) provides an overview of new and experimental estimates of labour productivity at the two-digit SIC industry level for the UK and provides some initial analysis demonstrating trends in the data (published 5 July 2017).
- [Regional and sub-regional productivity in the UK: February 2018](#) provides statistics for several measures of labour productivity; statistics are provided for the NUTS1, NUTS2 and NUTS3 sub-regions of the UK and for selected UK city regions (published 7 January 2018).
- [Understanding firms in the bottom 10% of the labour productivity distribution in Great Britain: "the laggards", 2003 to 2015](#) examines the characteristics of businesses in the bottom 10% of the labour productivity distribution in terms of their size, age, industry and location, between 2003 and 2015 (published 5 July 2017).
- [Multi-factor productivity estimates: Experimental estimates to 2015](#) decomposes output growth into the contributions that can be accounted for by labour and capital inputs; the contribution of labour is further decomposed into quantity (hours worked) and quality dimensions (published 5 April 2017).
- [Developing new measures of infrastructure investment: July 2017](#) is the first in a series of papers on infrastructure statistics, focusing on definitional and data challenges in measuring infrastructure investment (published 5 July 2017).
- [Volume index of UK capital services \(experimental\): estimates to Quarter 2 \(Apr to Jun\) 2017](#) provides estimates of the contribution of capital inputs to production in the market sector, split by asset and industry (published 7 February 2018).
- [Public service productivity estimates: total public service, UK: 2015](#) presents updated measures of output, inputs and productivity for public services in the UK between 1997 and 2014, in addition to new estimates for 2015; includes service area breakdown, as well as impact of quality adjustment and latest revisions (published 5 January 2018).
- [Public service productivity estimates, healthcare: 2015](#) presents updated estimates of output, inputs and productivity for public service healthcare in the UK between 1995 and 2013, and new estimates for 2015 (published 5 January 2018).

## 8 . Quality and methodology

The [International comparisons of productivity Quality and Methodology Information report](#) contains important information on:

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

For this release the base year for purchasing power parities (PPPs) is 2014, which is the latest year for which the Organisation for Economic Co-operation and Development (OECD) PPP series have been benchmarked.

The output measure used here (gross domestic product (GDP)) differs from that used for the Office for National Statistics' (ONS's) headline measure of productivity (gross value added (GVA)). In the national accounts, GDP is valued at market prices and GVA is valued at basic prices. The principal difference is that basic prices exclude taxes and subsidies on products, such as Value Added Tax (VAT) and excise duties. For further information on the relationship between GVA and GDP, see Chapter 4 of the [ONS Productivity Handbook](#).

GVA is the preferred measure of output for productivity purposes. However, as OECD does not produce output level series using basic prices over the necessary time period and PPPs are based on market prices, GDP is used in this bulletin. Differences between the growth rates of GVA and GDP are not normally significant.

Estimates of labour inputs (employment and hours worked) are taken from OECD where available, supplemented in some cases by other sources. Differences between OECD estimates and national sources reflect adjustments made by OECD to achieve greater consistency between national estimates. Furthermore, OECD's use of non-seasonally adjusted (NSA) hours as opposed to seasonally adjusted (SA) hours will cause inconsistencies with national sources. NSA hours are different to SA hours primarily due to the non-working day adjustment in the seasonal adjustment process. There may also be timing differences as national sources are updated outside the OECD revision cycle.

Current price productivity estimates are indexed to UK equals 100 for each year and show each country's productivity relative to that of the UK in that year. Since productivity is an important determinant of living standards, these estimates also provide an indication of living standards relative to the UK.

In interpreting these estimates you should bear in mind that PPPs provide only an approximate conversion from national currencies and may not fully reflect national differences in the composition of a representative basket of goods and services. Additionally, care should be taken in interpreting movements in current price productivity estimates over time. For example, an increase in UK productivity relative to another country could be due to UK productivity growing faster, or falling less, or due to changes in relative prices in the two countries, or some combination of these movements.

Constant price productivity estimates are indexed to a particular year. For each country, these estimates are very similar to national labour productivity series. The index year is set at 2007 to focus on movements in labour productivity over the economic downturn. These estimates, conversely to the current price estimates, show the evolution of productivity for each country and for the G7 (and G7 excluding the UK) aggregates, but should not be used to compare productivity across countries at a point in time.

Productivity growth can be decomposed into growth of output minus the growth of labour input and these components can move in different directions within and across countries. This should be kept in mind in interpreting the constant price productivity estimates in this release.

## 9 . Links to related statistics

- [UK productivity introduction: October to December 2017](#) draws together the headlines of the productivity releases into a single release, providing additional analysis of our productivity statistics (published 6 April 2018).
- [Labour productivity: October to December 2017](#) contains the latest estimates of labour productivity for the whole economy and a range of industries, together with estimates of unit labour costs (published 6 April 2018).
- [Quarterly UK public service productivity \(experimental statistics\): October to December 2017](#) contains the latest experimental estimates for quarterly UK total public service productivity, inputs and output (published 6 April 2018).
- [International comparisons of UK productivity \(ICP\), final estimates: to 2016](#) presents an international comparison of labour productivity across the G7 nations, in terms of growth in GDP per hour and GDP per worker (published 6 April 2017).
- [Introducing industry-by-region labour metrics and productivity](#) presents new, experimental industry-by-region productivity metrics; this includes measures of hours worked, jobs, and accompanying productivity measures for the SIC letter industries in the NUTS1 regions (published 6 April 2018).
- [Quarterly multi-factor productivity: Progress to date and next steps](#) details the methodology used to compile quarterly multi-factor productivity and sets out plans to reduce the time taken in producing these estimates and increasing the industry granularity (published 6 April 2018).
- [Quarterly Multi-factor productivity \(MFP\), \(experimental estimates\): to Q2 2017](#) decomposes output growth into the contributions that can be accounted for by labour and capital inputs; the contribution of labour is further decomposed into quantity (hours worked) and quality dimensions (published 6 April 2018).
- [Management practices and productivity in British production and services industries - initial results from the Management and Expectations Survey: 2016](#) Results from the second wave of a pilot survey, the Management and Expectations Survey, which gathered information on British management practices and firms' expectations for future growth (published 6 April 2018).
- [Public service productivity estimates: total public service, UK: 2015](#) presents updated measures of output, inputs and productivity for public services in the UK between 1997 and 2014, in addition to new estimates for 2015 (published 5 January 2018).
- [Public service productivity estimates: healthcare, 2015](#) presents updated estimates of output, inputs and productivity for public service healthcare in the UK between 1995 and 2014, in addition to new estimates for 2015 (published 5 January 2018).
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