BIS | **Department for Business Innovation & Skills**

BIS PRIVATE SECTOR EMPLOYMENT INDICATOR: USER GUIDE AND TECHNICAL ANNEX

Version 1.0

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Introduction

This document provides some background on the publication, outlines key methodologies used to compile the publication, and provides a guide to interpreting the results of the private sector employment indicator data. This is first draft which will be revised in future if a need arises. Any comments from users are welcome.
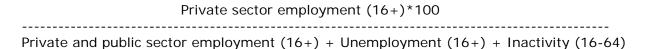
Overview of the publication

As part of the Departmental Business Plan to support the Government's agenda to rebalance the economy across sectors and regions, the Department for Business, Innovation and Skills (BIS) developed an indicator to monitor private sector employment growth in England. This indicator forms part of the performance framework for assessing the impact of the Department's policies and reforms. This indicator publication provides a timely indicator measuring whether, over time, dependency on the private sector for employment is increasing and how this rebalancing varies by region.

It is a quarterly publication, and covers England and nine English regions. However, to minimise distortions due to high levels of commuting between London, South East and East, changes in the indicator are monitored for two regional groups in England:

- London, South East and East
- Rest of England

Definition and Data sources

The indicator is defined as a share of private sector employment of population aged 16-64 plus those who are aged over 64 in the labour market. More specifically, it is calculated using the following formula:

$$\frac{\text{Private sector employment } (16+)*100}{\text{Private and public sector employment } (16+) + \text{Unemployment } (16+) + \text{Inactivity } (16\text{-}64)}$$

The publication draws on a mix of administrative and survey data. Regional Employment, Unemployment and Inactivity are based on the ONS quarterly Labour Force Survey (LFS). The source of public sector employment data is the National Statistics Public Sector Employment (PSE) series. This is published quarterly by ONS and the Scottish Government to provide employment estimates for national, English regions as well as each Devolved Administration. Both the private sector and public sector employment data are workplace based, providing a consistent basis for calculating the indicator.

Further information on the data sources can be found at the following websites:

Background note for the Indicator Statistical Bulletin:

http://www.bis.gov.uk/analysis/statistics/sub-national-statistics/private_sector_employment _indicator

ONS PSE Release:

http://www.ons.gov.uk/ons/guide-method/surveys/list-of-surveys/survey.html?survey=Quarterly+Public+Sector+Employment+Survey

ONS LFS Release:

http://www.ons.gov.uk/ons/guide-method/surveys/list-of-surveys/survey.html?survey=Labour+Force+Survey

How to identify significant changes

One of main uses of the publication is to allow for identifying any significant changes to the indicator. As the indicator has been derived from a survey, as well as administrative sources, changes in the indicator could be caused by variations between samples in the survey, so they may rise by chance rather than genuine differences between the indicators for two quarters.

BIS commissioned the ONS Methodology Advisory Service to develop a methodology to calculate the confidence intervals for the indicator. These estimates will enable BIS and other users to identify whether changes in the indicator are significant given sampling variances. A confidence interval (CI) is an interval for the estimate of a population parameter, indicating the reliability of the estimate. The detailed methodology for estimating the confidence intervals can be found in Annex 1.

Having obtained a 95% confidence interval (CI) for a change in the indicator between two quarters, we can identify a significant difference by checking whether the confidence interval contains zero. A change will be regarded as a significant one if the value zero does not fall in the interval.

As an example, suppose the indicator in the North East increased by 3.5 ppts in Q4 2011 compared to Q4 2010. With the method described in the Annex 1, we can work out the CI at 95% level for the indicator change in the North East region as (0.5ppts, 6.1ppts), where the lower limit = 3.5 – 2.6 = 0.5ppts, and the upper limit = 3.5 + 2.6 = 6.1ppts. As the CI doesn't contain a zero, the change in the indicator for the region compared to the same quarter a year ago is regarded as significant and shaded accordingly.

Caveats when interpreting results

Though efforts and care have been applied when developing the indicator, the method is still not perfect and has inherent limitations arising from underlying data sources and the definition:

- Falling public sector employment is one of the factors driving a rise in this indicator, and thus an increasing indicator does not necessarily reflect improved labour market conditions in all cases. Users should read the figures for indicators together with underlying components defining the indicator. The accompanying statistical

release also will explain the underlying causes for a change in the indicator, highlighting any caveats.

- Whether a change is significant is determined by the magnitude of the change and the underlying sampling variances. The latter is also affected by the sample size. An area like England tends to have a large sample, leading to a relatively small sample variation compared to regions like North England. So a small change in a large region is more likely to be identified as significant compared to a region with a small sample size.

Annex 1 Estimating confidence intervals

Confidence intervals have been estimated for the regional indicators for the current quarter as well as for their changes compared to the same quarter a year ago. The confidence level, usually at 95%, implies that if we repeat the sampling and estimation many times and calculate confidence intervals 95% of the intervals will contain the true value of the indicator.

For each set of estimates, the standard error δ (the square root of the variance) is calculated, and then the 95% confidence interval CI for the indicator $\hat{Q}$ is derived as follows:

$$(\hat{Q} - 1.96\frac{\delta}{n}, \quad \hat{Q} + 1.96\frac{\delta}{n})$$

The estimation of variances of the indicator follows a method used in Holmes and Skinner (2000)[1].

Given an indicator:

$$\hat{Q} = \frac{\hat{T}_{priv}}{\hat{T}_{priv} + \hat{T}_{unemp} + \hat{T}_{inact} + T_{pub}} = \frac{\hat{T}_{emp} - T_{pub}}{\hat{T}_{emp} + \hat{T}_{unemp} + \hat{T}_{inact}} = \frac{\hat{Y}_R}{\hat{V}_R}$$

Each regional estimate of private sector employment, $\hat{T}_{priv}$, is derived by subtracting the fixed public sector total for that region, T_{pub}, from the Labour Force Survey (LFS) estimates of employment in this region, $\hat{T}_{emp}$. $\hat{T}_{unemp}$ and $\hat{T}_{inact}$ refer respectively to LFS estimates of the regional unemployed, aged 16 and over, and the regional inactive, aged 16 to 64, and both of these are based on region of residence.

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[1] Variance Estimation for Labour Force Survey Estimates of Level and Change, Holmes and Skinner (2000), GSS Methodology Series no. 21. Available from http://www.ons.gov.uk/ons/guide-method/method-quality/specific/gss-methodology-series/index.html

The denominator here looks at first glance to be a fixed quantity since LFS definitions ensure that everyone is either employed, unemployed or inactive and the LFS is calibrated to fixed population totals. However, there are random departures from that fixed total coming from excluding residents employed outside the region, including non-residents employed within the region and excluding those 65 and over who are inactive.

To estimate the variance of this estimate, derived variables have been created for each individual, k:

$$y_k = I_{emp,k} - T_{pub} / \hat{V}$$

$$v_k = I_{emp,k} + I_{unemp,k} + I_{inact,k}$$

Where the I's are indicator variables and $\hat{V}$ is the weighted sum of the denominator, which is the fixed population total for the region. These variables have the property that their weighted sums over the sample included in the denominator are equal to the numerator and denominator of the required indicator.

Then the standard ONS programs are used for estimating variances of a ratio with the above two derived variables. The program deploys a variance estimation method described as jackknife linearization variance estimator, as described in Skinner and Holmes (2000). The details of the method can be found in Skinner and Holmes (2000)

For the variance of a change, an approximation is applied such that the denominator of the indicator is close to a fixed quantity. The impact of this approximation was investigated by applying it to the variance of level calculation for the indicator and it was found that the resulting values overstated the values from the above calculation by between three and 15%. We assume that when applied to variance of change, estimates will also tend to overstate the variance. This would lead to fewer significant changes to be identified.

So the variance of change between one quarter (Q1) and the same quarter a year ago (Q2) in the indicator can be derived as:

$$\text{var}(\hat{Q}_2 - \hat{Q}_1) = \text{var}\left(\frac{\hat{T}_{emp,2}}{\hat{V}_2} - \frac{\hat{T}_{emp,1}}{\hat{V}_1} \right)$$

$$\approx \frac{\text{var}(\hat{T}_{emp,2})}{\hat{V}_2^2} + \frac{\text{var}(\hat{T}_{emp,1})}{\hat{V}_1^2} - 2\frac{\text{cov}(\hat{T}_{emp,2}, \hat{T}_{emp,1})}{\hat{V}_2 \hat{V}_1}$$

The covariance estimates are approximated as follows:

$$\text{cov}(\hat{T}_{emp,2}, \hat{T}_{emp,1}) = \rho_{12}\sqrt{\text{var}(\hat{T}_{emp,1})\,\text{var}(\hat{T}_{emp,2})}$$

Where ρ_{12} is a correlation coefficient equal to ONS estimates for correlation of total employment between a quarters and the same quarter a year ago. These correlations have been shown to be stable over time for total employment and will only be updated when ONS updates them for its LFS estimates.