

Article

# Human capital estimates in the UK: 2004 to 2018

National estimates of human capital and lifetime earnings for the economically active population in the UK.

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# 1 . What is human capital?

This release presents the latest results on the UK's human capital.

According to [The Well-being of Nations: The Role of Human and Social 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”. It plays an important role in productivity and sustainability, and it is one of the main resources that may affect individual well-being. In this release, we measure human capital through people's expected lifetime earnings, one of the recommended international methods.

## 2 . Main points

- The UK's human capital stock was £21.4 trillion in 2018, equivalent to around 10 times the size of UK gross domestic product (GDP).
- There was an annual increase of 0.2% in 2018 in real terms, using the new indexing methodology; this was the result of an increase in the educational attainment of those who were economically active and an increase in their population size, though these increases were partially offset by the effects of an ageing population.
- Men's average lifetime earnings fell by 0.1% in 2018, while women's average lifetime earnings increased 0.2% compared with 2017.
- The average lifetime earnings of women grew more rapidly than those of men between 2004 and 2018 but remain 41% lower than those of men.
- Those with a Master's degree or PhD qualification have an average £65,000 extra in future lifetime earnings – a 10% premium – compared with those with an undergraduate or equivalent degree in 2018; this premium has been consistent since 2004.
- There are now more economically active people with a Master's or PhD degree, at 4.5 million, than those without any formal academic qualifications, at 3.4 million.

## 3 . Information about this release

There has been increased interest in measuring and understanding human capital recently, both in the UK and internationally, to better understand the skills of national workforces and the drivers of growth. We have therefore published [a workplan](#) outlining the developments we are considering to meet user needs.

We have a [public consultation open until 18 November](#) on measuring human capital through an indicator-based approach. The proposal considers the impacts on people's development across their lifetime; this involves aspects of health, the family, home, education and work, among other themes. We encourage interested individuals and organisations to respond so their views can be taken into account.

In this release, we estimate human capital by looking at what qualifications people have and what they earn as well as how much longer they will continue to work, in line with international recommendations from the [United Nations Economic Commission for Europe \(UNECE\) Guide on Measuring Human Capital](#). As such, an individual's human capital, referred to as their lifetime earnings, tends to be higher for younger workers, as they have more years in the labour market ahead of them.

When interpreting differences between groups or over time in these statistics, it is necessary to consider a range of potential factors. If one group has higher human capital than another, this may be because they have, on average, more qualifications, better education progression rates, higher salaries for any given level of qualifications, or because they are younger. Two people with identical characteristics (for example, sex and qualifications) will have different levels of human capital if one is younger. This is because the younger person has more years' earning potential, or because they can work and therefore earn for longer.

Further information on how human capital is calculated and the methodology for this can be found at the end of the release and in more technical detail in [Measuring the UK's Human Capital Stock \(PDF, 208KB\)](#).

In summary, estimates are constructed by adding together the labour income people would receive over the rest of their working life, for every combination of age, sex and highest qualification obtained. For every "age–sex–highest qualification" combination, next year's lifetime earnings are assumed to be the average discounted value of people a year older with the same sex and highest qualification who are currently in the labour market. This is adjusted by calculating the probability of someone obtaining a further formal qualification and hence increasing their earnings trajectory to that of someone with a higher qualification. It also accounts for the mortality rate of an individual, to consider if they would still be in the workforce. Full information on data sources and methodology can be found in [Measuring the UK's Human Capital Stock \(PDF, 208KB\)](#).

It is important to note that within this release, there has been a change in calculating the headline changes in human capital.

Internationally, the Törnqvist index is one of the most widely used approaches to measure changes in human capital, and the [UNECE Guide on Measuring Human Capital](#) recommends it as a way to measure change over time. We have developed a new measure based on the Törnqvist index that takes into account the differing lifetime earnings of people with varying ages, qualifications and sex and how the demography of the population changes over time. This effectively provides a different deflator to each sub-population and so provides a more comprehensive view of how human capital has changed over time.

In previous releases, the real changes for all estimates have been measured by deflating by the [Consumer Prices Index](#) (CPI), which is a measure of the change in prices for a basket of goods and services that people buy.

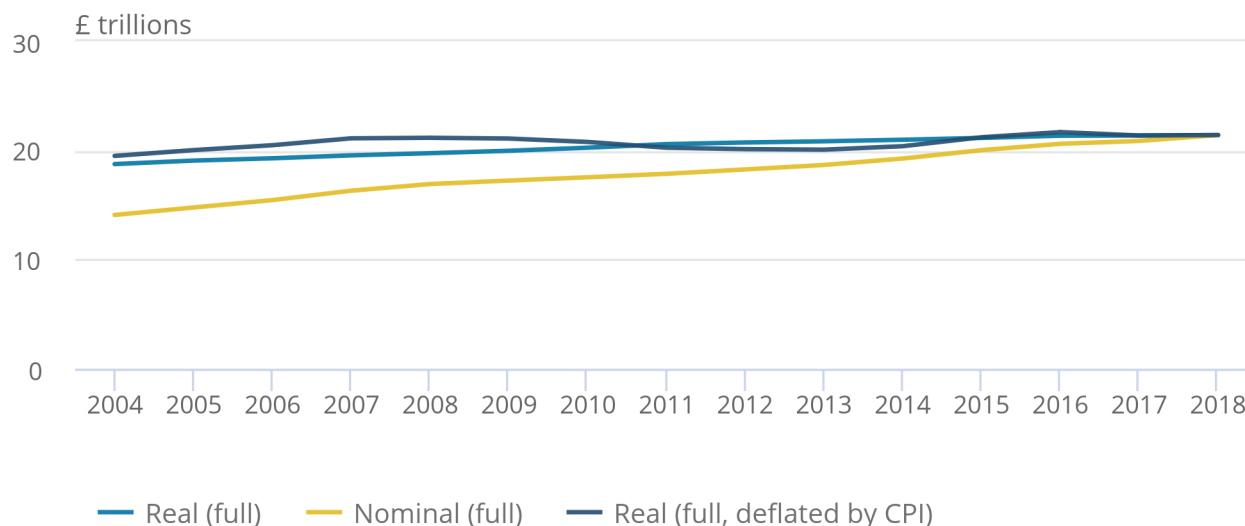
## 4 . Human capital in 2018

**Figure 1: Human capital continued to rise in 2018 but at a slower pace since 2016**

Human capital stock in the UK, full, in nominal and real terms, 2004 to 2018

Figure 1: Human capital continued to rise in 2018 but at a slower pace since 2016

Human capital stock in the UK, full, in nominal and real terms, 2004 to 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

**Notes:**

1. Real figures with 2018 as the base year, derived using new methodology outlined in the [Methodology developments section](#). This is based on the Törnqvist index, which is the internationally recommended approach of measuring Human Capital over time.
2. Full human capital captures the human capital of the employed and the unemployed.

The value of the UK's real full human capital stock, or the human capital of the employed and the unemployed, was £21.4 trillion in 2018. This relates to people between 16 and 65 years who were working or looking for work. This was a 0.2% increase compared with 2017, when derived using the Törnqvist volume methodology. This continues the slower rate of growth seen since 2016, compared with the rest of the period since 2004. Using the previous Consumer Prices Index (CPI) deflated method, the UK's real full human capital also increased by 0.2% between 2017 and 2018. This follows a fall of 1.4% the previous year.

The Törnqvist method is the preferred method of measuring real human capital as it directly measures volume estimates, taking account of differences in lifetime earnings across the population, while deflating by the CPI does not.

Since 2004, the real measure derived using the Törnqvist index shows human capital steadily increasing each year. On the other hand, human capital as deflated through CPI has varied more over time, rising more rapidly in the years until 2008 but then falling between 2009 and 2013. This difference arises from a difference in what the measures include.

Within the rest of the analysis, the Törnqvist index will be used. Further information about this method including why and how it is used can be found at the end of the report.

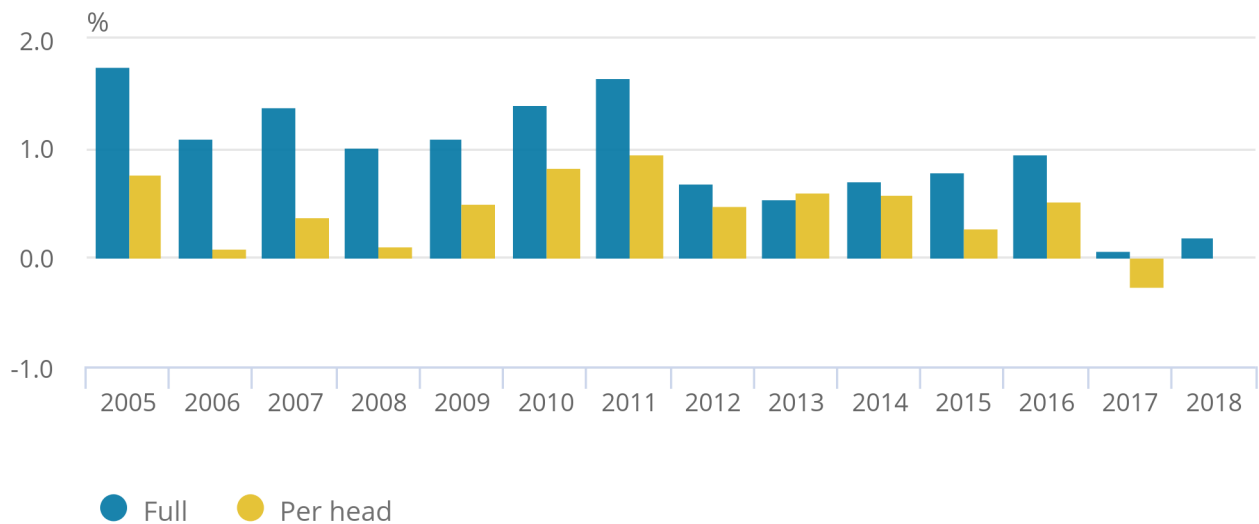
The UK's real employed human capital increased by 0.2% between 2017 and 2018. This occurred during a period when the employment rate grew at 0.6%. The increase in human capital mainly occurred in Northern Ireland and London, which saw an increase in their human capital stock by 3.4% and 1.9% respectively. The South West and the North East saw their human capital stock reduced by 0.5% in 2018. More regional data can be found in the accompanying reference tables, and we will be looking to publish more regional analysis in the future.

**Figure 2: Real human capital increased in 2018 while average human capital per person remained unchanged**

Growth rates of real human capital stock and real lifetime earnings per person, UK, 2004 to 2018

Figure 2: Real human capital increased in 2018 while average human capital per person remained unchanged

Growth rates of real human capital stock and real lifetime earnings per person, UK, 2004 to 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

Notes:

- 1. Real figures are in 2018 values.
- 2. Per head figures are divided by the economically active population.

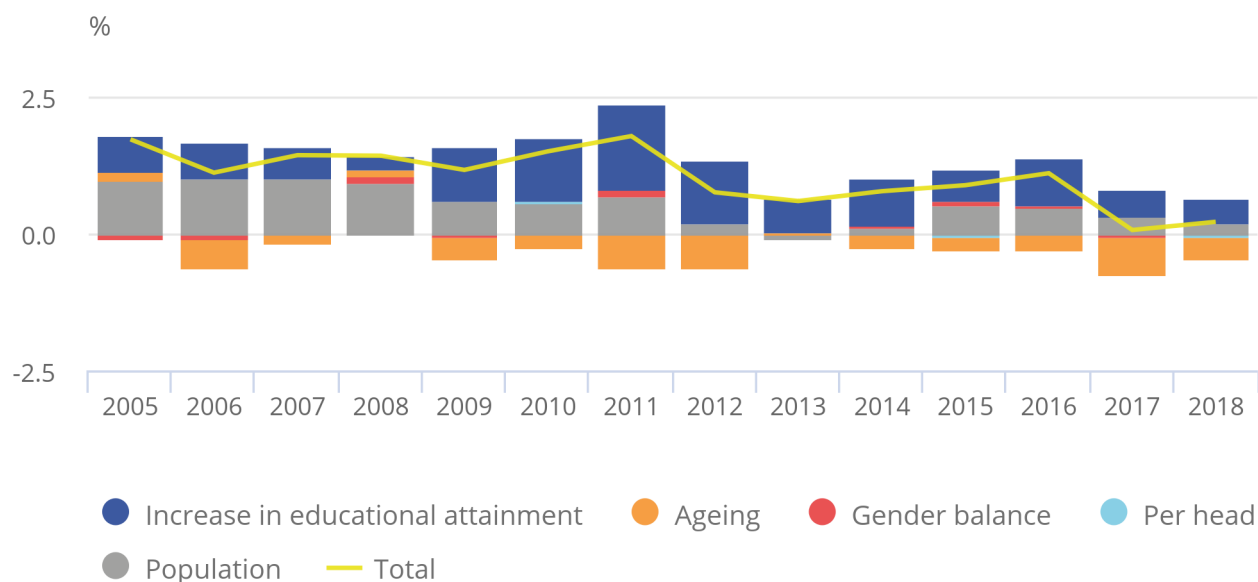
The increases in real full human capital over the last two years are slower than the longer-term average annual increase of 0.9% from 2011 to 2016. This suggests there has been a slowdown of growth in human capital since 2016. This is also seen in the average human capital per person or average lifetime earnings of individuals, which grew at the second-slowest rate over the period since 2004. The reduction and slowdown of growth of human capital per head in the last two years has meant that human capital per head has a lower value in 2018 than it did in 2016.

**Figure 3: An increase in people's educational attainment and the growth of the working population are the main causes of human capital increases**

Contributions to annual growth in real human capital stock, UK, 2004 to 2018

## Figure 3: An increase in people's educational attainment and the growth of the working population are the main causes of human capital increases

Contributions to annual growth in real human capital stock, UK, 2004 to 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

### Notes:

1. May not sum because of the rounding and chain-linking methodology, which is not additive.
2. Population changes are calculated by applying the average increase in the economically active population only, for the year, compared with the year before, while keeping average lifetime earnings fixed to the previous year.
3. Increase in educational attainment or formal qualifications is calculated by applying the qualification distribution only, for that year compared with the year before, while keeping average lifetime earnings fixed to the previous year.
4. Ageing is calculated by applying the age distribution of the population only, compared with the year before, while keeping average lifetime earnings fixed to the previous year.
5. Gender balance is calculated by applying the balance of both sexes for each age and qualification category for each year measured and the year before, while keeping average lifetime earnings fixed to the previous year.

The increase in people's educational attainment in 2018 had the largest positive effect on real growth, followed by the effect of the increased working population, contributing 0.46 and 0.20 percentage points respectively towards the 0.2% increase in real human capital. These were similar contributions to those in 2017.

Looking across the past 15 years, the increase in educational attainment or formal qualifications of the economically active population and the increase in the size of that population have made the biggest contributions to the growth in total human capital. They have contributed 10.8% and 7.8% respectively since 2004. At the same time, an ageing population has had a negative effect on human capital levels, as an older workforce has less time available to participate in the labour market. Since 2011, this ageing effect has more than offset the rise in human capital from a larger active population and particularly in the last two years, it has brought down growth of human capital.

The increase in educational attainment or formal qualifications has mainly been driven by more individuals obtaining degree or equivalent-level qualifications and there being fewer people without any qualifications.

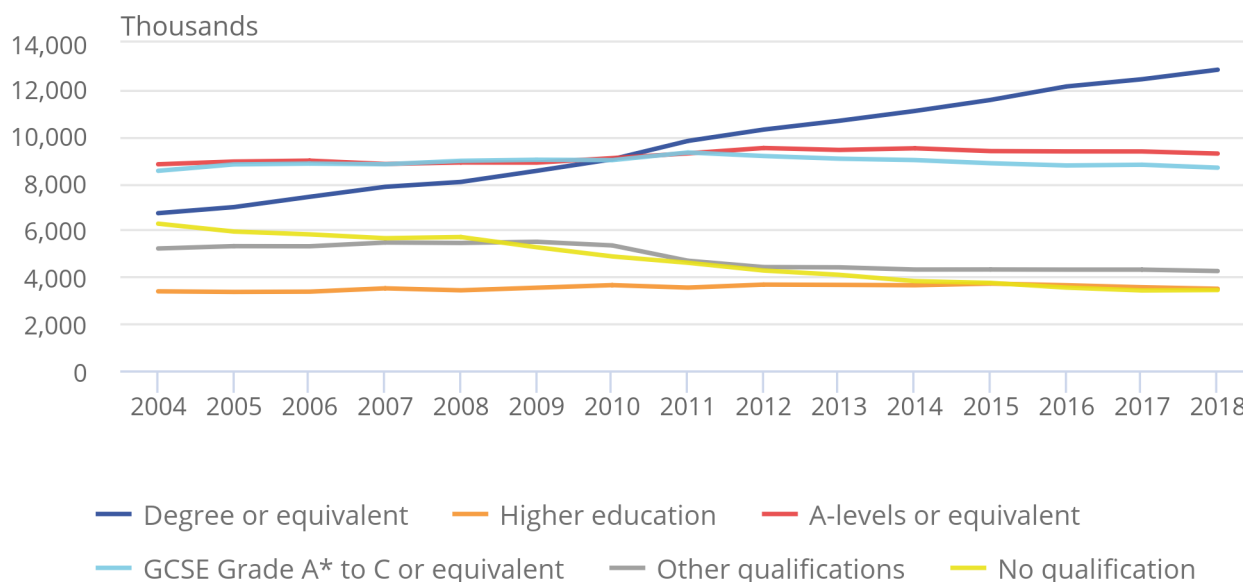


**Figure 4: The number of people with a degree or equivalent increased the most between 2004 and 2018**

Economically active population, highest educational attainment, UK, 2004 to 2018

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Economically active population, highest educational attainment, UK, 2004 to 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

### Notes:

1. "Degree or equivalent" includes undergraduate degrees and Master's and PhD degrees.
2. "Higher education" includes Diploma in Higher Education, Teaching Diplomas and National Vocation Qualification Level 4 .
3. "A levels or equivalent" includes A levels, AS levels and International Baccalaureates.
4. "GCSE grades A\* to C or equivalent" includes GCSE A\* to C and BTEC first diploma.
5. "Other qualifications" includes GCSE below grade C and BTEC first certificate.
6. "No qualifications" includes individuals who have no formal qualifications.

Since 2004, the number of economically active individuals with a degree (or equivalent) or higher qualification has increased by 91.3%, rising from 6.7 million to 12.8 million people. At the same time, the number of economically active people with no qualifications has nearly halved, from 6.3 million to 3.4 million in the same period.

The share of the active population with a degree has increased the most, which would suggest that this is the cause of the increases in attainment that led to higher human capital. It is worth noting that someone with a higher educational attainment will have, on average, higher lifetime earnings than the same individual with a lower attainment. For example, those aged 26 to 35 years who have a degree will have a 19% higher average human capital than those whose highest level of qualification is higher education, which are qualifications that are higher than A levels but lower than an undergraduate degree.

Notes for: Human capital in 2018

- 1. We refer to those people with no qualifications as having no formal academic qualifications.

5 . Human capital of people with a Master’s or PhD degree

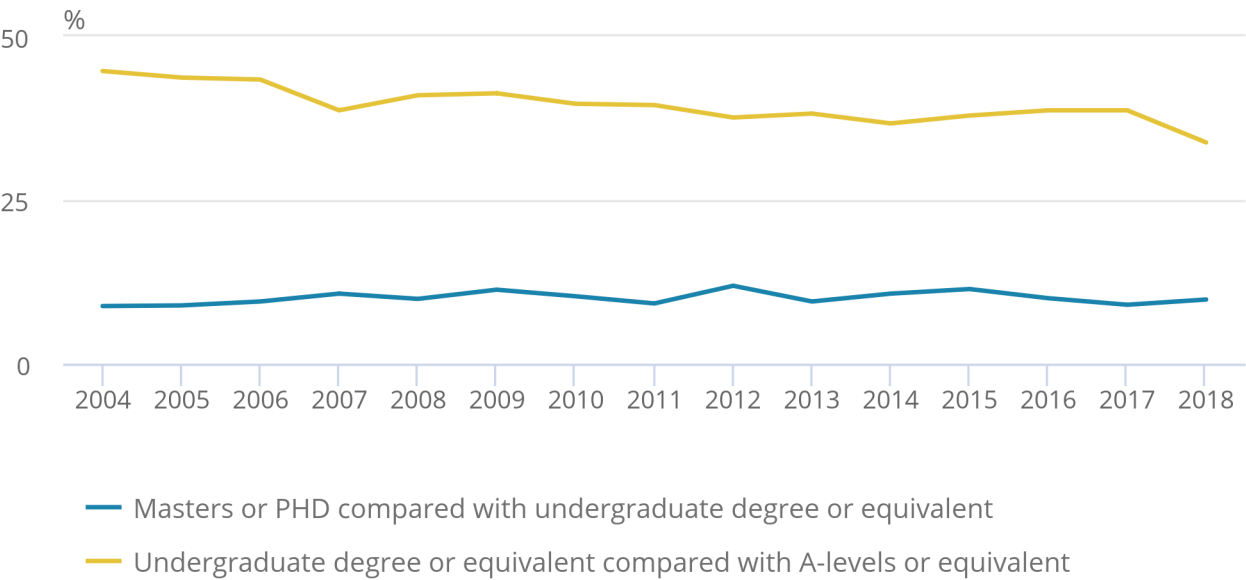
In this section, we have expanded the methodology to consider those with a Master’s or PhD degree separately to people with an undergraduate degree or equivalent. Further detail on our approach can be found in the [Methodology developments section](#).

Figure 5: Individuals with a Master’s or PhD degree had a higher human capital in 2018 than those with an undergraduate degree or equivalent

Average premium in lifetime earnings for those with a Master’s or PhD degree and those with an undergraduate degree or equivalent, compared with people with A levels, UK, 2004 to 2018

Figure 5: Individuals with a Master’s or PhD degree had a higher human capital in 2018 than those with an undergraduate degree or equivalent

Average premium in lifetime earnings for those with a Master’s or PhD degree and those with an undergraduate degree or equivalent, compared with people with A levels, UK, 2004 to 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

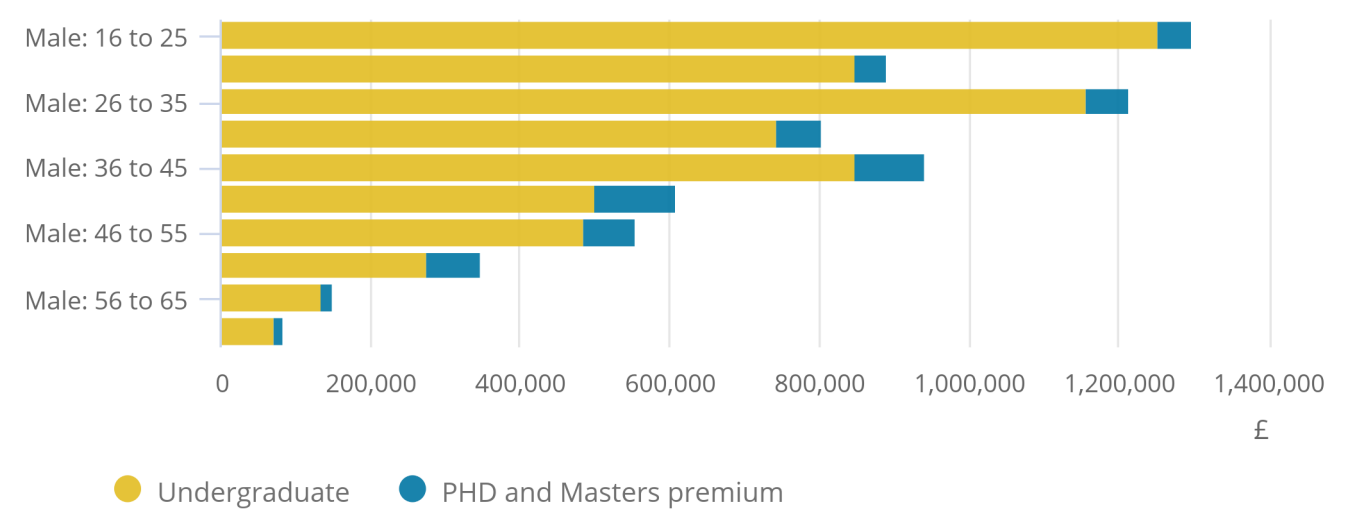
As shown in Figure 5, the lifetime earnings premium for someone with a Master’s or PhD degree over and above an undergraduate or equivalent degree has remained fairly stable, at between 9% and 11%. There is also a significant premium for those with an undergraduate degree compared with people who have obtained A levels as their highest qualifications. However, it has fallen from 45% higher average lifetime earnings in 2004 to 34% higher average lifetime earnings in 2018.

**Figure 6: The greatest difference in lifetime earnings between people with a Master’s or PhD degree and between those with an undergraduate or equivalent degree occurred for the 36 to 45 years age group**

Difference between lifetime earnings for those with a Master’s or PhD degree and those with an undergraduate degree or equivalent, by age group and by sex, UK, 2018

Figure 6: The greatest difference in lifetime earnings between people with a Master’s or PhD degree and between those with an undergraduate or equivalent degree occurred for the 36 to 45 years age group

Difference between lifetime earnings for those with a Master’s or PhD degree and those with an undergraduate degree or equivalent, by age group and by sex, UK, 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

Notes:

1. Positive figures show that lifetime earnings for those with a Master's or PhD degree are larger than for those with an undergraduate degree or equivalent.

Figure 6 shows average future lifetime earnings for those with an undergraduate degree or equivalent for men and women across different age groups. It also shows the additional lifetime earnings premium associated with having a Master's or PhD degree. For those aged between 26 and 55 years, the premium associated with having a higher degree is greater for women than for men. For example, among those aged 36 to 45 years, women with a Master's or PhD degree will earn, on average, £108,000 more over the rest of their working life than those with an undergraduate degree, compared with a premium of £92,000 for men. This suggests that, in terms of future earnings, it is more beneficial for women to obtain higher degrees than for men.

However, despite this higher premium, women with a Master's or PhD degree have around 33% lower lifetime earnings than men, on average, with the same level of qualifications, depending on their age. Across every age group, the average future lifetime earnings of women with Master's or PhD degrees is substantially lower than that for men with undergraduate degrees. For example, women aged 26 to 35 years with higher degrees have average lifetime earnings of £803,000, whereas men of the same age with undergraduate level qualifications have average lifetime earnings of around £1,160,000.

The population of those with a Master's or PhD degree who are either working or looking for work has increased from 1.9 million in 2004 to 4.5 million in 2018. This equates to a 130% increase throughout this time period, while those with an undergraduate degree or equivalent have increased by 75%. This increase in Master's and PhD degree qualifications shows that there has been a continued increase in advanced qualifications in the UK's workforce.

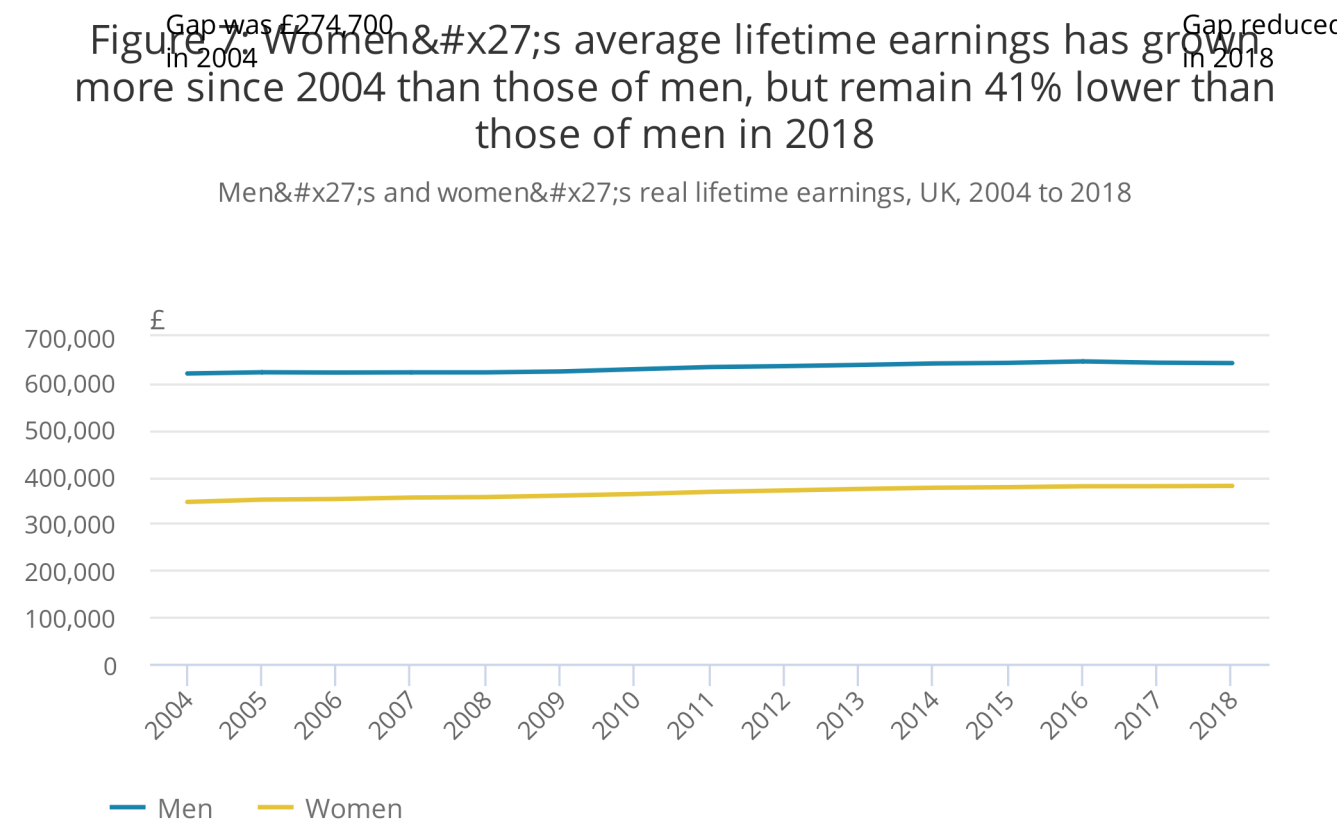
There are now more people with a Master's or PhD degree, at 10.7% of the population, than people with no qualifications.

We recognise people can take other training at work that does not lead to a recognised formal qualification, so we would like to measure this effect and incorporate it into future releases.

## 6 . Human capital by sex

**Figure 7: Women's average lifetime earnings has grown more since 2004 than those of men, but remain 41% lower than those of men in 2018**

Men's and women's real lifetime earnings, UK, 2004 to 2018



Source: Office for National Statistics – Human capital estimates

Notes:

1. Real figures are in 2018 values.
2. This shows human capital per head of the population for each sex.

Men have a higher average human capital than women, when measured in terms of lifetime earnings. In 2018, the average lifetime earnings of men were £643,000 while those of women were £380,000. Taking account the effect of weekly hours worked for men and women, women's human capital is 22.7% lower than men's. Despite this, women's average lifetime earnings have grown at a faster rate since 2004. The average rate of increase has been 0.7% annually, while for men it has grown by an average of 0.3% a year during this period. Most recently, men's human capital per head has fallen by a cumulative 0.6% in 2016 and 2018, owing to a bigger negative effect from an ageing workforce than positive effects from improved educational attainment.

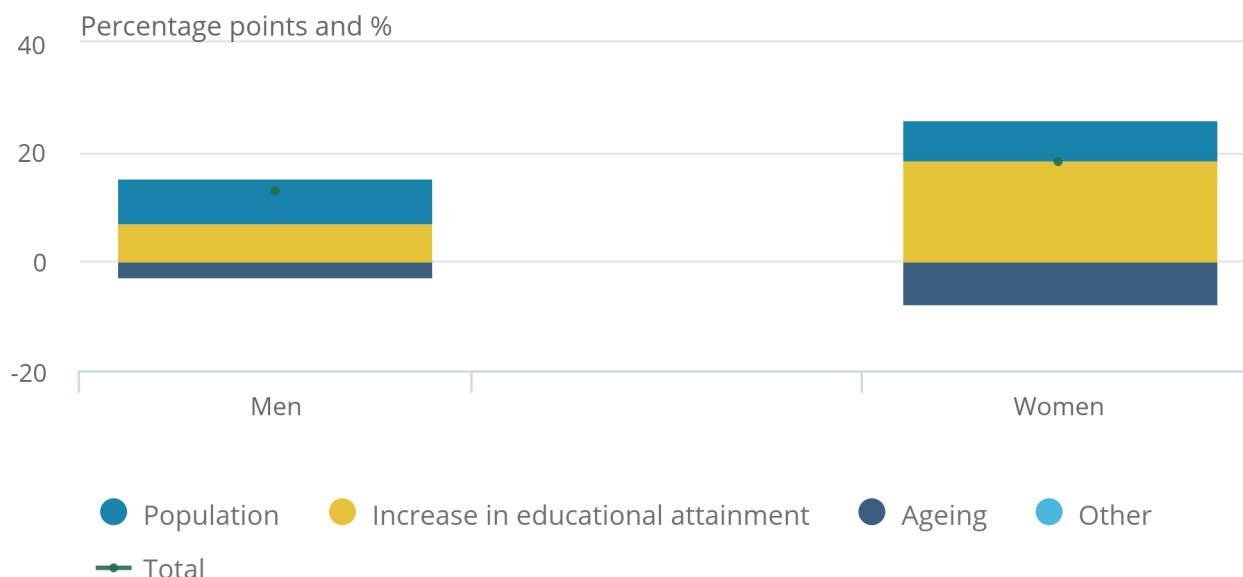
This means that the gap in average lifetime earnings for men and women has narrowed, with women now receiving, on average, equal to 59% of men's average lifetime earnings; this is up from 56% in 2004.

## Figure 8: Women's human capital has increased more than men's owing to a greater increase in educational attainment than among men

Decomposition in cumulative changes of human capital stock, men and women, UK, 2018 compared with 2004

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Decomposition in cumulative changes of human capital stock, men and women, UK, 2018 compared with 2004



Source: Office for National Statistics – Human capital estimates

#### Notes:

1. Real changes in 2018 values, as measured through the Törnqvist index.
2. Population changes are calculated by applying the average increase in the economically active population only, for the year, compared with the year before, while keeping average lifetime earnings fixed to the previous year.
3. Increase in educational attainment or formal qualifications is calculated by applying the qualification distribution only, for that year compared with the year before, while keeping average lifetime earnings fixed to the previous year.
4. Ageing is calculated by applying the age distribution of the population only, compared with the year before, while keeping average lifetime earnings fixed to the previous year.
5. Measuring total human capital stock for men and women.
6. "Other" includes the effect of the relative change in average lifetime earnings across age, sex and qualification categories.

Figure 8 shows the contribution of different factors to changes in human capital for men and women. The biggest contributor to women's rising human capital has been an increase in average levels of educational attainment or formal qualifications. This has led to an 18.8 percentage point contribution to their human capital increase between 2004 and 2018, compared with only 7 percentage points for men. This indicates that women have become more formally and academically qualified, comparatively, than men. For every additional formal qualification, women also gain more in average lifetime earnings than men. Additionally, increases in the population had a significant impact on the rise in human capital for both men and women.

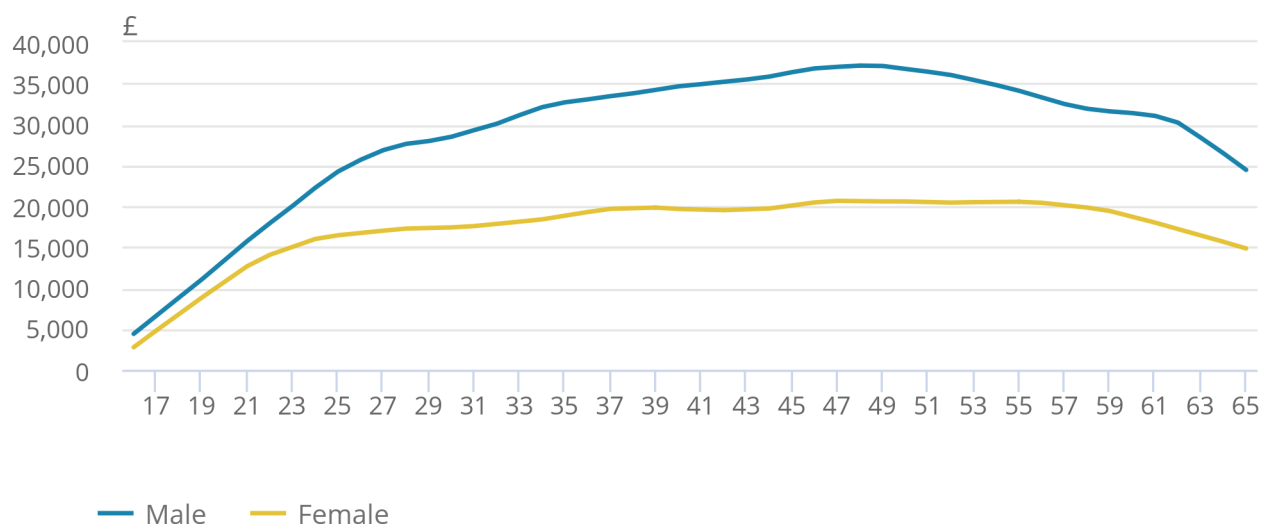
## Earnings differences between men and women throughout working life

**Figure 9: Men reach their peak in earnings in their late 40s, while women level off after their 30s**

Annual average earnings for men and women with their highest qualification as A levels or equivalent, UK, 2018

### Figure 9: Men reach their peak in earnings in their late 40s, while women level off after their 30s

Annual average earnings for men and women with their highest qualification as A levels or equivalent, UK, 2018



Source: Office for National Statistics – Annual Population Survey and Labour Force Survey

The differences in average lifetime earnings between men and women, as shown in Figure 9, reflect the fact that men, on average, earn more annually throughout their lifetime than women. Figure 9 looks at the average annual earnings for each age group from 16 to 65 years by sex for those who have A levels or equivalents. Both men and women have similar annual employee earnings early on in their lives. However, after they reach their 20s, they diverge and men begin to have much higher total average annual earnings. Men, on average, peak at 48 years old, at which point there is a £16,600 difference between men and women's average earnings.

It is important to note annual earnings are shown here, which also reflect differences in working patterns. Further analysis can be found in [Gender pay gap in the UK: 2018](#) as well as in an [interactive tool](#) to see the differences in hourly pay for different occupations.

## Notes for: Human capital by sex

1. We refer to those people with no qualifications as having no formal academic qualifications.

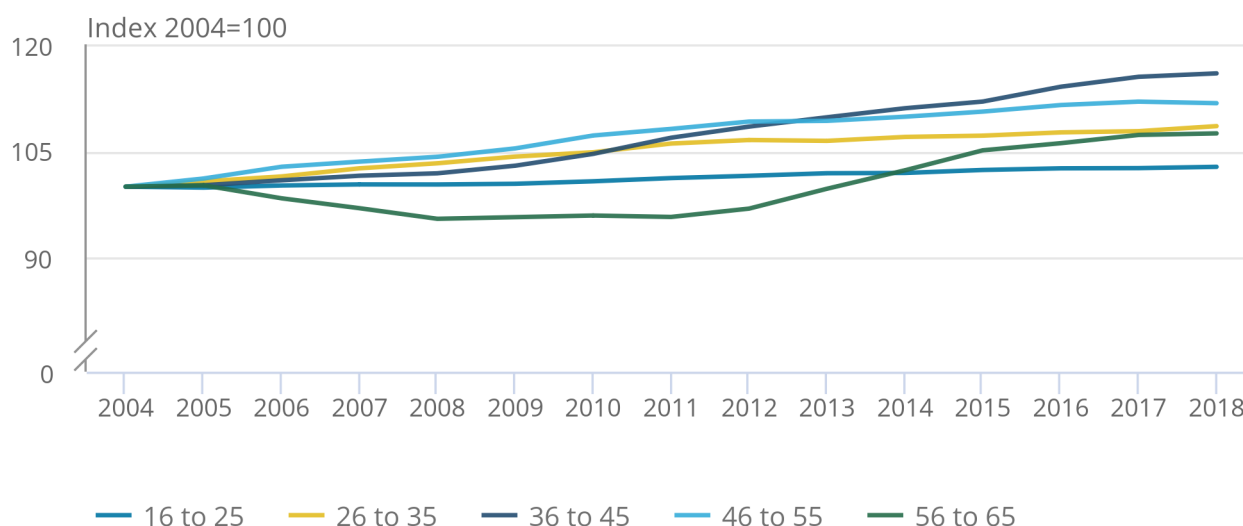
## 7 . Human capital across age groups

**Figure 10: The average lifetime earnings of people aged between 16 and 25 years has only increased by 2.8% compared with those of the same age 15 years ago, the lowest amount of any age group**

Lifetime earnings per head, different age groups, UK, 2004 to 2018

Figure 10: The average lifetime earnings of people aged between 16 and 25 years has only increased by 2.8% compared with those of the same age 15 years ago, the lowest amount of any age group

Lifetime earnings per head, different age groups, UK, 2004 to 2018



Source: Office for National Statistics – Human capital estimates

### Notes:

1. Index is set at 2004 = 100.
2. Age groups constant over time, meaning as people age, different populations are in each category, which may have different sex and highest qualification compositions within them over time.

Each age group in 2018 had higher lifetime earnings, compared with their 2004 counterparts. Those aged 36 to 45 years in 2018 had an estimated 15.9% higher average lifetime earnings than they would have 15 years ago, the largest increase of any age group. This in part reflects higher average levels of educational attainment among this group. For example, there are now 1.6 million more people aged between 36 and 45 years with a degree or equivalent than there were 15 years ago. This in turn reflects long-term trends in the number of people attending university after leaving school and an increased share of people obtaining further qualifications during their working life.



56- to 65-year-olds in 2018 had, on average, a 7.5% higher human capital compared with this age group in 2004. However, 56- to 65-year-olds in 2011 had, on average, lower human capital than those in 2004 by 4.2 percentage points. Since 2011, on average, the age group's human capital is 1.6% higher than the equivalent group a year before.

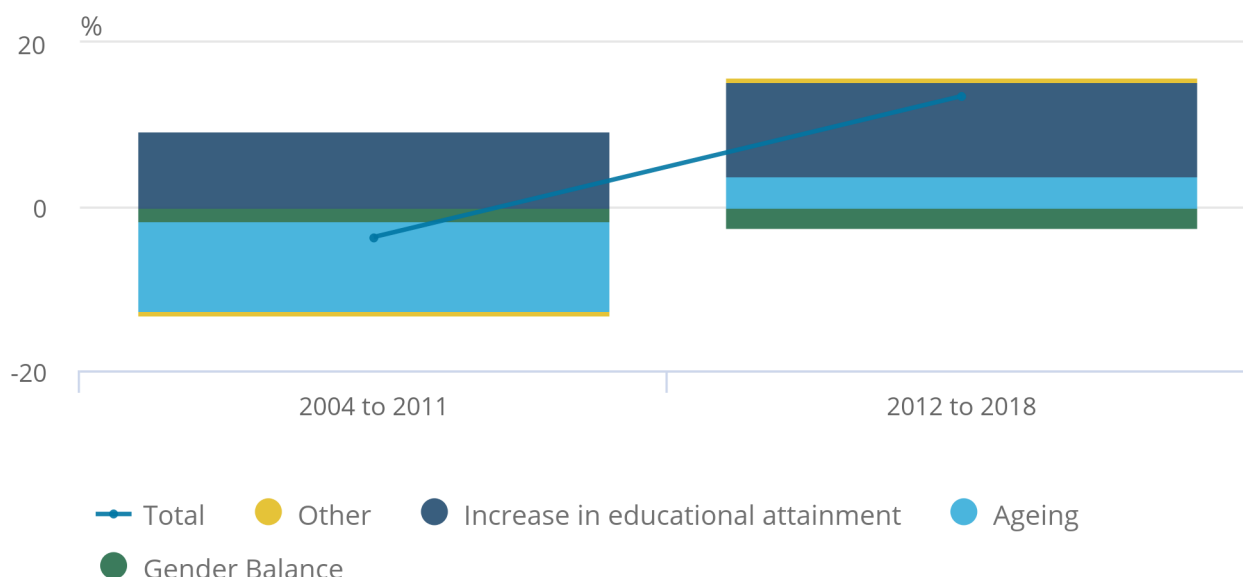
The ageing of the 56 to 65 years age group impacted average human capital between 2004 and 2018.

## Figure 11: Ageing had a bigger negative impact for 56- to 65-year-olds up to 2011, after which it has had a positive impact

Decomposition of changes in average human capital for 56- to 65-year-olds, UK, 2004 to 2011 and 2012 to 2018

### Figure 11: Ageing had a bigger negative impact for 56- to 65-year-olds up to 2011, after which it has had a positive impact

Decomposition of changes in average human capital for 56- to 65-year-olds, UK, 2004 to 2011 and 2012 to 2018



Source: Office for National Statistics – Human capital estimates

#### Notes:

1. In real 2018 values.
2. Increase in educational attainment or formal qualifications is calculated by applying the qualification distribution only, for that year compared with the year before, while keeping average lifetime earnings fixed to the previous year.
3. Ageing is calculated by applying the age distribution of the population only, compared with the year before, while keeping average lifetime earnings fixed to the previous year.
4. Measuring total human capital stock for men and women.
5. "Other" includes the effect of the relative change in average lifetime earnings across age, sex and qualification categories.
6. Measured as a full human capital stock.

Figure 11 shows the contribution to the changes in the average human capital of 56 to 65 year olds during these time frames.

From 2004 to 2011, on average, the lifetime earnings of 56- to 65-year-olds fell because of ageing. This meant that within the 56 to 65 years age group, the average age increased and the average human capital for this age group fell. This was despite the fact that those aged 56 to 65 years in 2011 had, on average, higher qualifications than those aged 56 to 65 years in 2004. This change resulted from the fact that between 2012 and 2018, the average age of the 56 to 65 years age group reduced and so there was an increase in human capital. At the same time, 56- to 65-year-olds in 2018 also had, on average, higher qualifications than 56- to 65-year-olds in 2011.

An individual's occupation also impacts their human capital. There are breakdowns of human capital by occupation within the reference tables, and we will be looking to publish more analysis on this in the future.

## Human capital per productive hour

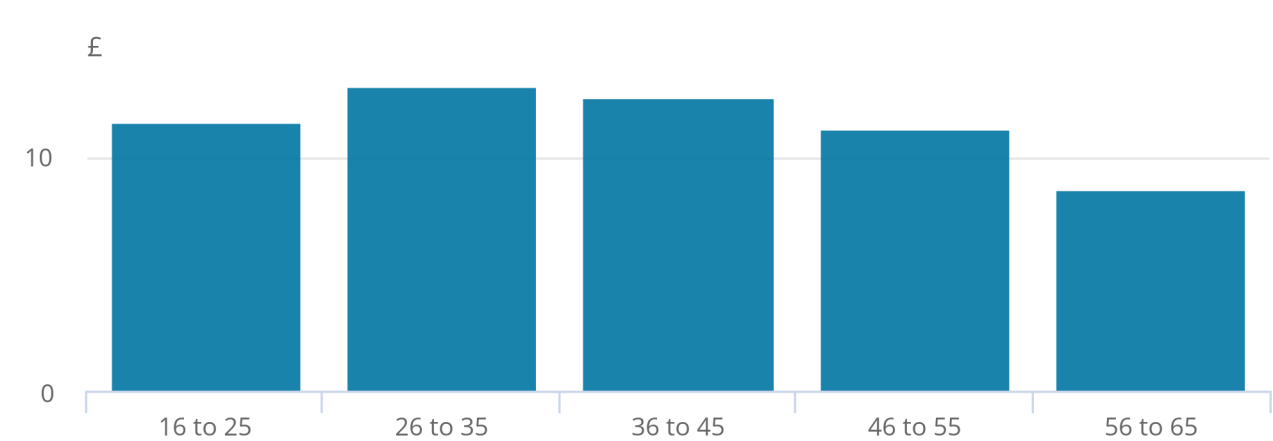
When we look at the overall average human capital of different ages groups, individuals have lower human capital on this measure the more they age. This is because their working life becomes shorter and their potential future earnings reduce. However, we can remove the effect of age to see when in an individual's career their productivity peaks. This gives a more nuanced understanding of how human capital develops throughout an individual's working life, without it simply decreasing as they age.

**Figure 12: The 26 to 35 years age group had the highest average productivity of human capital**

Employed human capital per productive hour, broken down by age group, UK, 2018

Figure 12: The 26 to 35 years age group had the highest average productivity of human capital

Employed human capital per productive hour, broken down by age group, UK, 2018



Source: Office for National Statistics – Human capital estimates

Removing the impact of age provides a different picture of the changes within human capital. In 2018, those who are employed and aged 26 to 35 years had, on average, the highest human capital per hour. This means for each hour left in their working life, they would be earning an average of £13.30. After this age group, this hourly measure decreases, with those aged 56 to 65 years earning an average of £8.90 per working hour for the remainder of their working life.

## Notes for: Human capital across age groups

1. We refer to people's productivity as their lifetime earnings per hour left in the workforce.

# 8 . Methodology developments

## Measuring Human Capital with the Törnqvist index

We have developed a new index, which we believe to be a more accurate measure of how real human capital changes over time. This is using the Törnqvist method of indexing the “quantity” of UK stock explicitly. The main advantage of this method is it considers the changes within the number of people within each of the population categories by age, sex, and highest qualification attainment and the changes in the shares of them. This allows for an indication of how human capital changes over time, as it specifically looks at these age, sex and qualification groups.

We considered several other methods, including other chain-linked indexes such as the Laspeyres, Paasche and Fisher indexes. The Fisher price index is generally seen as optimal of the three, as it allows the estimate to capture changes in the shares of different components' quantities and prices simultaneously. The Törnqvist index approximates the Fisher index well and requires less data to be calculated. Note, we could have derived a price or quantity index, but we chose to derive a quantity index as this automatically gives real volume estimates rather than deflating the price index.

We also considered finding another “price” of human capital that could be relevant. As documented in [our previous release](#), we considered whether a minimum-wage-type index could capture a price measure that does not take into account any of the improvements in quality of people's skills and knowledge. However, minimum-wage jobs generally still require some form of formal schooling, which can change in quality over time. Further, the upbringing of children through their schooling can change, which might impact their skills development (see [our current consultation](#) for an elaboration on this point). This means that using some kind of average earnings measure would not capture a general increase in quality of the population, which would be the main purpose of measuring real volumes of human capital.

We believe that using the Törnqvist index presents a few important advantages, including:

- different populations have different effective “prices” of their human capital, rather than deflating by the same number for everyone
- at an aggregated level (for example, nationally), changes in the composition of the population are taken into account in considering the change in the UK as a whole; this allows changes in the age, sex and highest qualification shares of the population to explicitly impact on the measure
- decomposition of the drivers of changes in human capital stock can be tailored to user needs, decomposing into the types of population change and into differing contributions from age groups, sexes and highest qualifications to varying detail

At the same time, we recognise two main downsides to such an index, including:

- as the measure takes account of the change in distribution of age, sex and highest qualification of the population in each year (termed “weights” in index methodologies), the measures are not additive when deriving indexes of the sub-populations; this effect, called chain-linking, means users cannot simply add up components of the population or add numbers across years, as the results would not match the index-derived equivalent measure
- an increase in the lifetime earnings of a specific age–sex–highest qualification category in the population (for example, 29-year-old females with a degree) is assumed to not impact on volumes, by definition; it is assumed to be a pure “price effect” rather than a “quality effect”, meaning an increase in average earnings is assumed to not be a result of an increase in people’s skills and knowledge; to improve this, we can consider a separate source to remove the effect from quality that would feed into earnings, using hedonic regression techniques

## Measuring Master’s and PhD degrees separately from other degrees

In previous releases, the methodology of human capital groups individuals’ qualification attainments into six categories, with the highest being degree or above. This has limitations as it does not provide a full range of qualifications an individual may achieve. Therefore, we have expanded it to separate out individuals with a Master’s or PhD degree. This has meant that when the data are grouped by highest qualification, age and sex grouping, an extra qualification has been included within this analysis. Otherwise, the methodology has not changed.

By separating out Master’s and PhD degrees from other degrees or equivalent, this causes the UK’s human capital overall to be higher. This is because we can distinguish the different earnings people can obtain with higher degrees, such as Master’s and PhD degrees, and the probability of everyone obtaining such further qualifications during their working lives. In 2018, this would account for a £380 billion increase in the total UK stock, compared with only accounting for six qualification levels.

## Developments of per hour

In a similar way to how a group’s human capital is measured, total hours worked is measured by calculating the total amount of hours an individual (by their age, sex and highest qualification grouping) is expected to work while still in the labour market until age 65 years. We then divide this by the amount of lifetime earnings (human capital) they would accumulate over their working life. This provides a number that represents how much human capital an individual has, removing the effect of differing hours and changes in working patterns. From this, we can see when individuals are at their most productive in “earning” human capital, which qualifications are more productive in doing so and when in their life they are most productive.

## 9 . Why is human capital important?

The concept of human capital allows analysis of the factors influencing economic growth as well as wider sustainability and well-being issues. Human capital is widely recognised to influence future potential output and income, as empirical work on economic growth suggests (for example, [The impact of human capital on economic growth: a review](#)). A measure of human capital stock can be a starting point to quantify any potentially reciprocal impact education has on health, crime and citizen engagement outcomes ([Health and Human Capital](#); [Education, Work and Crime: A Human Capital Approach](#); and [Does Education Increase Political Participation?](#)). Tracking stock trends also allows analysis of the provision of skills needs for different parts of the economy, whether regional or industry based, which can link education (and other human capital accumulation) provision to business needs.

Our methodology brings together analysis of earnings, labour market demographics and educational outcomes into one framework. This allows us to understand how the evolution of these factors has impacted on the stock estimates, what drives differences in individuals’ human capital stock values over time and persistent step differences.

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 on the Measurement of Economic Performance and Social Progress](#). Our current estimates can give insight into how the UK’s skills and knowledge resources are evolving and whether there is a different volume of stock that can productively be used in the economy in the future.

The measures can also be used in the assessment of the impact of an ageing population and changes in retirement ages and in the evaluation of the economic benefits of different levels of education.

## 10 . Workplan

We recognise there are further ways to measure people’s skills, knowledge, competencies and attributes. So in October 2018, we published [our workplan](#) of the developments we are aiming to achieve, which have been gathered through user discussions. One of the main developments is [our current consultation on measuring human capital through a set of indicators](#). We would really appreciate your responses, which can be filled in here.

Within the published workplan, we proposed to investigate developing our methodology for measuring stocks through lifetime earnings. Our outlines and work done so far is summarised in Table 1.

Table 1: Planned developments from 2018 published workplan, with work done up to October 2019

Development	What we have done	Further plans
Human capital per productive hour	We derived initial estimates, which are presented within this release.	We can derive further analysis, given user interest. We are interested in user feedback on the methodology applied.
Further qualifications	<p>Within this release, we have derived estimates of Master's and PhD degrees combined. We investigated splitting out Master's and PhD degrees separately, but further work would be needed as the sample sizes are too small to apply the same methodology.</p> <p>We have also investigated the derivation for further breakdown of GCSE or equivalent qualifications as well as of A level or equivalent qualifications, splitting out different types of the equivalent qualifications, such as the subjects taken for GCSEs versus equivalent NVQ-type qualifications. Further work would also be needed here as the sample sizes are too small to apply the same methodology.</p>	Future article focused on deriving further breakdown of GCSE or equivalent qualifications as well as of A level or equivalent qualifications but with more aggregated age groups, similar to the occupation and regional methodology, can be considered, given user interest. The occupation and regional methodology is explained in our previous 2004 to 2017 release and 2015 release.
On-the-job training	<p>Characteristics and benefits of training at work, UK: 2017 showed differences in earnings associated with in-work training depending on occupation, highest qualification and other characteristics. Because we were unable to account for whether training taken on the job results in further formal qualifications or in informal training, more research is required into the optimal way to incorporate training into the current methodology. One way of developing this would be to expand the age coverage of the likelihood of people gaining further formal qualifications during their working lives to encompass people aged over 40 years. Some initial findings on this are presented after this table.</p>	<p>We plan to present a paper on different methods to derive the effect of on-the-job training, with differing impacts from both. One of the two main methods would be to split existing transition probabilities of obtaining further qualifications to also capture the probability of having taken informal on-the-job training, per each qualification level.</p> <p>An alternative way would be to derive a lifetime earnings premium from doing any type of on-the-job training and apportion that out based on whether people did any in the last year.</p> <p>In order to apply these methods, we would need to consider cumulative impacts from several years' worth of training at work. Further, at present, our survey sources capture training at work within the past 4 or 13 weeks but not for the past year as a whole, which would be consistent with the rest of our estimates.</p>

Further earnings differences	<p>Within this development, several elements were considered. In order to fully implement these, we need to make use of not-yet-acquired administrative data, such as the Longitudinal Education Outcomes dataset.</p> <p>However, we have investigated the feasibility of taking account of differential progressions, which is feasible. We will look to derive some experimental estimates of progression using administrative data linked to the 2011 Census, continuing analysis on progressions presented in Inclusive growth: measures and trends and Young people's earnings progression and geographic mobility, England and Wales: tax year ending 2012 to tax year ending 2016. However, there are differences in earnings between administrative sources of earnings and self-reported measures.</p>	Future releases once further data is obtained.
Incorporating human capital into a framework consistent with the national accounts	<p>We presented at the Economic Statistics Centre of Excellence (ESCoE) Conference on Economic Measurement in May 2019 [<a href="#">link to slides</a>] . Our slides are available upon request. We set out our thoughts regarding what needs to be considered in order to assess how human capital and other "missing capitals" can relate to assets and other concepts in the national accounts. We had some useful feedback, and we will continue to develop our thinking as part of the Organisation for Economic Co-operation and Development (OECD) working group on well-being and sustainability and the future of the system of national accounts.</p> <p>We have also commissioned an ESCoE project to investigate research into this topic, and we are looking to hold workshops around future ESCoE and International Association for Research in Income and Wealth (IARIW) conferences; the ESCoE discussion paper is to be published in the next year, setting out possible options.</p>	Future ESCoE discussion paper to coincide with a wider set of views on what can be done. Also, guidance from the OECD working group should be presented at the IARIW 2020 conference, after which we will consider how to incorporate suggestions and what further research and sources may be needed to fulfil the recommendations.
Other		We have received user requests to analyse human capital by industry and the effects of training at work by industry. We will look to publish this in the future, either as an article or as an ad-hoc release.

Source: Office for National Statistics – Human capital estimates



## Notes:

1. [Occupation and regional methodology, 2004 to 2017 release](#)
2. [Occupation and regional methodology, 2015 release](#)
3. [Characteristics and benefits of in-work training](#)
4. [Progression in inclusive growth](#)
5. [Progression in young people's earnings and geographic mobility](#)

## On-the-job training

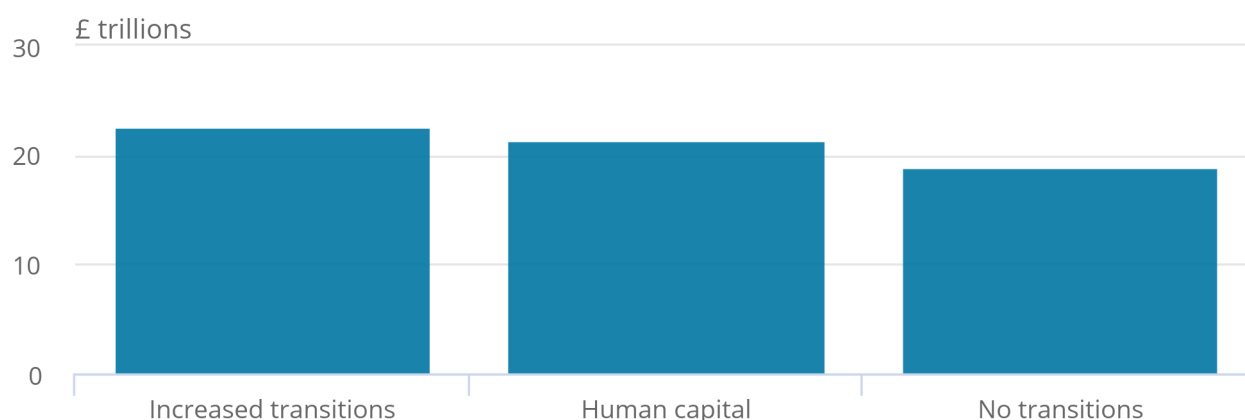
Individuals earn qualifications later in life, whether resulting in informal or formal certificates. In the current methodology, we assume individuals do not increase their qualifications after the age of 40 years. However, this is increasingly an area of our methodology that does not reflect people's behaviours. Figure 13 presents the initial impact on total human capital stock of capturing people's training for further formal qualifications.

**Figure 13: Human capital stock would increase by £1.1 trillion, if taking into account the increased qualifications taken by those aged over 40 years**

Human capital stock when taking into account these increased transitions into qualifications and no transitions into qualifications at all, UK, 2018

Figure 13: Human capital stock would increase by £1.1 trillion, if taking into account the increased qualifications taken by those aged over 40 years

Human capital stock when taking into account these increased transitions into qualifications and no transitions into qualifications at all, UK, 2018



Source: Office for National Statistics – Human capital estimates

If the further qualifications for people aged over 40 years were taken into account, the UK's human capital stock would increase by £1.1 trillion in 2018, which would be 5% higher. However, if people of all ages did not take any further recognised qualifications after becoming economically active, the UK's human capital stock would have been £2.6 trillion less in 2018, which would be 12% lower.

More information on the likelihood of people obtaining further qualifications can be found in the reference tables.