Office for National Statistics

Article

Human capital estimates: 2015

Estimates of national and regional human capital in the UK from 2004 to 2015.

Contact:
Dominic Webber
economic.wellbeing@ons.gsi.gov.uk

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1. Main points

The value of employed human capital in the UK was £19.23 trillion in 2015 – an increase of £0.89 trillion (4.8%) from 2014 – surpassing its pre-economic downturn peak for the first time. However, the per head measure remains below pre-downturn levels.

In 2015, the average employed human capital stock per head of working age population was £471,000 – an increase of £18,000 (3.9%) from 2014.

In 2015, on average, an individual with a degree or equivalent had human capital stock worth £628,000. In comparison, the average employed human capital stock for those with no qualifications was £274,000.

London residents accounted for 14.3% of the total UK working-age population and 19.5% of the total employed human capital stock in 2015. When looking at those working in London, it accounts for 23.3% of the UK total.

In 2015, residents of Northern Ireland accounted for 2.1% of the UK employed human capital stock.

2. What is human capital?

Human capital is a measure of the “knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being” (Organisation for Economic Co-operation and Development, 2001).

At a whole economy level, we can also consider the contribution of human capital to economic output. Growth in an economy can be driven by increases or improvements in either:

- land – the natural resources that we have at our disposal, for example, coal, wood
- labour – our workforce
- capital – the buildings and machines we use to produce goods and services

In this context, human capital refers to labour and captures both the number of people in the workforce and the abilities they bring with them.

3. Why measure human capital?

Human capital and well-being

Human capital is important because of its positive contribution to a range of well-being aspects relevant to policy-makers and researchers.

Firstly, it has been shown that individuals' labour market outcomes are linked to their human capital. In general, individuals with low skills or levels of education are more likely to be unemployed and face social exclusion. Unemployment can have a negative impact on an individual's well-being. In 2014, the Office for National Statistics (ONS) found that unemployed people rated their life satisfaction significantly lower on average than employed people. The average life satisfaction of unemployed people was 6.7 out of 10 compared with 7.6 for employed people. In addition, higher human capital (in particular educational attainment) is associated with higher earnings. Earnings have been found to be related with life satisfaction and happiness. ONS (2014) finds, "those in households with higher incomes report higher life satisfaction and happiness, and lower anxiety on average".

It has also been shown that the distribution of human capital is important for equality. For example, part of the observed pay gap between men and women is related to men gaining higher levels of human capital (it has been suggested that this is a result of women, on average, having a weaker attachment to the labour market and therefore having less incentive to acquire human capital) (Polachek, 2014). Inequality might also persist over time as educational attainments of children are related to the educational attainment of their family, particularly their parents.

Finally, human capital can also have social impacts, in particular, improved health outcomes, lower crime rates and higher rates of trust and social participation.

Human capital and the economy

Human capital is also recognised as having important economic impacts. Empirical work on economic growth suggests that countries with higher levels of human capital, other things being equal, have greater potential output and income in the future. The measures can also be used in the assessment of the impact of an ageing population, changes in retirement ages and in the evaluation of the economic benefits of different levels of education.

Human capital and sustainability

Human capital is also an important aspect of sustainability. Sustainability is seen as, "what we leave to future generations; whether we leave enough resources, of all kinds, to provide them with the opportunities at least as large as the ones we have had ourselves" (UN, 2012). The capitals approach states that economic, natural, human and social capitals are all resources that matter for the present and future well-being of individuals. This was highlighted in the report by the Commission of the Measurement of Economic Performance and Social Progress (Stiglitz et al., 2009).

4. How we measure human capital

Earnings are considered to reflect human capital as it is expected that people with more valuable attributes, such as higher qualification levels, skills and abilities will earn more in the labour market. Social attributes, personality and health attributes are also reflected in wage rates. For these reasons, human capital is measured in monetary terms as the total potential future earnings of the working age population.

The following estimates are subject to a number of assumptions that affect their final value: the labour productivity rate growth rate (2%), discount rate (3.5%) and age of retirement (64). The effect that these assumptions have on the final estimate can be found in the sensitivity analysis in Annex 1. Full information on data sources and methodology (including the rationale behind any assumptions) can be found in the measuring human capital methodology document.

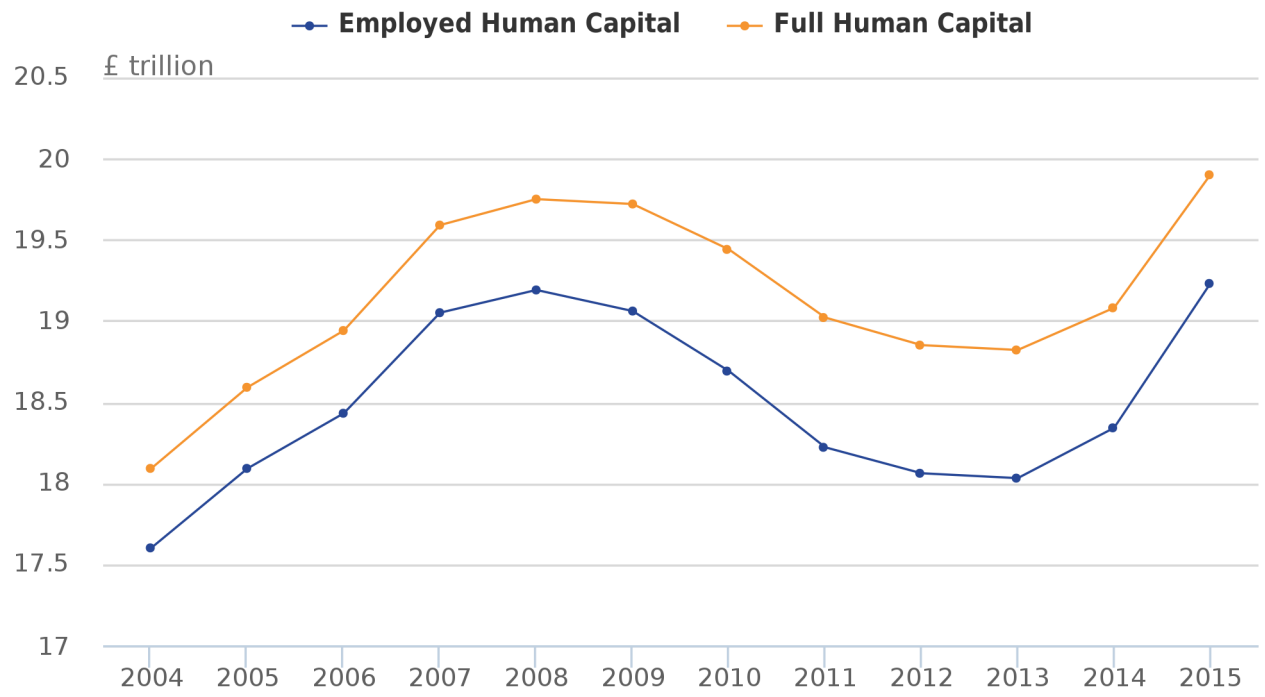
We measure "full" human capital, which captures the human capital of the employed and the unemployed. This is calculated by imputing earnings for unemployed people based on incomes of similar employed people (in terms of age, sex, and highest qualification).

Finally, this publication presents regional estimates of employed and full human capital for the first time. A guide to the regional methodology can be found in the quality and methodology section of this publication.

5. The value of human capital

Figure 1: Employed and full human capital, 2004 to 2015

UK



Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capitall estimates the total human capital stock of the employed population of working age (16 to 64) .

2. Full human capitalestimates the total human capital stock of the employed and unemployed population of working age (16 to 64), assuming the unemployed are employed.

3. Figures in 2015 prices, deflated using the Consumer Price Index (CPI).

4. Labour productivity growth rate = 2%.

5. Discount rate = 3.5%.

In 2015, the value of employed human capital was £19.23 trillion, an increase of 4.8% compared with 2014. This meant that employed human capital surpassed its pre-economic downturn peak for the first time – it was 0.2% above the £19.19 trillion recorded in 2008 – and at its highest level since records began in 2004.

There are 3 main factors which are taken into account when valuing human capital and help to explain the 4.8% growth in employed human capital in 2015. First, average weekly earnings, after adjusting for inflation, increased by 2.3% in 2015 compared with 2014. This perhaps reflected an increase in the overall skill level of workers – measured through qualifications. The proportion of the population with a degree or equivalent increased from 27.0% to 28.0% compared with those who had no formal qualifications, falling from 9.0% to 8.8%. Secondly, the employment rate of those aged 16 to 64 increased by 0.8 percentage points to 73.7% in 2015. Finally, the employed population aged 16 to 64 grew 2.1% between 2014 and 2015.

Looking at the historical context, Figure 1 shows the effect of the economic downturn on the UK's employed human capital stock. Between 2004 and 2007, the value of the UK's employed human capital stock increased steadily, at an average of 2.7% per year. This was driven by an increase in both the employed working-age population (16 to 64) and earnings over this period. Average real weekly earnings increased by an average annual growth rate of 2.4% between 2004 and 2007. Growth in employed human capital slowed into 2008 (0.7%) before falling slightly in 2009, beginning to reflect the effect of the economic downturn on the UK's human capital stock. In 2010, the employment rate for those aged 16 to 64 fell 0.5 percentage points compared with 2009. This, alongside falls in real earnings – which fell 0.8% between 2009 and 2010 and 1.9% between 2010 and 2011 – contributed to further falls in the value of the UK's human capital stock in 2010 and 2011 (of 1.9% and 2.5% respectively). Following these falls, the value of the UK's human capital stock began to stabilise in 2012 and 2013, before rising in 2014 and 2015.

Figure 1 compares employed human capital with full human capital – a measure which includes both the employed and unemployed. The gap between employed and full human capital provides an indication of the amount of human resource which could be deployed in order to increase economic output. In 2015, the value of the UK's full human capital stock was £19.90 trillion, an increase of £0.83 trillion from 2014. Between 2008 and 2011, the gap between full and employed human capital increased from 2.9% to 4.2%. This reflects the impact of the unemployment rate (for those aged 16 and over) increasing from 5.7% to 8.1% over the same period. More recently, with a recovery in the employment rate, the gap between employed and full human capital has declined – in 2015 it was £0.67 trillion (3.4%), slightly less than the £0.73 trillion (3.8%) in 2014.

Figure 2: Employed and full human capital per head (working-age population), 2004 to 2015

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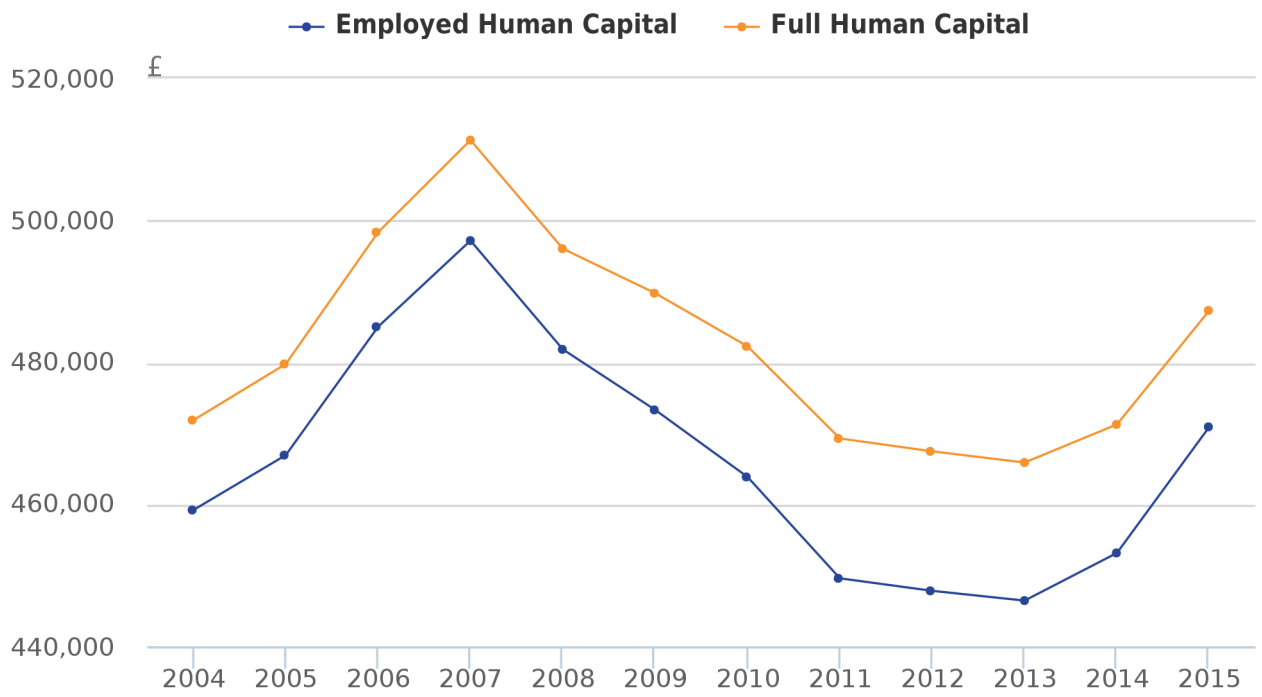

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64).
2. Full human capital estimates the total human capital stock of the employed and unemployed population of working age (16 to 64), assuming the unemployed are employed.
3. Figures in 2015 prices, deflated using the Consumer Price Index (CPI).
4. Per head estimates were calculated using information on the working age population from the Annual Population Survey.
5. Labour productivity growth rate = 2%.
6. Discount rate = 3.5%.

As the total value of the UK's human capital will naturally increase over time as a result of increasing population, Figure 2 reports the value of human capital per head of the working-age population on both a full and employed basis.

In 2015, the average employed human capital stock per head of working-age population was £471,000, an increase of £18,000 (3.9%) on 2014. This is a result of the value of human capital growing at a faster rate than the size of the working-age population. However, unlike total human capital, employed human capital per head is still 5.3% below the peak in 2007 recorded prior to the economic downturn.

Similar to the total stock, there was a steady accumulation of human capital per head between 2004 and 2007. Between 2008 and 2013, the per-head figure began to decline, although at a slower rate in 2012 and 2013, before increasing in both 2014 and 2015.

6. The distribution of human capital

This section considers the distribution of employed human capital in 2015 by highest qualification, age and sex.

Figure 3: Employed human capital by highest qualification, 2015

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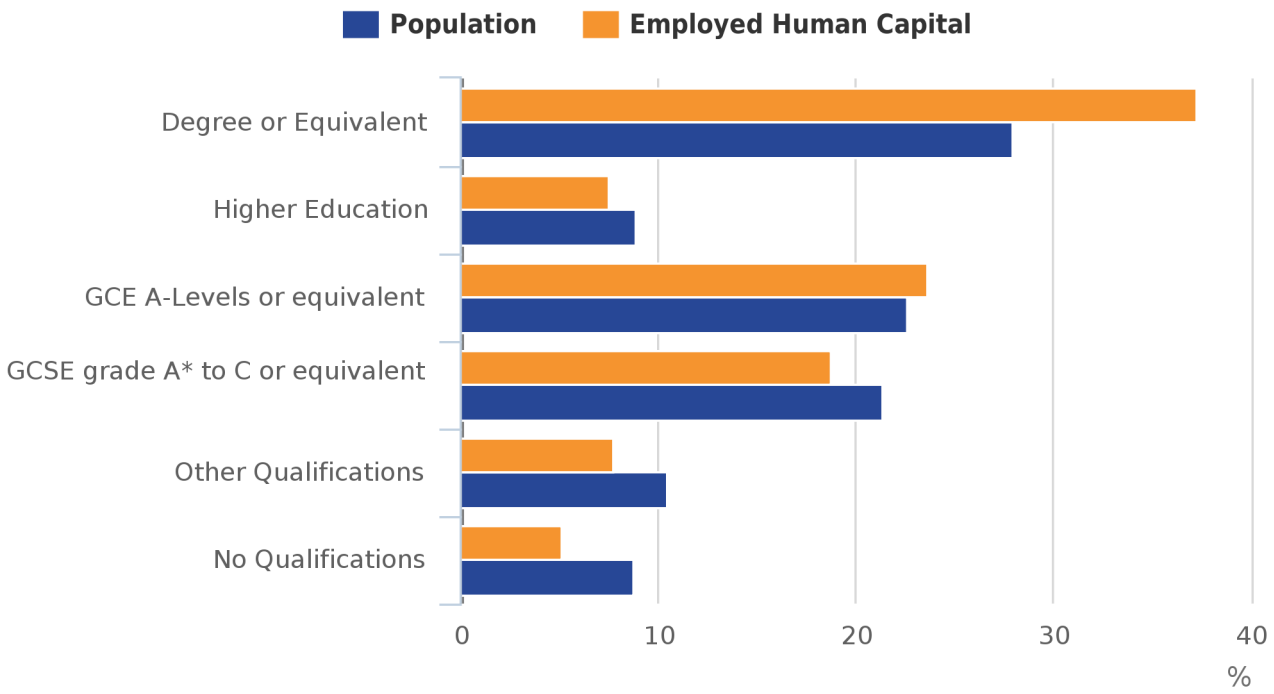

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64).
2. Components may not sum to total due to rounding.
3. Labour productivity growth rate = 2%.
4. Discount rate = 3.5%.

Figure 3 shows the effect of qualifications on the distribution of human capital. Overall, it shows the variation between the proportion of total employed human capital by qualification and the proportion of the population who hold that qualification. In 2015, a total of 37.3% of the human capital stock was embodied in the 28.0% of the working population whose highest educational attainment was a degree or equivalent. In contrast, only 5.1% of the UK's human capital stock was embodied in the 8.8% of the working-age population who have no formal qualifications.

Figure 4: Employed human capital per head by highest qualification, 2015

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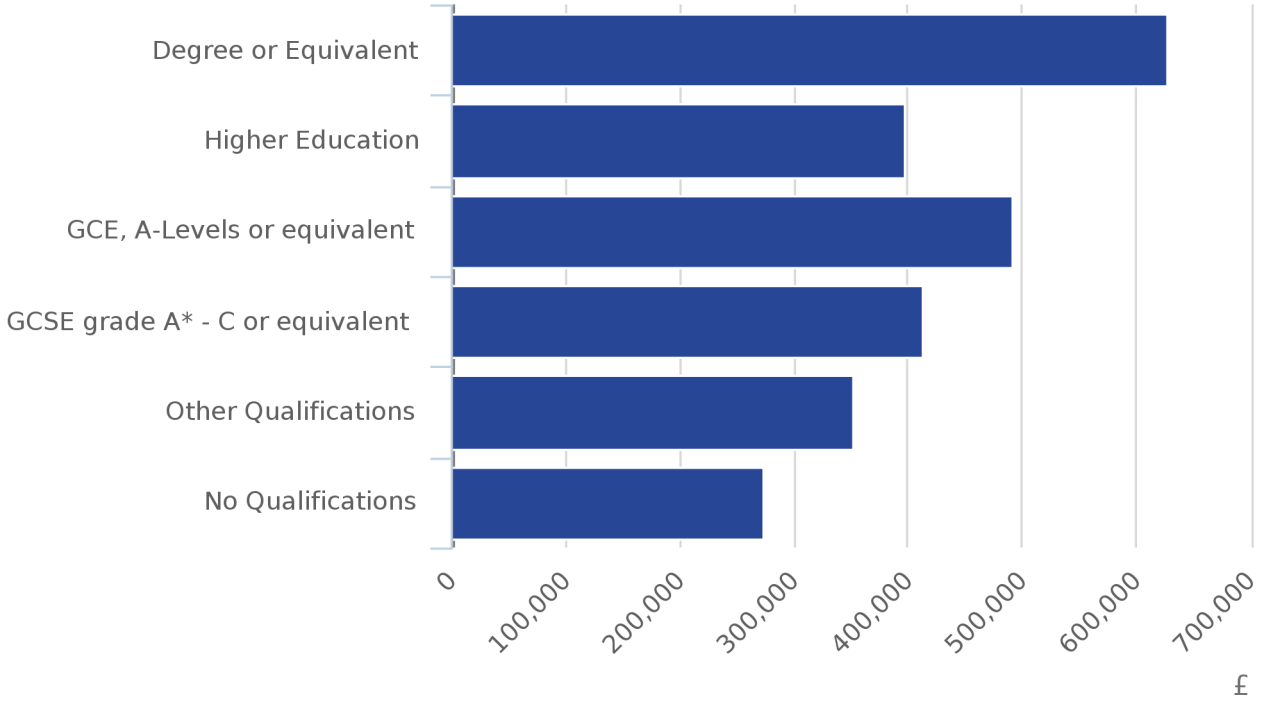

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64).
2. Per head estimates were calculated using information on the working age population from the Annual Population Survey.
3. Labour productivity growth rate = 2%.
4. Discount rate = 3.5%.

Figure 4 compares employed human capital per person by qualification. In 2015, on average, those with a degree or equivalent had human capital worth £628,000, which was £136,000 more than those with a highest qualification of GCE A-Levels or equivalent (£492,000 per head). In comparison, the average employed human capital stock for those with no qualifications was £274,000.

The employed human capital stock of those whose highest qualification was “higher education” was £398,000. Despite this being recognised as a higher education level than GCE A-Levels or equivalent and GCSE grades A*to C or equivalent, reflected by higher earnings on average, those in this category had lower employed human capital. This is due to the fact that those with “higher education” have a higher average age. As human capital is measured using a lifetime labour income approach (see the methodology document for further information), younger individuals will likely have a higher human capital as they have more years left to work.

Figure 5: Employed human capital by age group, 2015

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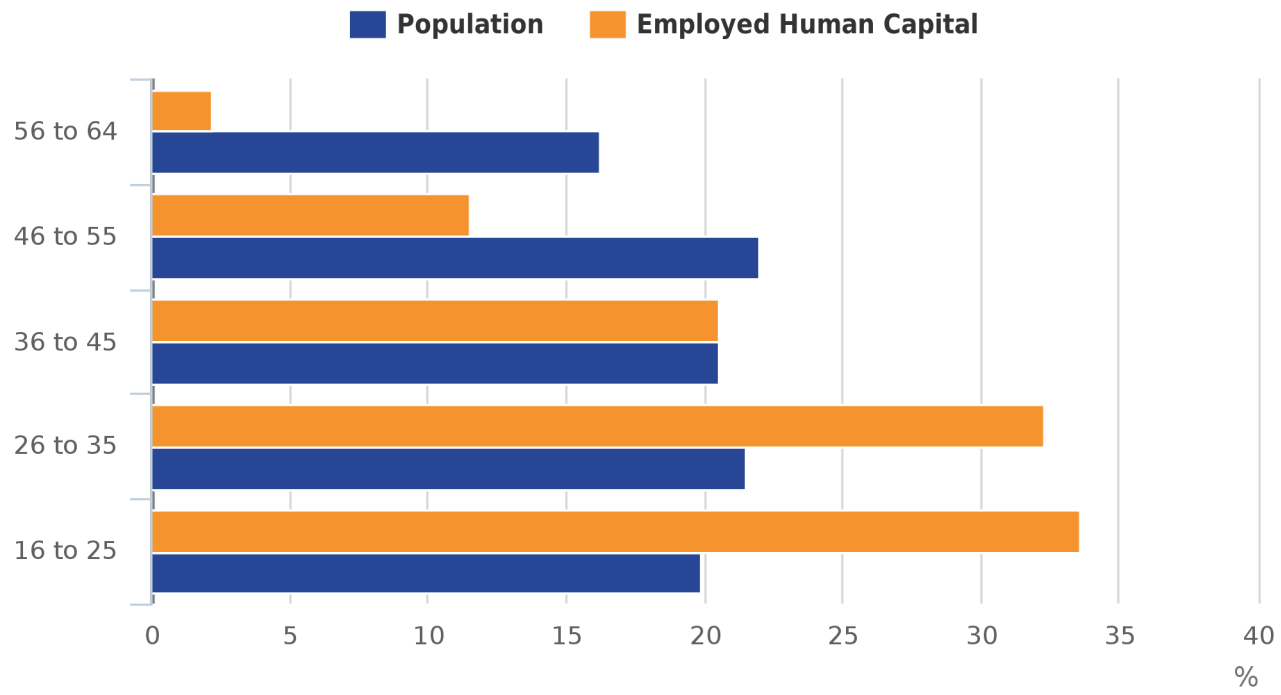


Source: Annual Population Survey (APS) - Office National Statistics

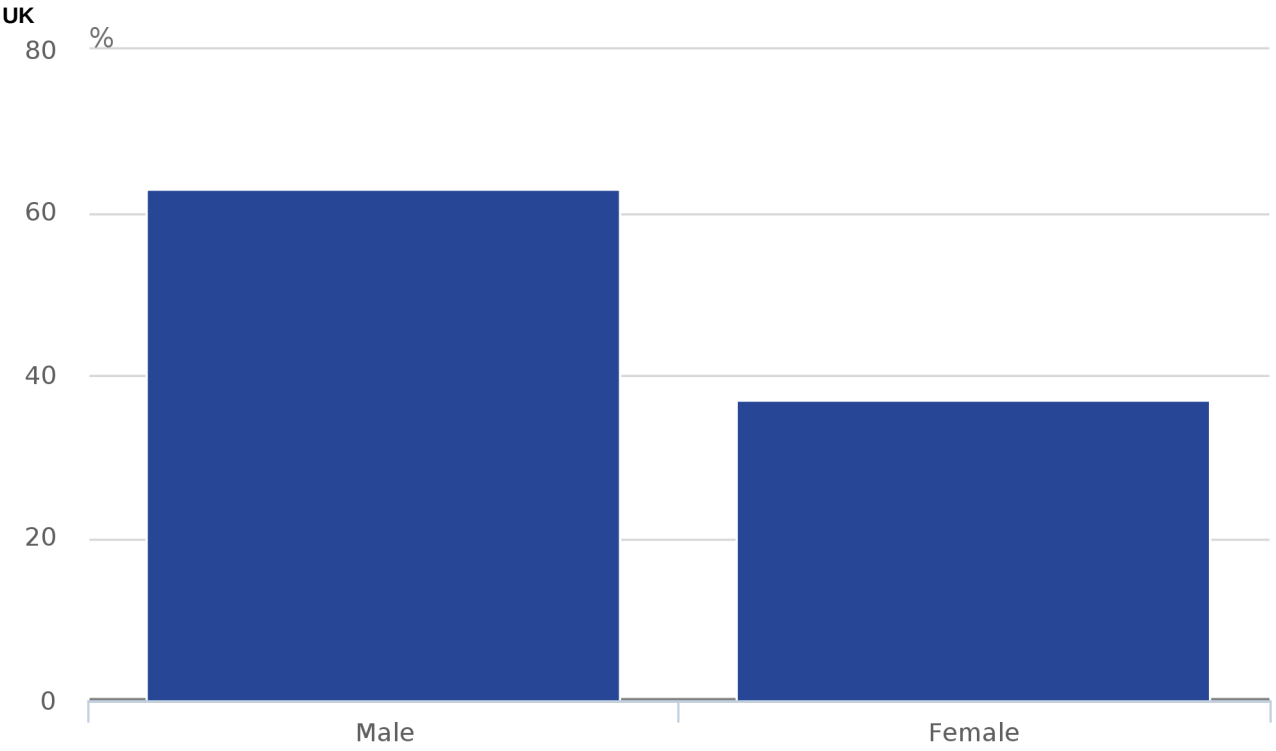
Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64) .
2. Components may not sum to total due to rounding.
3. Labour productivity growth rate = 2%.
4. Discount rate = 3.5%.

Figure 5 shows, for each age category, the proportion of the population and proportion of employed human capital in 2015. The stock of human capital is disproportionately concentrated in younger workers – 41.3% of the working-age population are aged between 16 and 35 but this group embodies 65.8% of the human capital stock. This shows that the longer remaining working life of younger age groups more than offsets their lower earnings.

Figure 6: Employed human capital by sex, 2015

UK



Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed Human Capital estimates the total human capital stock of the employed population of working age (16 to 64)
2. The working age population is taken from the Annual Population Survey.
3. Components may not sum to total due to rounding.
4. Labour productivity growth rate = 2%.
5. Discount rate = 3.5%.

Figure 6 shows that despite accounting for similar proportions of the working age population, males embodied 62.9% of human capital compared with females who embodied 37.1%. This reflects both high employment rates and earnings of men compared with women.

7. Regional human capital estimates

This section highlights the value of human capital levels at the regional level. This is the first time that we have published information on human capital at the regional level. More information on the regional human capital methodology can be found in the quality and methodology section and we welcome any feedback on both the methodology and results presented here.

Figure 7: Regional employed and full human capital, 2015

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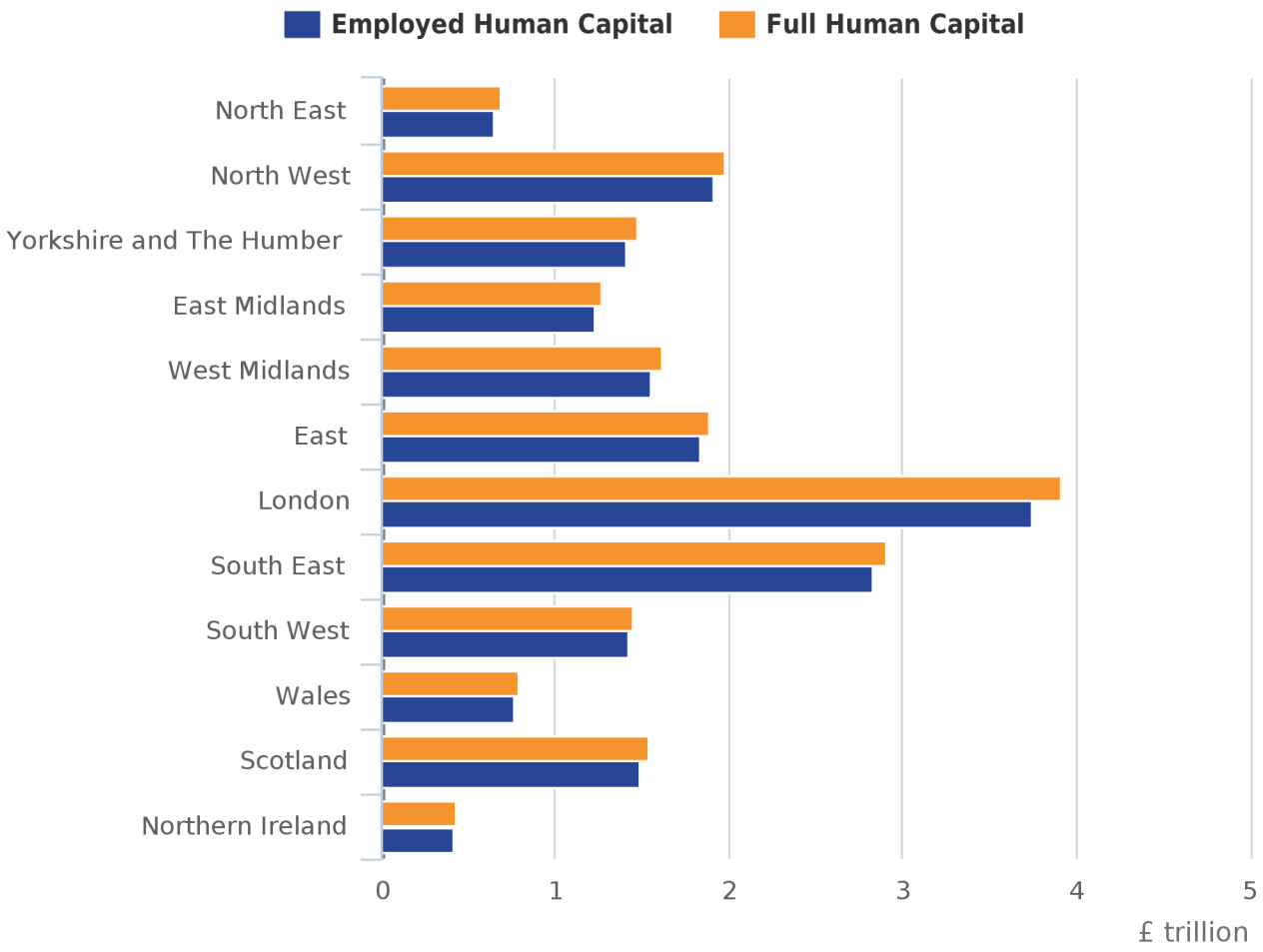


Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64).

2. Full human capital estimates the total human capital stock of the employed and unemployed population of working age (16 to 64), assuming the unemployed are employed.

3. Labour productivity growth rate = 2%.

4. Discount rate = 3.5%.

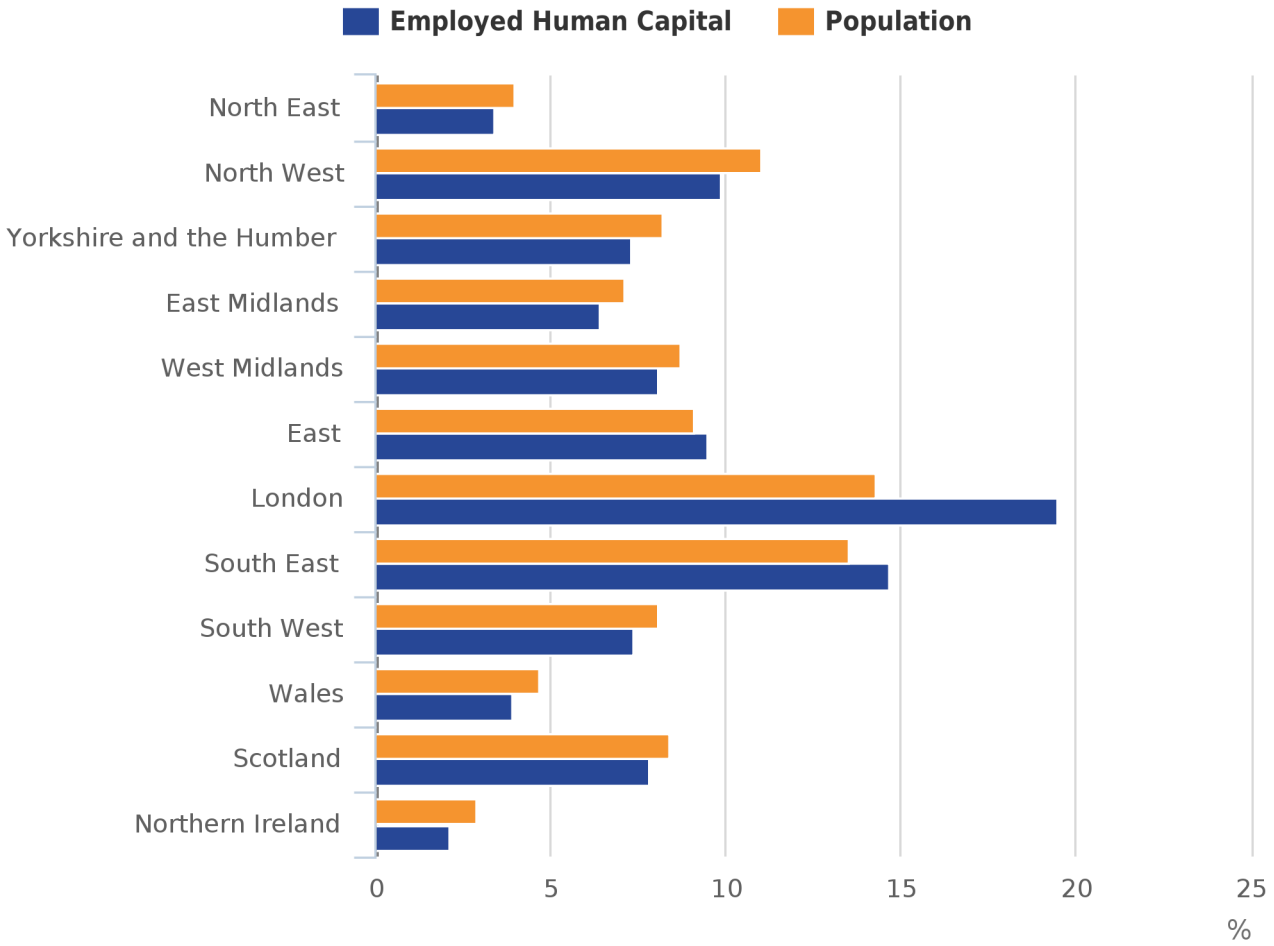
Figure 7 shows the breakdown of UK human capital by English region and UK constituent countries in 2015. London accounted for the largest proportion of employed human capital in the UK, possessing almost one-fifth (19.5%), followed by the South East (14.7%). In comparison, the North East and Northern Ireland had the smallest proportion of total employed human capital, at 3.4% and 2.1% respectively.

Comparing estimates of employed human capital with full human capital provides a measure of potential spare capacity within a region. Despite London having the most human capital, it had the second largest gap between employed and full human capital (4.1%). The only region with a larger gap between employed and full human capital was the North East (4.2%). The South West (2.6%) had the smallest gap between employed and full human capital followed by the East of England (2.8%) and the South East (2.9%).

This gap between employed and full human capital can possibly be explained by regional unemployment rates (for those aged 16 and over). The North East and London had the largest gaps between employed and full human capital in 2015 and are the regions with highest and third highest regional unemployment rates, 7.7% and 6.1% respectively. Likewise the smallest gap seen in the South West was reflected by the lowest regional unemployment rate, at 2.8%.

Figure 8: Distribution of population and human capital by region, 2015

UK



Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64).
2. Components may not sum to total due to rounding.
3. Labour productivity growth rate = 2%.
4. Discount rate = 3.5%.

Figure 8 highlights the distribution of the population and employed human capital by English region and UK constituent countries in 2015. While London accounted for 14.3% of the total working-age population, it held 19.5% of the total UK-employed human capital stock. The South East and the East of England were the only other regions in which the proportion of UK-employed human capital was greater than the proportion of UK population – differences of 1.3 and 0.4 percentage points respectively.

In comparison, the proportion of the working age population living in the North West (11.0%) was 1.1 percentage points more than its proportion of UK human capital (9.9%). Finally, Northern Ireland accounted for the smallest proportion of both UK human capital (2.1%) and population (2.9%).

Regional differences in employed human capital estimates reflect a number of factors. First, London had a younger workforce – 47.8% of the working population were aged 16 to 35 in 2015 – higher than any other region. All things being equal, a younger workforce has higher human capital due to increased years of earning compared with older workers. Second, there was regional variation in earnings – London, which had the highest employed human capital in 2015, had the highest median gross weekly earnings at £528.90 a week, followed by the South East at £467.90 a week. In comparison, the region with the lowest employed human capital stock, Northern Ireland, had the lowest median gross weekly earnings (£382.40 a week).

These estimates of regional human capital presented so far are based on where an individual works rather than their region of residence. Figure 9 presents human capital on both measures.

Figure 9: Regional employed human capital by region of work and region of residence, 2015

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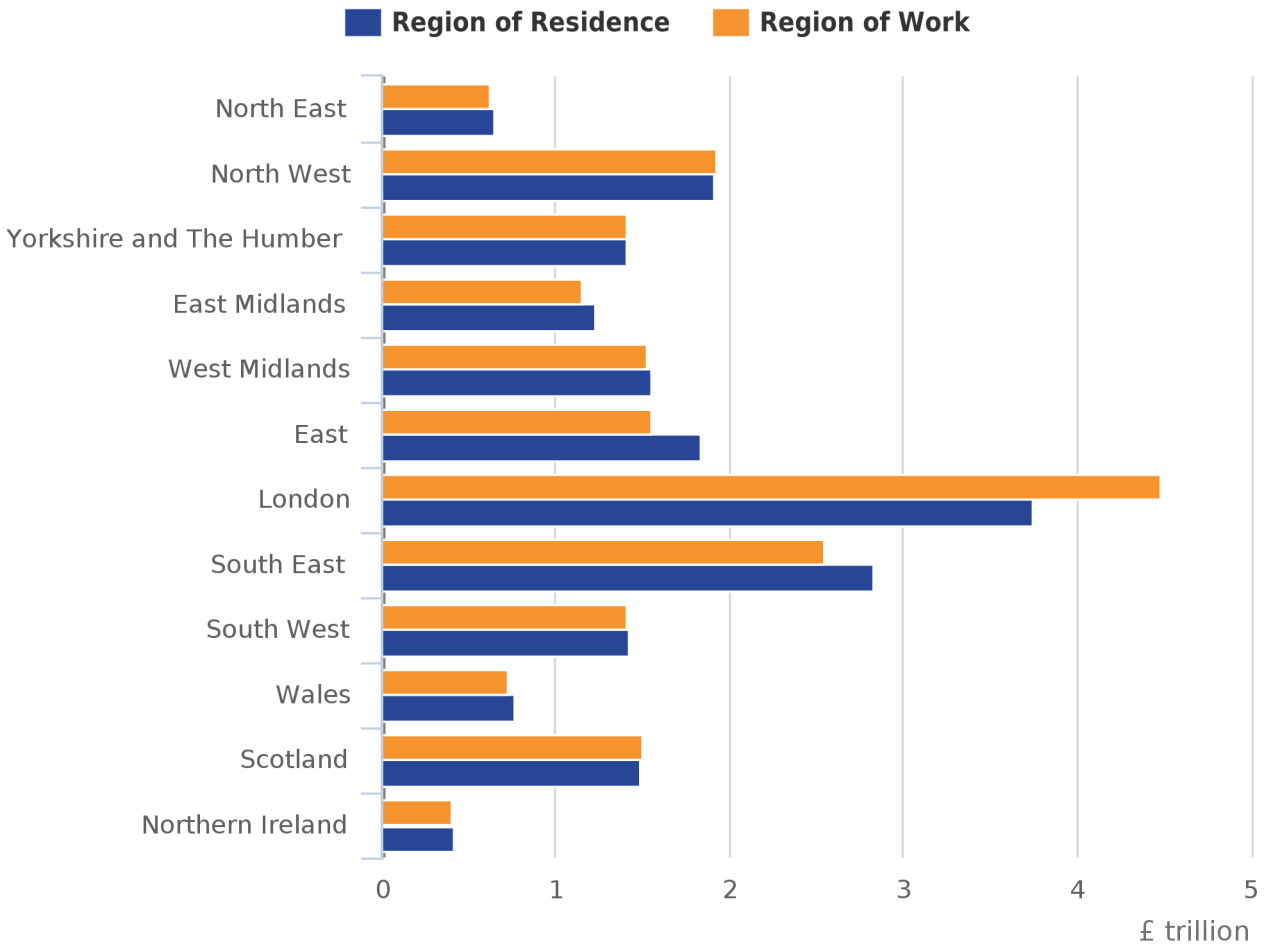

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Employed human capital estimates the total human capital stock of the employed population of working age (16 to 64).

2. Labour productivity growth rate = 2%.

3. Discount rate = 3.5%.

The impact of measuring human capital by region of work compared to region of residence is greatest in London – the total human capital increased by 19.6%, a rise of £0.73 trillion. This highlights the large net flow of workers who live in surrounding regions and commute into London. In comparison, the South East, the second largest region in terms of total human capital value, decreased by 10.4%. Scotland and the North West (both 0.4%) were the only other regions with a net increase to human capital by measuring in terms of region of work instead of region of residence.

8. Revisions

This edition of human capital estimates has minor revisions to some of the back series. In general revisions can be attributed to revisions in the reweighting of the Labour Force Survey (LFS) and Annual Population Survey (APS) datasets.

Table 1: Revisions to employed human capital (£ trillions), UK, 2004 to 2014

2015 Prices

Year	Previously Published	Current Estimate	Revision
2004	£17.58	£17.60	-0.0
2005	£18.17	£18.09	0.1
2006	£18.42	£18.43	-0.0
2007	£18.98	£19.05	-0.1
2008	£19.00	£19.19	-0.2
2009	£18.87	£19.06	-0.2
2010	£18.52	£18.69	-0.2
2011	£18.07	£18.22	-0.2
2012	£18.02	£18.06	-0.0
2013	£17.99	£18.03	-0.0
2014	£18.22	£18.34	-0.1

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Labour productivity growth rate = 2%

2. Discount rate = 3.5%

3. Figures in 2015 prices, deflated using the Consumer Price Index (CPI)

Table 2: Revisions to full human capital (£ trillions), UK, 2004 to 2014

		2015 Prices	
Year	Previously Published	Current Estimate	Revision
2004	£18.06	£18.09	-0.0
2005	£18.66	£18.59	0.1
2006	£18.92	£18.94	-0.0
2007	£19.51	£19.59	-0.1
2008	£19.56	£19.75	-0.2
2009	£19.53	£19.72	-0.2
2010	£19.25	£19.44	-0.2
2011	£18.86	£19.02	-0.2
2012	£18.81	£18.85	-0.0
2013	£18.78	£18.82	-0.0
2014	£18.96	£19.08	-0.1

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Labour productivity growth rate = 2%

2. Discount rate = 3.5%

3. Figures in 2015 prices, deflated using the Consumer Price Index (CPI)

9. References

Fender (2013) Human Capital Estimates 2013

Jones and Fender (2011) Human Capital Estimates 2010

Organisation for Economic Cooperation and Development (OECD). (2001) The well-being of nations: the role of human and social capital. OECD, Paris

Office for National Statistics (2012) Consultation on the Measures of Human Capital

Office for National Statistics (2014) Income, Expenditure and Personal Well-being, 2011/12

Office for National Statistics (2014) Has personal well-being improved for people in and out of work

Office for National Statistics (2015a) Labour Market Statistics – August 2015

Office for National Statistics (2015b) Consumer Price Inflation – July 2015

Polachek (2014) The Gender Pay Gap Across Countries: A Human Capital Approach

Stiglitz et al. (2009) Report by the Commission on the Measurement of Economic Performance and Social Progress

10. Quality and methodology

Full information on data sources and methodology (including the rationale behind any assumptions) can be found in the measuring human capital methodology document.

Methodology for regional estimates of human capitial

Introduction

In April 2013, the Office for National Statistics (ONS) published its response to the public consultation on measures of human capital. The consultation identified that there was demand from users to produce regional estimates of human capital. This release publishes regional estimates of human capital for the first time. The methodology section outlines the approach that we adopted, discussing the main changes from the methodology for measuring national human capital.

Methods of estimation

We considered 2 main methods for producing estimates of human capital at the regional level.

Option 1: Apply national lifetime labour income estimates to the regional population distribution

Option 1 entails simply estimating human capital in a “top-down” approach. This involves using the national level estimates and then apportioning to the regions, using information on age, sex and qualification. Therefore, under Option 1, the human capital of a female aged 32 with a degree estimated at the national level, would be assigned to people with similar characteristics at each regional level. The main benefits of this option are that it produces regional estimates of human capital which take population size, age, sex and highest qualification into account.

However, this option this would not reflect some of the other differences which are used to value human capital, in particular, it is expected that there will be difference across regions in terms of:

- income – used to value human capital
- employment rates
- transition rates – expressed as the probability that an individual will increase their highest qualification level
- mortality rates

Option 2: Creating regional estimates of lifetime lLabour income

Option 2 involves estimating human capital using a “bottom-up“ approach. Essentially it involves estimating human capital at the regional level using only information from that region. It provides an estimate of human capital that not only reflects the population size, the distribution of the population (by age, sex and highest qualification) within the region, but also regional levels of income, transition rates, employment rates and mortality rates.

Due to this increased level of detail, this is the methodology that we have adopted.

Detailed methodology

Under Option 2, regional human capital estimates are produced using the same approach as the national estimates – the output or income based approach. The main sources of data used in the analysis continue to be the Annual Population Survey (APS), which is an annual version of the Labour Force Survey (LFS) and the longitudinal LFS. A regional variable, based on region of residence, is obtained from the APS. This allows the regional estimation of number of people, earnings (when employed) and enrolment rates for different levels of education. Survival rates, by age, are sourced from ONS mortality, but are only available at the UK country level (England, Wales, Scotland and Northern Ireland). In the publication we also provide estimates of employed regional human capital by region of work, rather than region of residence, available from the APS.

One of the concerns with creating regional estimates of lifetime labour income was the sample size, as there are fewer observations of individuals when grouped into age, sex and highest qualification level categories at the regional level. Therefore, to increase sample sizes, individuals were grouped into age bands. We examined the impact of using age bands of 5 years (20 to 24, 25 to 29 and so on) and 10 years. One feature of age bands of 10 years is that they provide very few categories without observations. However, the distortions in variables, such as income, within 10 year age bands, were large, and would potentially produce inaccurate estimates. For this reason regional samples were grouped into 5 year age bands starting with 16 to 19 (the first category comprises 4 years) through to 60 to 64.

Estimating lifetime labour income involves a process of backwards recursion – the lifetime labour income of a person aged 64 (that is, one year before assumed default retirement) is simply their current labour income because their lifetime labour income at 65 is zero by construction. Similarly, the lifetime labour income of a person aged 63 is equal to their labour income plus the present value of the lifetime labour income of a person aged 64 and so forth. In the regional methodology, 2 approaches were considered for the recursion. The first involves grouping ages into 5-year age bands, taking average income and employment rates for each age group and calculating lifetime labour income as the result of a maximum of 9 recursive steps. The second approach involves imputing age-band averages onto every age within an age group. The recursion is run on every age – resulting in a maximum of 48 recursive steps. Our analysis indicates that the first approach overestimates the national figure, while the second underestimates. However, the magnitude of the difference was much smaller when implementing the maximum of 48 recursive steps method. As a result, this approach was chosen.

However, one drawback of this approach is to create a distorted age-income profile with only 9 different levels of income for 48 age-years. To better reflect the curved nature of the national age-income profile, we impute fitted values of income for each age based on the output of a polynomial regression of order 2. This methodology is based on the Gang Liu's paper from the Organisation for Economic Co-operation and Development on Human Capital, 2013 (“Measuring the stock of human capital for international and inter-temporal comparisons”). Specifically, the regression model is:

$$\text{income} = \text{age} + \text{age}^2$$

where income is the average income of the age-group.

11. Background notes

1. The statistics presented in this release are experimental in nature.

2. Reported changes in human capital have not tested for statistical significance.

3. Full information on data sources and methodology can be found in the measuring human capital methodology document and the regional methodology document in the quality and methodology section.

4. The sources of data used in the analysis are the Annual Population Survey (APS), which is an annual version of the Labour Force Survey (LFS) and the longitudinal LFS. Both surveys are conducted by the Office for National Statistics. The APS and LFS collect household and individual data from a nationally representative sample.

5. This release incorporates the reweighting of the Annual Population Survey (APS) data and Longitudinal Labour Force Survey (LFS) data consistent with the 2014 mid-year estimates (MYEs) published in June 2015 and the 2014-based National Population Projections (NPPs) published on 29 October 2015. This latest currently available document explained the likely impact of the LFS and APS moving from previous weights based on population estimates derived from the 2012-based MYEs and NPPs.

6. Details of the policy governing the release of new data are available from the UK Statistics Authority website.

12. Annex 1: Sensitivity analysis

Estimates of human capital are sensitive to a number of assumptions. Holding everything else constant, each assumption can be varied individually to show the impact. The 3 main assumptions analysed here are:

- the discount rate
- the labour productivity growth rate
- the upper age boundary

The results are shown in Table A1.

Table A1: Employed and full human capital in 2015, UK, (£ trillion, current prices)

2015 Prices

Labour Productivity Rate	Discount Rate	Age	Employed Human Capital	Full Human Capital
1	3.5	64	£16.74	£17.33
1.5	3.5	64	£17.92	£18.55
2	3.5	64	£19.23	£19.90
2.5	3.5	64	£20.69	£21.40
3	3.5	64	£22.30	£23.07
2	2	64	£24.10	£24.93
2	2.5	64	£22.29	£23.05
2	3	64	£20.67	£21.39
2	3.5	64	£19.23	£19.90
2	4	64	£17.95	£18.58
2	4.5	64	£16.79	£17.39
2	5	64	£15.76	£16.32
2	3.5	64	£19.23	£19.90
2	3.5	65	£19.38	£20.05
2	3.5	66	£19.52	£20.21
2	3.5	67	£19.65	£20.33
2	3.5	68	£19.79	£20.47
2	3.5	69	£19.89	£20.59

Source: Annual Population Survey (APS) - Office for National Statistics

Notes:

1. Labour productivity growth rate in main estimates = 2%
2. Discount rate in main estimates = 3.5%
3. Figures in 2015 prices, deflated using the Consumer Price Index (CPI)
4. Upper age limit in main estimates = 64 years old

Sensitivity analysis shows that increasing the discount rate by one percentage point, to 4.5%, reduces the estimated value of the employed human capital stock by £2.44 trillion. Conversely, reducing the discount rate to

2.5% increases the value of the employed human capital stock by £3.05 trillion. Changing the labour productivity growth rate by one percentage point, leads to changes of a similar magnitude but in the opposite direction in the estimates of the human capital stock.

Restricting the sample to individuals aged between 16 and 64 years is a somewhat arbitrary assumption particularly at the higher end of the age range. Table A1 illustrates the effects of changes in the upper age bound on estimates of the human capital with a discount rate of 3.5% and a labour productivity growth rate of 2%. As would be expected, increasing the upper age bound increases the estimates of the human capital stock since the human capital of additional workers is included in the estimate and the expected working lives of individuals already in the sample is extended, raising the value of their human capital. In general the increases become smaller as the upper age bound is increased because the employment rate and total income is lower in each age-year cohort added to the sample.