

Statistical bulletin

# Regional labour productivity, including industry by region, UK: 2018

Regional output per hour and output per job, and an experimental analysis of the performance of output per hour levels and growth by industry and region.



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#### 1. Main points

- Output per hour varied significantly across the UK's regions and countries in 2018, with London being 31.6% above and Wales 17.2% below the UK average, and all other regions and countries lying in between; the distribution of output per job followed a similar pattern.
- Productivity grew in half of the 12 regions and countries of the UK in 2018, with output per hour increasing in both Scotland and the East Midlands by more than 2%; in contrast, output per hour fell in Yorkshire and The Humber and in Northern Ireland by at least 2%.
- Taking account of the share of hours worked across regions, in 2018 the South East and Scotland each contributed 0.2% to overall growth in output per hour in the UK; this contrasts with Yorkshire and The Humber, where a contraction in output per hour pulled down overall UK productivity by 0.2%.
- New experimental analyses assess whether the productivity of any industry within each region is higher or lower than would be expected given the overall performance of each industry and region across the UK in the three years to 2018; across regions, industry category ABDE (Non-manufacturing production and agriculture) varied from one extreme to another.
- This is the first standalone commentary containing estimates of regional labour productivity and industry by region productivity.
- This bulletin covers regional output per hour and output per job, which are National Statistics; it also
  presents an experimental analysis of the performance of output per hour levels and growth by industry and
  region.

#### 2. Variation in productivity across regions

Productivity is the main driver of economic growth and determines the long-term material prosperity of a group of people, a region or a nation. For the UK as a whole, there has been little cumulative growth in productivity over recent years, as discussed in <u>Labour productivity</u>, <u>UK: July to September 2019</u>. However, this may mask what is happening in the different geographic areas of the UK. Considering the 12 regions and nations of the UK distinguished by <u>Nomenclature of Units for Territorial Statistics level 1 (NUTS1)</u>, productivity is relatively high in some regions and relatively low in others.

As measured by output per hour, the only two areas with levels of productivity above the UK average in 2018 were London (positive 31.6%) and the South East (positive 9.1%). London and the South East are both disproportionately large regions in terms of their share of hours worked. As a result, their high productivity drags up the UK average so much that all other regions fall below the UK average output per hour.

The lowest levels of output per hour were in Wales, and Yorkshire and The Humber, which were about 17% below the UK average. The gap between the highest and lowest productivity regions has changed very little over the last 10 years.

This analysis uses national price deflators, so it may fail to take account of differences in the level of prices in the different regions and countries of the UK.

#### Figure 1: Only London and the South East observed output per hour above the UK average

Output per hour by NUTS 1 region relative to UK, 2018

Whilst output per hour is our preferred measure, productivity can also be measured in terms of output per job. The two measures can produce different results if average weekly hours worked vary across regions.

When regions are ranked by output per job rather than output per hour, the South West region moves down the ranking. This means that on average workers in the South West worked shorter hours for each job compared with the UK average. In contrast, Northern Ireland moves up the ranking when regions are ranked by output per job rather than output per hour. This means that on average workers in Northern Ireland worked longer hours for each job compared with the UK average.

## Figure 2: When looking at output per job, London's lead increases and Northern Ireland also improves, compared with output per hour measures

Output per job by NUTS 1 region relative to UK, 2018

#### 3. Variation in growth of productivity across regions

Productivity growth is important because increases in output per hour allow salaries and profits to rise, standards of living to improve, and society to fund better public services. In the long-run, regions that experience faster sustained growth in productivity will eventually have greater levels of prosperity than other regions, even if they start out with somewhat lower levels of productivity.

According to our experimental statistics for industry by region productivity, 6 of the UK's 12 Nomenclature of Units for Territorial Statistics level 1 (NUTS1) regions and nations saw real-terms growth in output per hour in 2018. However, the other six experienced a contraction, showing the UK's continued weak productivity performance. Output per hour grew by more than 2% in both Scotland and the East Midlands over the past 12 months. In contrast, output per hour fell by more than 2% over the last year in both Yorkshire and The Humber, and Northern Ireland.

Interestingly, London had relatively modest growth in output per hour of 0.5% compared with the previous year, with Scotland, the East Midlands, the West Midlands, the East of England and the South East all showing greater levels of productivity growth. Wales, Northern Ireland, the South West and the three regions of the north in England all saw a decline in productivity.

#### Figure 3: Half of all NUTS 1 regions experience negative output per hour growth

Output per hour annual log growth rates by NUTS 1 region, UK, 2018

For the UK as a whole, while productivity growth will be mainly driven by productivity growth within each region, shifts of economic activity from one region to another are also important. In other words, if inputs and outputs move from a low- to a high-productivity area, even if each area has no change in its local productivity level, the movement from low to high would result in an increase in UK productivity. This "reallocation" of economic activity can work either to increase or decrease the overall productivity of the UK, depending on whether economic activity shifts mostly from regions with lower productivity to regions with higher productivity or the other way around.

In 2018, the South East made the largest contribution to UK output per hour growth. Despite having the fastest output per hour growth rate, Scotland made only the second-largest contribution to growth, as total hours worked are lower in Scotland compared with the South East.

In contrast, Yorkshire and The Humber showed the greatest negative contribution to growth, largely because they had the largest fall in output per hour growth. Meanwhile the allocation effect was positive showing that on average inputs and outputs were moving from lower- to higher-productivity areas over the year.

Figure 4: The South East and Scotland make the largest positive contributions to productivity growth, while Yorkshire and The Humber makes the largest negative contribution

Contributions to UK output per hour, by NUTS 1 region, UK, 2018

Figure 4: The South East and Scotland make the largest positive contributions to productivity growth, while Yorkshire and The Humber makes the largest negative contribution

Contributions to UK output per hour, by NUTS 1 region, UK, 2018



**Source: Office for National Statistics** 

## 4. Assessing unexpectedly high or low productivity for industries in each region

Results reported in the previous section show how regions vary above or below the UK average level of productivity when we look at all industries together. We can better understand the economy within each region by examining the amount of output produced by each hour worked in different industries within the region.

On average, in 2018 the UK economy produced about £35 of value for each hour worked. However, in some industries output per hour is much higher than the UK average, and in other industries output per hour is lower. For example, in industry K (Finance and insurance) across the UK productivity was about £69 per hour, while in industry I (Accommodation and service activities) productivity was about £17 per hour.

If we combine the average output per hour for a particular region with the average output per hour for an industry relative to the UK, we might anticipate the output per hour that a particular industry might be "expected" to achieve in each region. For example, London has the highest output per hour of all the regions, and industry K (Finance and insurance) has one of the highest levels of output per hour among various industries in the UK economy, so we might expect that industry K in London would have higher output per hour than most industries in most regions.

If an industry has either higher or lower output per hour in a particular region than would be expected from the region's overall output per hour combined with the industry's overall output per hour, this might suggest something unusual is affecting productivity for that industry within that particular region.

To assess this possibility, we combined industry by region data for the three most recent years (2016 to 2018), calculated the "expected" level of productivity from the region's overall output per hour combined with the industry's overall output per hour, and compared actual output per hour for each industry within each region with the expected output per hour. Deviations from expected productivity levels are measured in log percentage points. Industry L (Real estate) was excluded from these analyses because the productivity for this industry is distorted by the inclusion of imputed rents in this industry's gross value added (GVA).

Results presented in this section are preliminary and we invite comments from users on the usefulness of these results as well as suggestions for improving the methodology.

Figure 5 does not show absolute levels of productivity, but rather shows the extent to which a region's industries have a pattern of output per hour that deviates from the average distribution seen between industries across the whole of the UK.

## Figure 5: Output per hour for some industries was more than 30 percentage points above or below expectation for particular regions

UK, industry sections (excluding L Real estate), NUTS 1 regions, 2016-2018

Some regions had less variability in output per hour among industries than others. The North West, South East and Scotland had no industries with output per hour more than 20 percentage points higher or lower than would be expected from the averages for each industry combined with the averages for those regions.

Across regions, industry category ABDE (Non-manufacturing production and agriculture) varied from one extreme to another. This industry had particularly high output per hour in the North East region and in London, compared with what would be intuitively expected. Output per hour for this industry was particularly low in Northern Ireland and in Wales compared with what would be expected.

We can look more closely at output per hour for all industries within the South East region and within Yorkshire and The Humber. These two regions made the largest positive and negative contributions respectively to productivity growth in the UK for 2018, as was shown in Figure 4.

In the South East, across the three years to 2018, output per hour for industry ABDE (Non-manufacturing production and agriculture) was 17.3 percentage points higher than would be expected given this industry's overall productivity across the UK combined with the region's average level of productivity, which may potentially be a "Head Office" effect.

In contrast, industry K (Finance and insurance) was 13.5 percentage points lower than modelled. This is perhaps to be expected given the different nature of the financial activity that occurs in London, which inevitably forms an outlier in this industry, skewing the expected result upwards in all other regions and nations of the UK. Industry O (Public administration and defence) and industry Q (Human health and social work) were respectively 13.0 and 12.8 percentage points lower than would be expected from the modelling.

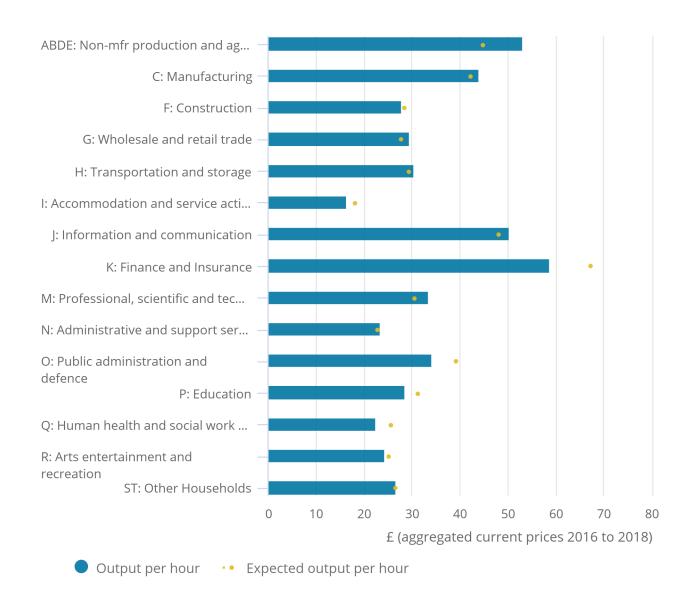
Figure 6 shows levels of output per hour for the South East by industry, along with the expected level for each industry given the industry's overall productivity across the UK combined with the region's average level of productivity.

Figure 6: In the South East region output per hour was unexpectedly high for Non-manufacturing production and agriculture, and low for several industries including Finance and insurance

Output per hour, industry sections, South East, 2016 to 2018

Figure 6: In the South East region output per hour was unexpectedly high for Non-manufacturing production and agriculture, and low for several industries including Finance and insurance

Output per hour, industry sections, South East, 2016 to 2018



**Source: Office for National Statistics** 

Across the three years to 2018, output per hour for industry I (Accommodation and service activities) was 22.3 percentage points higher than would be expected given this industry's overall productivity across the UK combined with Yorkshire and The Humber's average level of productivity. As is standard for all areas outside London, industry K (Finance and insurance) was lower than would be expected, in this case by 25.0 percentage points. Industry J (Information and communication) was 17 percentage points lower than would be expected.

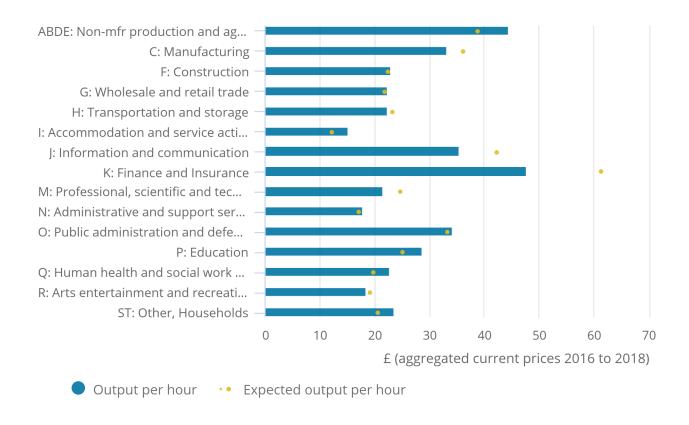
Figure 7 shows levels of output per hour for Yorkshire and The Humber by industry, along with the expected level for each industry given the industry's overall productivity across the UK combined with the region's average level of productivity.

Figure 7: Output per hour by industry, Yorkshire and The Humber

Output per hour, industry sections, Yorkshire and The Humber, 2016 to 2018

## Figure 7: Output per hour by industry, Yorkshire and The Humber

Output per hour, industry sections, Yorkshire and The Humber, 2016 to 2018



**Source: Office for National Statistics** 

## 5. Assessing unexpectedly high or low growth of productivity for industries in each region

On average, in 2018 output per hour for the UK economy grew in real terms by 0.5%. However, in some industries output per hour grew much faster than the UK average, and in other industries output per hour declined. For example, in industry J (Information and communication) output per hour grew by 4.5% overall across the UK, while in industry K (Finance and insurance) output per hour fell by 2.3%.

If an industry has either higher or lower growth of output per hour in a particular region compared with what would be expected from the region's average growth in output per hour and the industry's overall growth in output per hour across the UK, this might suggest something unusual is affecting productivity growth for that industry within that particular region.

To assess this possibility, we analysed industry by region annual growth in output per hour over the three most recent years (2016 to 2018). Industry L (Real estate) was excluded from these analyses.

Results presented in this section are preliminary, and we invite comments from users on the usefulness of these results as well as suggestions for improving the methodology.

Figure 8 shows the extent to which growth in output per hour exceeds or falls short of the rate that would be expected from each region's overall growth rate combined with each industry's annual growth rate for 2016 to 2018. Deviations from expected productivity levels are measured in log percentage points.

Some regions had less variability in productivity growth across industries, and other regions had greater variability across industries. London and Scotland had no industries with annual growth in output per hour more than 5 percentage points higher or lower than would be expected from the averages for each industry combined with the averages for those regions.

Across regions, industry category ABDE (Non-manufacturing production and agriculture) varied widely. This industry had particularly high growth in output per hour in Northern Ireland and in Wales compared with what would be expected. The growth rate for output per hour in this industry was particularly low in the North West region compared with what would be expected.

### Figure 8: Growth in output per hour for some industries was more than 5 percentage points per year above or below expectation for particular regions

UK, industry sections (excluding L Real estate), NUTS 1 regions, 2016-2018

Again, we can look more closely at results for industries within the South East region and within Yorkshire and The Humber.

In the South East region, across the three years to 2018, annual growth in output per hour for industry R (Arts, entertainment and recreation) was 5.1 percentage points higher than would be expected given this industry's overall rate of productivity growth across the UK combined with the region's average rate of productivity growth. In contrast, annual growth in output per hour for industry K (Finance and insurance) was 3.4 percentage points lower than would be expected. Other industries in the South East region had less unexpected rates of growth in output per hour over this period.

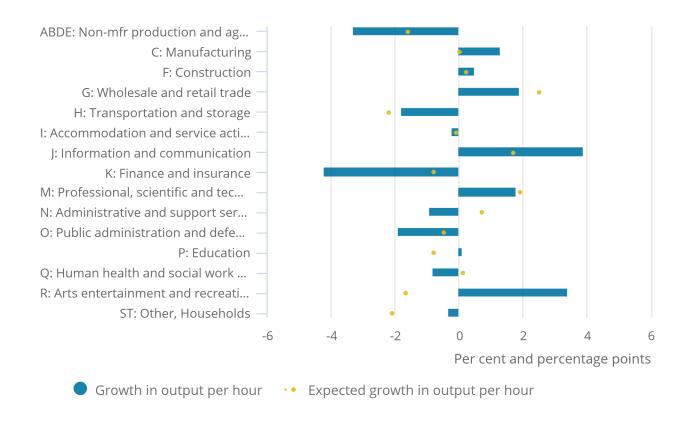
Figure 9 shows annual growth of output per hour for the South East by industry (bars), along with the expected growth rate for each industry (dots) given the industry's overall rate of productivity growth across the UK combined with the region's average rate of productivity growth.

Figure 9: In the South East region growth in output per hour was unexpectedly high for Arts, entertainment and recreation, and low for Finance and insurance

Output per hour, annual log growth rates, 2016 to 2018, South East

Figure 9: In the South East region growth in output per hour was unexpectedly high for Arts, entertainment and recreation, and low for Finance and insurance

Output per hour, annual log growth rates, 2016 to 2018, South East



#### **Source: Office for National Statistics**

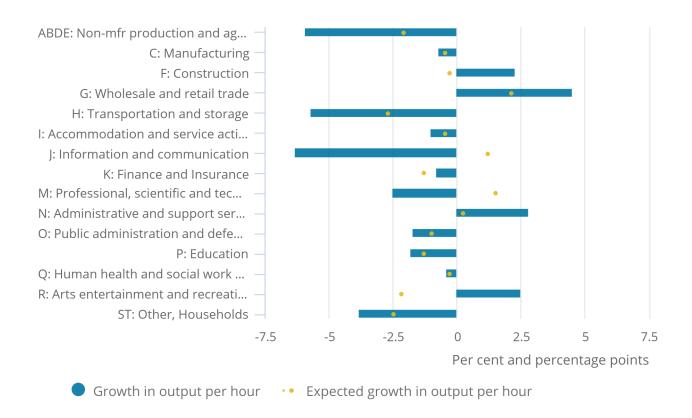
Although Yorkshire and The Humber had the highest aggregate negative effect on UK productivity growth in 2018, this does not imply that all industries in this region performed poorly. For example, across the three years to 2018, annual growth in output per hour for industry R (Arts, entertainment and recreation) was 4.7 percentage points higher than would be expected given this industry's overall rate of productivity growth across the UK combined with the region's average rate of productivity growth.

In contrast, annual growth in output per hour was 7.5 percentage points lower than would be expected for industry J (Information and communication), 4.0 percentage points lower than would be expected for industry M (Professional, scientific and technical activities) and 3.9 percentage points lower than would be expected for industry ABDE (Non-manufacturing production and agriculture).

Figure 10 shows annual growth of output per hour for Yorkshire and The Humber by industry (bars), along with the expected growth rate for each industry (dots) given the industry's overall rate of productivity growth across the UK combined with the region's average rate of productivity growth.

Figure 10: In Yorkshire and The Humber growth in output per hour was unexpectedly high for Arts, entertainment and recreation, and low for several industries including Information and communication

Figure 10: In Yorkshire and The Humber growth in output per hour was unexpectedly high for Arts, entertainment and recreation, and low for several industries including Information and communication



**Source: Office for National Statistics** 

#### 6. Regional labour productivity data

#### Annual regional labour productivity

Dataset PRODBYREG | Released 5 February 2020

Annual estimates of output per job and output per hour relative to the UK, for the whole economy across 13 regions and nations in the UK, from 1998. Prior to July 2019 these data were published as Table 9 of dataset LPROD01.

#### Regional productivity time series

Dataset RPRD | Released 5 February 2020

Annual output per hour and output per job for the whole economy across 13 regions and nations in the UK.

#### Region by industry labour productivity

Dataset INDBYREG | Released 5 February 2020

Annual productivity hours, productivity jobs, output per hour, and output per job by UK NUTS1 regions (and devolved nations) and industry section. Experimental Statistics.

#### 7. Glossary

#### Industry

Industrial sections defined by the Standard Industrial Classification 2007: SIC 2007.

#### **Labour inputs**

Labour inputs in this release are measured in terms of jobs ("productivity jobs") and hours worked ("productivity hours"), for an industry within a geographic area.

#### Labour productivity

Labour productivity is calculated by dividing output by labour input.

#### **Output**

Output refers to gross value added (GVA), which is an estimate of the volume of goods and services produced by an industry within a geographic area, and in aggregate across industries for a geographic area.

#### Region

One of the 12 regions or devolved nations of the UK distinguished by <u>Nomenclature of Units for Territorial</u> <u>Statistics level 1 (NUTS1)</u>.

#### 8. Measuring the data

Two measures of output are used in these statistics, both from <u>Regional gross value added (balanced) by industry: all NUTS level regions</u>, published in December 2019. For comparing levels of output per hour across industries or regions, output is the current price estimate of economic activity using nominal output (current prices) and may be subject to unmeasured differences in regional prices. For assessing rates of growth in output per hour from one year to another, output is the chained volume measure of gross value added (GVA).

Labour input measures used in this bulletin are known as "productivity jobs" and "productivity hours".

For estimates of regional productivity relative to the UK, productivity jobs is calculated by summing numbers of employees, the self-employed and two smaller components: Her Majesty's Forces (HMF) and government-supported trainees (GST). These data come from two principal sources within the Office for National Statistics (ONS): Short-Term Employment Survey (STES) data and the Labour Force Survey (LFS). Productivity hours are derived from estimates of average hours (derived from the LFS micro-dataset) and productivity jobs.

Information on the industry by region estimates of labour can be found in <u>Introducing industry-by-region labour metrics and productivity: 2015</u>.

#### Presentation of growth rates in log percentage changes

In this release charts and associated text measure growth in terms of percentage log changes and we will continue to use this presentation in future releases. We have adopted this approach because a log change between two observations has the same numerical value regardless of which observation is the starting point. This is not true for a percentage change. For illustrative purposes, in the following example, log changes are substantially different from percentage changes.

Suppose one data point of interest has the value 7, and another point at a different time or for a different industry or region has double the value, 14. The log change from 7 to 14 is 69%, and the log change from 14 to 7 is negative 69%. In contrast, the percentage change from 7 to 14 is 100%, while the percentage change from 14 to 7 is negative 50%. The log change reflects the fact that the second change reverses the first (and so has the same value) while the percentage change appears to be very different depending on which data point is taken as the reference.

This approach is the same as that we use to compile guarterly labour productivity and multi-factor productivity.

#### Expected output per hour and growth in output per hour

Users are particularly invited to comment on the usefulness of these preliminary analyses, or to share suggestions for improving them, by emailing productivity@ons.gov.uk.

For levels of output per hour, composite current price values were estimated as the sum of GVA over 2016 to 2018, divided by the sum of hours worked over those years, for each of the 180 industry by region combinations (12 regions multiplied by 15 industries). Since no adjustment was made for inflation, these estimates are influenced slightly more by the more recent data relative to the earlier data. Industry L (Real estate) was excluded from these analyses because the productivity for this industry is distorted by the inclusion of imputed rents in the industry's GVA without any corresponding imputation of labour.

Expected output per hour was estimated by fitting a linear, weighted regression to the composite (2016 to 2018) output per hour levels, using hours worked as the weighting variable. The regression included an intercept for UK output per hour across all industries and categorical main effects for regions and for industries. The best fit predicted values were interpreted as the level of output per hour "expected" from each region's average output per hour combined with each industry's overall output per hour. Within each region, some industries will have higher output per hour than expected and other industries will be lower than expected. Similarly, for each industry, output per hour in some regions will be higher than expected, and output per hour for that industry in other regions will be lower than expected.

For annual rates of growth in output per hour, average percentage log growth was calculated as the cumulative percentage log growth from 2015 to 2018 (three years of growth), divided by three, for each industry by region combination. Expected growth rates were estimated by fitting a linear, weighted regression to the average annual growth rates, using hours worked as the weighting variable. The regression included an intercept for UK output per hour across all industries and categorical main effects for regions and for industries. Within each region, some industries will have higher growth than expected and other industries will be lower than expected. Similarly, for each industry, growth in some regions will be higher than expected, and growth for that industry in other regions will be lower than expected.

#### Quality

More quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the <u>Labour productivity QMI</u> and <u>Introducing industry-by-region labour metrics and productivity: 2015</u>.

#### **Revisions**

This release reflects a change from one form of GVA to another. All results in the present release are based on GVA compiled on a balanced basis, GVA(B). Previously, we used GVA compiled on the income approach, GVA (I), for current price labour productivity estimates. The transition from one to the other was described in <a href="Industry-by-region estimates">Industry-by-region estimates of labour productivity: 2017</a>.

Revisions to the current data also reflect revisions to jobs data resulting from an annual benchmarking to the Business Register and Employment Survey, and other <u>revisions to workforce jobs estimates</u>. These revisions affect all time periods.

#### 9. Strengths and limitations

This release reports labour productivity estimates for 2018 for Nomenclature of Units for Territorial Statistics level 1 (NUTS1) regions and for section-level industries within regions. Productivity is important because it is the long-term driver of changes in average living standards.

The data in <u>Section 2 Variation in productivity across regions</u>, including Figures 1 and 2, output per hour and output per job relative to the UK, reflect the dataset PRODBYREG, which are <u>National Statistics</u>.

Data in all other figures are based on the dataset INDBYREG, which are <u>Experimental Statistics</u>. This includes growth rates of regional output per hour and industry by region comparisons to expected output per hour levels and growth rates.

#### Comparability and consistency

The output statistics in this release are consistent with the latest Regional economic activity by gross domestic product, UK published on 19 December 2019. Note that productivity in this release does not refer to gross domestic product (GDP) per person, which is a measure that includes people who are not in employment.

The labour input measures used in this release are consistent with the latest <u>Labour market statistics</u> at the Office for National Statistics (ONS).

#### 10. Related links

#### Labour productivity, UK: July to September 2019

Bulletin | Released 8 January 2020

Output per hour, output per job and output per worker for the whole economy and a range of industries.

#### 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 Nomenclature of Units for Territorial Statistics level 1 (NUTS1) regions from 1997 to 2017. They compare annual productivity growth by region, as output per hour, relative to the UK and explains how manufacturing and services have grown across the regions.

#### Introducing industry-by-region labour metrics and productivity: 2015

Article | Released 5 July 2017

New experimental industry-by-region metrics, including measures of hours worked, jobs and accompanying productivity measures for the SIC letter industries in the NUTS1 regions.

#### Regional labour market statistics in the UK: January 2020

Bulletin | Released 21 January 2020

Regional, local authority and Parliamentary constituency breakdowns of changes in UK employment, unemployment, economic inactivity and other related statistics.

### Productivity measures by region

United Kingdom 100.0 100.0 100.0 1	016 2017 00.0 100.0 36.6 85.1	
Nominal GVA per filled job		100.0
	36.6 85.1	
	36.6 85.1	
	91.3 91.3	
	32.4 83.3	
	35.2 84.5	
	38.4 88.5	
East of England DMDQ 92.6 <sup>†</sup> 93.2 93.2 93.0	93.8 94.6	
	12.9 141.0	
	04.6 105.6	
	37.1 87.6	
	01.7 101.6	
	31.4 82.0	
	95.3 94.9	
Northern Ireland <b>DMOA</b> 88.3 <sup>†</sup> 86.9 86.7 88.1	39.4 91.3	88.6
Nominal GVA per hour worked		
	39.0 87.5	86.5
North West <b>DMOH</b> 92.3 <sup>†</sup> 92.4 90.2 91.2	92.2 92.3	91.6
Yorkshire and The Humber DMOK 86.3 <sup>†</sup> 86.2 84.9 85.6	34.9 85.8	83.5
	35.5 84.9	86.5
	37.7 88.4	89.6
East of England DMOO 93.9 <sup>†</sup> 93.9 95.2 94.6	94.6 95.2	95.4
London DMOR 133.1 <sup>†</sup> 132.4 133.4 134.1 1	34.1 132.0	131.6
	05.8 107.7	' 109.1
South West DMOT 91.3 <sup>†</sup> 90.0 90.5 90.0	90.7 91.1	90.2
England DMOV 101.4 101.5 101.5 1 101.5	01.5 101.6	101.5
Wales DMOW 85.5 <sup>†</sup> 85.2 83.4 82.4	33.5 83.8	82.8
Scotland DMOY 97.6 <sup>†</sup> 98.0 98.5 98.1	96.7 95.5	97.6
Northern Ireland DMWA 84.9 <sup>†</sup> 82.3 82.0 85.3	36.6 87.2	84.4

 $<sup>^{\</sup>dagger} indicates$  that estimates are new or have been revised. The period marked is the earliest in the table to have been revised.