Understanding Labour Productivity Statistics

Introduction

Productivity is an important indicator of economic performance. As a practical concept, productivity helps define both the scope for raising living standards and the competitiveness of an economy.

What is Labour productivity?

Labour productivity measures the average amount of goods and services produced for each hour worked by the labour force. Labour productivity can be measured for individual branches or companies, for industrial sectors or for the whole economy. The most productive economies can produce higher levels of output, on average, for each hour worked.

Unlike some economic statistics, productivity cannot be directly observed or measured and is instead derived from separate estimates for output and labour input. It is calculated by dividing a measure of output (gross value added, GVA) by a measure of input (number of jobs or total number of hours worked). An increase in GVA or a decrease in Jobs/hours contributes toward an increase in labour productivity, whilst a decrease in GVA or an increase in jobs/hours contributes towards a decrease.

The *OECD Productivity Manual* defines output per hour worked as the most comprehensive indicator of labour productivity because it reflects changes in working patterns and includes the greatest precision about the amount of labour that has been used. For this reason, output per hour worked in taken as the headline measure in Scotland's Labour Productivity Statistics.

The output statistics used in the calculation of Scotland's labour productivity statistics are consistent with the latest GDP Quarterly National Accounts Scotland publication and labour input measures are consistent with the NUTS1 results for countries and regions in the latest Labour Productivity, UK – published by the Office for National Statistics (ONS).

What does Labour Productivity not cover?

Labour productivity relates output to the number of workers employed. It does not measure the specific contribution of labour alone. Rather, it reflects the joint effects of many factors, including new technology, capital investment, health and skills of workers and the use of more efficient management and production practices.

Key Quality Issues

Source data

Because labour productivity statistics are derived using simple calculations on other source statistics, their quality and accuracy is dependent on the component series used for output and labour inputs.

While there are some known issues with the consistency between GVA and labour market statistics due to factors including the different survey sources, workforce residency and commuting effects, and differing definitions of business unit classifications, the data sources used to produce the labour productivity estimates for Scotland are all individually recognised to be of high quality and are designated as such.

Onshore economy statistics

The GVA estimates for Scotland used for productivity are for the onshore economy only (identified as the NUTS1 region of the UK with code UKM). Comparisons with the UK average (Table D) are consistent with those for all NUTS1 regions and countries published in ONS Regional Accounts. These comparisons are made to 'onshore' UK GVA only (that is, UK excluding overseas and offshore activity classed as extra regio in UK regional accounts). The main reason for using only onshore output in analysis of UK countries and regions is that the labour inputs series associates all workers and hours with one of the 12 onshore countries and regions of the UK, and therefore there are no labour inputs directly associated with offshore activities.

Users should note that this introduces a potential bias to the onshore productivity estimates, given that a portion of the workforce is not counted against the output that they produce. For Scotland, and the UK total, this means that labour input series are larger than they might otherwise be, and therefore that reported productivity will be lower than if only the 'onshore' workforce was used in the calculation. The analysis of the scale of this effect and investigation of potential adjustments to mitigate it are included in the development plan for future productivity statistics releases.

Industry splits

There is a trade-off between the level of disaggregation and reliability of productivity estimates; productivity estimates for Scotland are published at a level of aggregation which ensures a sufficient level of quality. For industry breakdowns, this means that estimates are only published at an annual level, whereas whole economy estimates are published on a quarterly basis.

Measuring productivity growth

Productivity growth within an industry or country is often compared against a longer term average. Quarterly changes in labour productivity can be volatile and should be interpreted with caution, not least due to difficulties in ensuring consistency of seasonal adjustment between the numerator and denominator.

Introducing a trend-based measure of productivity growth

Many industries see significant changes in output and labour inputs at the same times each year. These regular annual patterns in output are known as seasonal factors, and can be due to a number of reasons including the weather, holidays, calendar effects (the number of business days in a given month or quarter) or production cycles.

For this reason, the economic output and labour input series are seasonally adjusted to allow for meaningful comparison between quarters without (for example) temporary seasonal workers at Christmas affecting the resulting labour productivity estimate.

Furthermore, quarterly estimates of hours worked are particular volatile due to statistical variance in the regional results of the Labour Force Survey which result in a similarly volatile labour productivity series. To aid interpretation of quarterly movements, trend series (the underlying movements after adjusting for seasonal and irregular components of the time series) of the unadjusted ONS productivity jobs and hours series are published and used to calculate what are defined in the statistical release as 'trend-based' productivity estimates. This is estimated as part of the X-12 ARIMA seasonal adjustment process, with the trend estimate defined as the D12 output from this procedure.

The resulting productivity series are much smoother and allow for more timely identification of short term change and turning points in the series. It should be noted, however, that the two most recent quarterly estimates are provisional and subject to potential revision in future releases.

Trend estimates of quarterly productivity jobs and hours are derived directly, rather than as a component of annual productivity jobs or hours. As a result the average of the four quarterly trend-based productivity jobs and hours series do not equal the annual total for the labour input series.

Summary of different measures of growth

Scotland's Labour Productivity publications and tables reference productivity growth figures in three alternative ways:

- **Annual growth**, also referred to as calendar year growth, is usually the headline measure of productivity growth and is calculated by comparing the latest calendar year and the previous calendar year.
- **Growth over the year**, also referred to as Q-on-4Q, compares the latest quarter to the same quarter in the previous year using the trend-based estimate of labour input. This growth rate is usually taken as the headline measure of quarterly labour productivity growth and is used for comparison with other economic measures for Scotland and the UK as a whole.
- **Quarterly growth**, also referred to as Q-on-Q, compares the most recent quarter to the previous quarter, using the using the trend-based estimate of labour input. This estimate allows for more timely identification of short term change and turning points in the series but as previously stated, is subject to revision when new data becomes available.

Medium- to long-term trends in productivity growth are usually measured by calculating the average annual growth rate over a larger number of years, with the onset of the recession often taken as a point of reference.

Differences between productivity in real terms and nominal terms

Headline Labour productivity statistics in Scotland are presented in real terms (where the effects of price changes have been removed).

Real terms productivity estimates and are used to analyse changes in the level of activity over time within a particular country or industry, or to compare growth rates between countries or industries on a consistent basis. Results are indexed to a reference year – currently set at 2007=100 in order to focus on movements since the onset of the recession in 2008.

Results presented in current prices (unadjusted for the effects of price changes) are used to make comparisons of the relative level (not growth rate) between countries or industries at a particular point in time.

International Comparisons

Internationally, the USA is used as a common benchmark for comparisons of productivity, with nominal productivity estimates indexed to USA=100 to show each country's productivity relative to that of the USA in that year.

Comparability across countries is achieved by using estimates of gross domestic product (GDP) and labour inputs from a common source (the OECD) and converting each local currency based measure of GDP using purchasing power parity (PPP) exchange rates.

GDP per hour worked is taken as the measure of labour productivity for international comparisons (rather than GVA per person) because the PPP conversion – which accounts for exchange rates and price differences between countries – is directly related to the country's GDP.

Results for Scotland are calculated using nominal GDP estimates published in GDP Quarterly National Accounts and estimates of total hours worked consistent with productivity hours for Scotland. The value in pounds sterling is converted into dollars using the UK PPP and then indexed to USA=100 as described above.

When interpreting movements in nominal productivity, i.e. a change in rank from one year to the next, it is important to note than an increase in Scotland's productivity relative to another country could be due to Scottish productivity growing faster, or falling less, or due to changes in relative prices or exchange rates between the two countries, or some combination of these movements.

Real terms measures of GDP per hour worked can be used to analyse within-country movements in labour productivity over time and enable a comparison of growth rates between countries.

Other productivity statistics for Scotland

Current price estimates for Scotland are produced to provide productivity statistics which are consistent with GDP Quarterly National Accounts and other economic statistics produced by the Scottish Government.

Alternative statistics are available from the Office for National Statistics which are consistent with the NUTS1 Gross Value Added (Balanced approach) produced for all countries and regions of the UK. ONS estimates of GVA differ from Scottish Government estimates because of adjustments made by the Scottish Government during the production of Supply and Use Tables which balance estimates of GVA using Production and Expenditure data sources as well as Income.

Estimates of labour productivity are derived directly from GVA statistics, and are often analysed alongside GVA and GDP. It is therefore important that productivity statistics should be used in context with the GVA data they are consistent with.

For users of Scottish Government GDP and Quarterly National Accounts statistics, the recommended productivity statistics are those in this release. Users of ONS Regional GVA statistics are recommended to continue using the ONS Regional Productivity statistics as a consistent product. Likewise, users who focus primarily on productivity statistics should ensure that any comparison to GVA or GDP makes reference to the consistent product.

Real terms productivity estimates show the evolution of productivity within a country or region, but should not be used to compare productivity levels across countries or regions at a point in time. Productivity growth can be decomposed into growth of output minus growth of prices and the growth of labour input, and these components can move in different directions within and across countries. This should be borne in mind in interpreting the real terms productivity estimates in this release.

Development programme for Scottish Labour Productivity Statistics

As part of the Scottish National Accounts Programme (SNAP), a work package has been investigating further development of productivity statistics for Scotland. This involves working closely with ONS, and is examining what data are available and how they can be used to extend the scope of existing statistics to better meet the needs of users.

Since their first release in 2014, Scottish Government labour productivity statistics have undergone the following developments:

- Productivity statistics, previously published annually with a 9 month lag, are now published quarterly one week after the release of GDP Quarterly National Accounts.
- These productivity statistics produced on a quarterly basis are based on labour input data available on the same basis as the annual figures.
- Estimates are now produced, on an experimental basis, of labour productivity for different industries as well as for the whole economy. These are based on labour input series which have been developed to be consistent with the whole economy data already available.

Planned and ongoing developments include:

- Continuing with the development of analysing additive decompositions of productivity growth by industry in order to facilitate a deeper understanding of what drives growth.
- Investigating whether the labour market source data can be used to produce output per worker and unit labour costs measures as well as jobs and hours.
- Ongoing development and quality assurance of the industry level labour input series.
- Investigating the treatment of offshore (extra-regio) GVA and offshore workers in existing labour market statistics and their impact on productivity estimates. UK whole economy productivity statistics include all offshore GVA and all offshore workers, but the situation is not as simple for sub-UK statistics including those for Scotland.

Some users have expressed interest in the development of estimates of Total Factor Productivity (also known as Multi-Factor Productivity) for Scotland, which takes account of changes in the composition of labour input and the utilisation of capital input to production as well as the labour input measured in Labour Productivity statistics. At present the required data on capital stocks, investment and depreciation are not available to allow such estimates to be produced for Scotland or other sub-UK areas, but the SNAP team plan to research opportunities for this in the future. Recent experimental estimates for the UK are published by ONS, with a fuller explanation of the definition of TFP and methodologies used in the article at:

https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/articles/multifactorproductivityestimates/experimentalestimatesto2015