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# **The Changing Educational Attainment of Graduate Recruits to Major Public Sector Occupations**

**Neil Amin-Smith**

**Ellen Greaves**

**Luke Sibieta**

*Copy-edited by Rachel Lumpkin*

**The Institute for Fiscal Studies**

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**The Institute for Fiscal Studies**

7 Ridgmount Street  
London WC1E 7AE

Tel: +44 (0) 20-7291 4800

Fax: +44 (0) 20-7323 4780

Email: [mailbox@ifs.org.uk](mailto:mailbox@ifs.org.uk)

Website: <http://www.ifs.org.uk>

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# Preface

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This report makes use of two sources of data provided by the Higher Education Statistics Agency (HESA). In particular, the HESA Student record 2006/07–2014/15 and HESA Destinations of Leavers from Higher Education record 2006/07–2014/15. These data are Copyright Higher Education Statistics Agency Limited. Neither the Higher Education Statistics Agency Limited nor HESA Services Limited can accept responsibility for any inferences or conclusions derived by third parties from data or other information supplied by HESA Services.

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# Contents

<b>Executive Summary</b>	<b>5</b>
<b>1. Introduction</b>	<b>10</b>
<b>2. Methodology</b>	<b>15</b>
2.1 The DLHE data set	15
2.2 Defining the sample	16
2.3 Defining major public sector occupations	16
2.4 Defining educational attainment	20
2.5 Statistical significance	24
<b>3. Prior Educational Attainment, by Occupation</b>	<b>26</b>
3.1 Results	27
3.2 Robustness checks	31
3.3 Subgroup analysis	33
3.4 Summary and policy implications	38
<b>4. Prior Educational Attainment of New Secondary School Teachers by Subject Area</b>	<b>39</b>
4.1 Policy context	40
4.2 Numbers of new teachers by subject area	42
4.3 Educational attainment of new teachers by subject area	44
4.4 Summary and policy implications	49
<b>5. Conclusion</b>	<b>51</b>
<b>Appendix</b>	<b>54</b>
<b>References</b>	<b>67</b>

# Executive Summary

Public sector pay has been squeezed since public spending cuts began to take effect from 2011, and it looks set to be squeezed even further up to 2020. However, this comes on the back of an increase in public sector wages relative to those in the private sector during the Great Recession. There is currently significant policy interest in the extent to which continued stagnation in public sector wages will affect the ability of the public sector to recruit and retain high-quality workers, although to date little is known about the potential effects.

We seek to add to this evidence base by examining how levels of educational achievement (on entry to higher education) have changed over time for new graduate recruits to major public sector occupations relative to all occupations. Educational achievement is not a direct measure of worker quality, but it is likely to correlate highly with individuals' skills and the wages they are likely to be able to receive.

We look in detail at the trends for teachers, doctors, nurses and National Health Service (NHS) professions allied to medicine, as well as looking more briefly at civil servants, police officers and prison service workers, for whom it is more difficult to obtain robust data. Given the particular set of challenges affecting the recruitment of new teachers, we also look in detail at the trends for teachers by major subject area. Our main source of data is the Destination of Leavers from Higher Education (DLHE) survey, which surveys all leavers from higher education across the UK six months after they graduate.

## Public sector earnings

**Average wages higher in the public sector, but mostly due to differences in the characteristics of public and private sector workers**

In 2015–16, average hourly wages were about 14% higher in the public sector than in the private sector, according to the Labour Force Survey. After accounting for differences in education, age and experience, this gap falls to about 4%.

**Wage gap between public and private sector workers has varied a lot over last decade**

In 2006–07, the wage gap stood at 3.7% in favour of the public sector, after accounting for differences in education, age and experience. This rose to reach 6.0% by 2010–11. This rise is explained by freezes in private sector wages during the recession, accompanied by steady growth in public sector wages. The wage gap fell back to 3.6% by 2015–16 as public sector wages were squeezed and private sector wages slowly recovered. At the same time, the generosity of public sector pensions has been reduced, although they are still more valuable than in the private sector.

**Public sector wages set to fall significantly relative to private sector wages up to 2020**

On the basis of current forecasts and policy, we expect public sector pay to fall by 5 percentage points relative to private sector pay between 2015 and 2020. This would take the raw wage gap to its lowest level for at least 20 years.

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**Large differences in wages across young graduate workers in major public sector occupations, but relative wages hold steady compared with all young graduates**

Average wages for doctors aged 21–30 are relatively high, placing them at around the 80<sup>th</sup> percentile amongst all graduates in the same age bracket. Teachers are around the 60<sup>th</sup> percentile, nurses around the median and NHS professions allied to medicine are generally just below the median. These differences are largely steady over the course of the recession and recovery. This suggests that these young public sector graduates have seen similar wage changes to all graduates in the same age bracket.

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**Prior educational achievement of new graduate entrants to major public sector occupations**

**Use educational achievement on entry to higher education as main measure of educational achievement**

We use individuals' Universities and Colleges Admissions Service (UCAS) Tariff Points Score on entry to higher education as our main measure of educational achievement. We convert this into a rank (or percentile) amongst all higher education leavers who were born in the same year; for example, those at the 80<sup>th</sup> percentile have a UCAS point score greater than 80% of higher education leavers in the same cohort. We then examine the average educational achievement of individuals observed in a set of major public sector occupations six months after graduating.

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**Educational achievement of new teachers looks very similar to all higher education leavers as a whole**

The average (median) educational achievement of new teachers is around the 45<sup>th</sup> percentile of all higher education leavers (equivalent to around three A Levels and an AS Level at grade B). There is a very wide distribution around this average, which roughly follows the distribution for all leavers of higher education.

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**Little change over time for teachers as a whole, but different trends by route of entry**

Over time, there has been little change in the average relative educational achievement of new teachers. However, there has been an increase amongst primary and secondary school teachers coming straight from an undergraduate degree, offset by falls among graduates starting postgraduate teaching courses in the UK (e.g. Postgraduate Certificate of Education (PGCE) in England).

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**Large (and expected) variations across NHS occupations, but almost no change over time in each occupation**

The average (median) educational achievement of new doctors is at around the 85<sup>th</sup> percentile amongst all higher education leavers (equivalent to four A grades at A Level), with relatively little variation around this average. For NHS professions allied to medicine, the average is just above the overall median for all higher education leavers (equivalent to one A Level at grade A, two A Levels at grade B and an AS Level at grade B), and for nurses it is around the 30<sup>th</sup> percentile (closer to three A Levels and an AS Level at grade C). Relative average attainment of all of these groups has been remarkably stable between 2006–07 and 2014–15.

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**Little evidence of change in educational achievement of new graduates going into police or civil service**

The average educational achievement of new graduate civil servants remains around the median of all higher education leavers over time and new graduate police officers remain around the 40<sup>th</sup> percentile.

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**Almost no differences in levels or trends by gender, but some differences by region and country**

Amongst teachers, the lowest level of educational achievement across regions and countries is seen for new teachers in London (which is somewhat surprising given the higher measures of school quality in London). The highest levels are in Northern Ireland. There has also been a narrowing of geographical differences for teachers, with the largest growth in educational achievement amongst new teachers in Wales. For doctors and NHS professions allied to medicine, there is less geographical variation. However, for nurses, we see differential regional trends, with growth in educational achievement amongst nurses in Wales and the North West of England, and falls elsewhere.

**Little evidence that public sector pay changes to date have affected quality of new recruits, but bigger changes in pay are coming**

Our results are consistent with pay and pension changes having little effect on the quality of new graduate recruits to major public sector occupations. It may be that non-pay factors have a larger effect on decisions to join one of these occupations (e.g. motivation, workload or employment benefits). A larger squeeze in public sector wages is likely to occur up to 2020, which may have different consequences.

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## **Prior educational achievement of new teachers by subject area**

**Large increases in bursaries and scholarships for teachers with top degrees in shortage subjects**

Trainee teachers with a first-class degree in physics and modern foreign languages saw their eligibility for bursaries increase from a maximum of £9,000 and £6,000, respectively, in 2011–12 to the much higher level of £25,000 across both subjects by 2015–16. These are tax-free and not conditional on becoming a teacher.

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**New teachers in shortage subjects have relatively high levels of educational achievement, but levels have not risen over time**

The average educational achievement of new teachers in high-priority subjects (physical sciences, maths and computing and modern foreign languages) is relatively high at around the 60<sup>th</sup> percentile of all higher education leavers. This is at least as high as amongst all graduates in each of their respective subject areas. There is, however, no evidence of any increase in educational achievement of new teachers in these areas since the introduction of more generous bursaries and scholarships.

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**Lower levels of educational achievement for other subject areas, and some declines over time**

For other (non-priority) subjects, the average educational achievement of new teachers is lower on average, generally around the median for all higher education leavers, or below in some cases. For the subject areas with the lowest bursaries (English, classics and history), there is evidence of a decline in educational achievement of new graduate teachers, both relative to all leavers from higher education and relative to leavers in their respective subject area.

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**More generous bursaries could have prevented a decline in educational achievement in shortage subjects, but too early to judge full impact**

The combination of no change in educational achievement of new teachers in shortage subject areas and declines elsewhere is consistent with more generous bursaries preventing a more general decline. However, we have not conducted a full evaluation of the change in bursaries, and many other factors are likely to have affected teacher recruitment over the same period. This policy is also only likely to be a success if it leads to high-achieving teachers in shortage subjects staying for a sustained period, and it is too early to make a judgement here.

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# 1. Introduction

The gap in pay between public and private sector workers has varied a lot over the last decade. Figure 1.1 illustrates this by showing the percentage difference in hourly pay between public and private sector workers from 1998–99 onwards, both in raw terms and after controlling for differences in the characteristics of public and private sector workers.

During the Great Recession, private sector pay was held back, whilst public sector pay continued to rise, largely in line with three-year deals that had already been agreed. As a result, public sector pay rose relative to that in the private sector. The gap rose in raw terms from just over 12% in 2007–08 to around 17% by 2010–11.

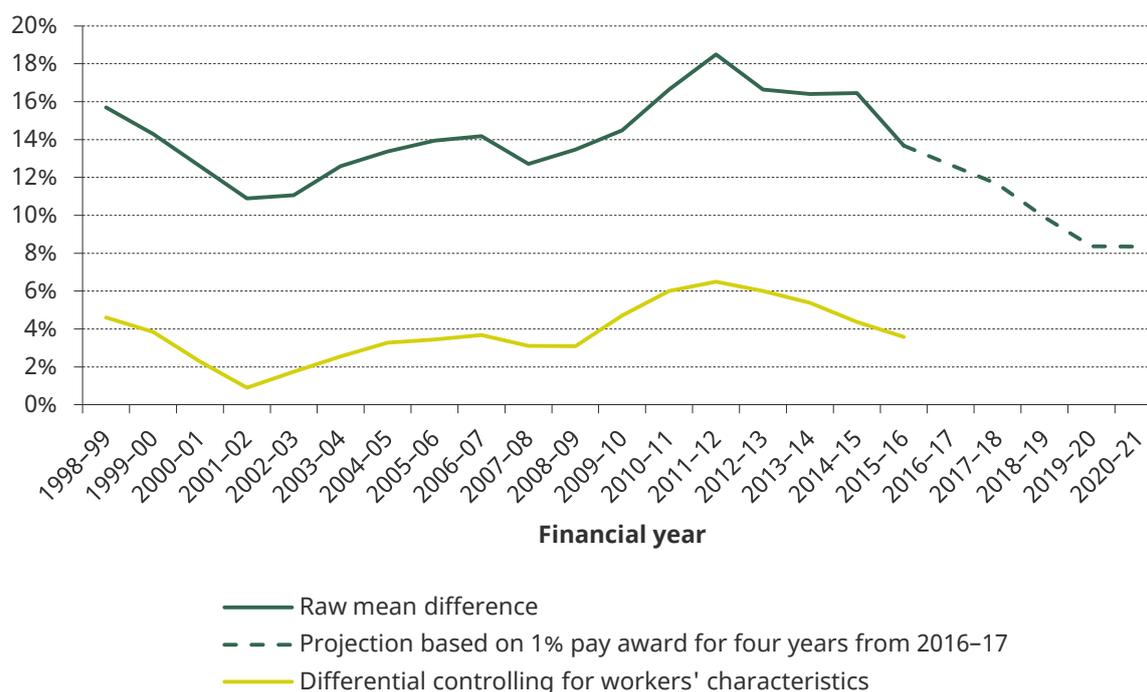
After accounting for differences in the characteristics and skills of public and private sector workers, the estimated gap in pay tends to be considerably lower. The absolute size of this gap depends on exactly which characteristics one controls for (Cribb, Emmerson and Sibietta, 2014). Here, we estimate the pay gap after controlling for differences in education, age, gender, experience and region. This gives an estimated pay gap of around 3% in 2007–08, which then rose to about 6% by 2010–11.

From 2010 onwards, public sector pay increases slowed with pay freezes for all but lowest paid workers in 2011–12 and 2012–13 and an average settlement of 1% per year from 2013–14 to 2015–16. However, a decline in private sector pay following the recession meant public sector pay remained above its pre-crisis level relative to the private sector throughout most of the last parliament.

In the 2015 Summer Budget, the then Chancellor announced that a tight public sector pay settlement would apply throughout the current parliament, with a cap of 1% on the average pay settlement across most public sector workers through to 2019–20. The latest forecasts from the Office for Budget Responsibility (OBR) imply greater growth in private sector earnings over the next few years. Figure 1.1 shows that the pay gap is likely to fall back to a level well below its most recent lows in the mid-1990s and early 2000s (to just over 8% in raw terms by 2020, compared with a raw gap of around 10% in the early 2000s). Forecasts after the 2016 Budget implied that the raw pay gap would fall to the much lower level of 4% by 2020. However, the OBR has downgraded its forecasts for private sector earnings growth following the vote to leave the European Union and there almost certainly remains considerable uncertainty around these forecasts.

Reforms to public sector pensions – most notably to how they are indexed – have also reduced their value to public sector workers, further reducing the generosity of total remuneration in the public sector relative to the private sector (Cribb and Emmerson, 2016).

**Figure 1.1. Percentage difference between hourly pay in public and private sectors over time, with and without controls for worker characteristics**



Note: Data up to 2014-15 estimated using Labour Force Survey. Hourly pay is calculated based on usual paid hours, including any overtime. Differential controlling for workers' characteristics controls for differences in age, gender, education, experience and region. Projections are based on OBR forecasts, including 1% pay awards from 2016-17 to 2019-20.

What will be the implications of the continued squeeze on public sector remuneration for the recruitment of high-quality workers across public sector occupations? This will be one of the key questions for all pay review bodies over the next few years. It is therefore essential that policymakers are provided with early warning indicators of the impact of changes in relative pay on the ability of the public sector to recruit high-quality workers. Some information on vacancy data is available, but up-to-date information on the likely quality of recruits is not readily available to pay review bodies at present.

In this report, we seek to address this issue by analysing how the level of educational attainment of new recruits to major public sector occupations has changed over time. Throughout, we use prior educational attainment of public sector employees as an indirect proxy for quality. Although this is not a perfect measure, higher levels of educational attainment are likely to correlate with higher skills and, potentially, an ability to deliver higher-quality public services.

Existing empirical evidence on the link between pay and worker quality looks at historical differences and the effects of local variation in pay. Nickell and Quintini (2002) show that declines in the relative pay of public sector workers amongst two cohorts born in 1958 and 1970 have been associated with a reduction in the average cognitive ability of men entering the public sector. We also know that declines in relative teacher pay in the US have been associated with declines in the cognitive aptitude of individuals going into teaching (Hoxby and Leigh, 2004; Leigh, 2012). Evidence also suggests that the quality of public sector workers is reduced when local private sector pay is higher relative to the

public sector, which has been shown for nurses (Propper and Van Reenen, 2010), teachers (Britton and Propper, 2016) and the police force (Crawford and Disney, 2016).

Such evidence, however, is only of limited value when considering the likely impact of the current national squeeze on public sector pay on the quality of new recruits in the UK. There are big differences between the UK and US systems, which might limit the value of US evidence for UK policymakers. The historical evidence for the UK might also be of limited value given the substantial changes to institutions, society and the economy that have taken place over time. Furthermore, the recent evidence that does exist largely looks at links between overall pay and the workforce as a whole, rather the impact of the pay squeeze on new entrants, where the effect is likely to be most acute. We also know very little about how the quality of recruits has changed more recently, including during the Great Recession and the recovery to date, during which time the pay gap between public and private sector workers has changed significantly.

In principle, differences in pay between public and private sector workers can affect the observed level of educational attainment of public sector workers through a number of mechanisms. First, it could affect initial career or occupational choices, with those with higher levels of educational attainment becoming relatively more likely to choose to join the private rather than the public sector as the size of the pay differential shifts in favour of the private sector. Second, reduced levels of relative public sector pay could affect the retention of public sector workers with higher levels of educational attainment if these individuals are more able (or more willing) to switch to alternative employment in the private sector.

In this report, we focus on the first of these mechanisms (recruitment) as administrative data are able to fill important evidence gaps as to how the quality of recent recruits to major public sector occupations has changed. The nature of the available data means that we focus exclusively on graduate recruitment. In particular, we make use of large-scale survey data on initial occupational choices of graduates across the UK (DLHE survey) linked to their higher education records and prior exam results. This allows us to compare the changing educational attainment of recent graduate recruits to major public sector occupations over time. Although this will not provide direct measures of how the quality of the workforce is changing, educational attainment is highly associated with later life earnings, which in turn suggests that private sector employers value the skills that are generated. Given that direct measures of worker quality are not available, this will provide the closest approximation to changes in the quality of the public workforce over time that can be produced using available data. The methods proposed could also be applied in future to provide a detailed assessment of how the composition of new graduate recruits to the public sector changes as the 1% pay settlement is implemented over the current parliament.

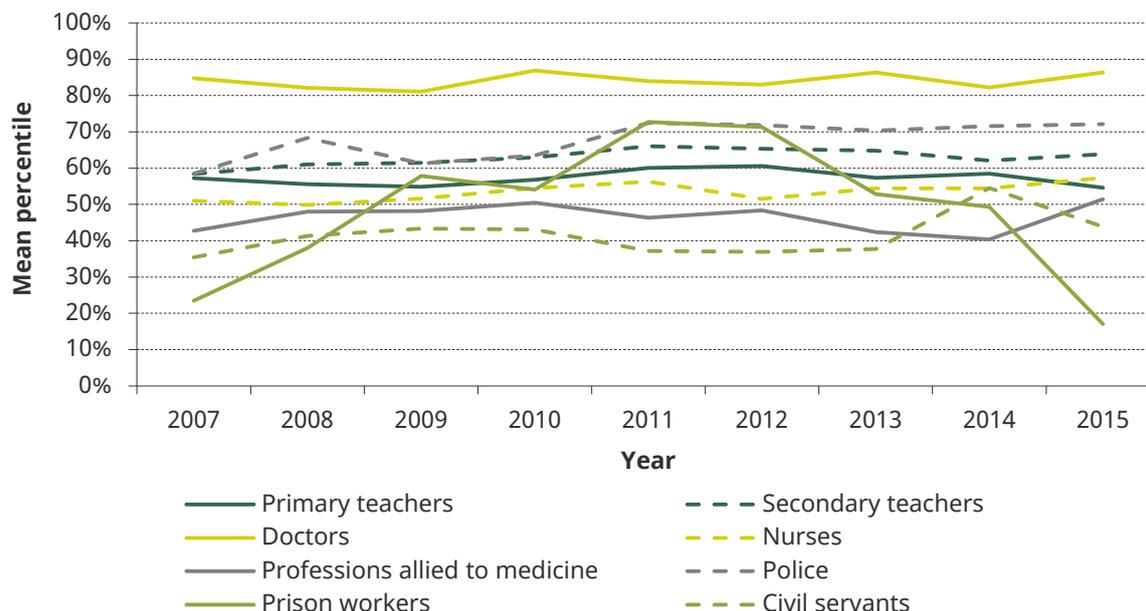
Given our focus on the destinations of new graduates, Figure 1.2 shows the average earnings percentile position over time of young graduates working in the major public sector occupations that we consider in this report (primary and secondary school teachers, doctors, nurses, NHS professions allied to medicine, police, prison service

workers and civil servants). To concentrate on the group covered by our education data, we focus on graduates aged 22-30 only.<sup>1</sup>

With the exception of NHS professions allied to medicine, the average earnings percentiles of these different occupations have not changed all that much. Doctors remain just above the 80<sup>th</sup> percentile of all young graduates, secondary school teachers just above the 60<sup>th</sup> percentile and primary school teachers just below the 60<sup>th</sup> percentile. Nurses are just above the median and NHS practices allied to medicine are just below the median over time. Graduate entrants to the police service remain just below the median over time, whilst civil servants remain around the 40<sup>th</sup> percentile over most of the period, before an increase to closer to the median in 2014. The trends for graduate entrants to the prison service are more volatile over time, although sample sizes are very small for this group meaning that the results for this group are not reliable. They also do not cover the majority of new prison officers, which is not typically a graduate profession.

Overall, this suggests that the earnings levels of young graduate workers in the private sector have been squeezed to a similar extent to those in the public sector over recent years. This is consistent with our earlier evidence showing that the overall public-private sector pay differential has not changed significantly over recent years. However, as already noted, reforms to public sector pensions have almost certainly reduced the generosity of overall remuneration in the public sector relative to that in the private sector. Such reforms are also likely to have had a larger impact on the younger workers we consider in this report (Cribb and Emmerson, 2016).

**Figure 1.2. Young graduate earnings percentile by occupation**



Note: Weekly earnings measured as usual weekly earnings. Sample only includes graduates aged 22-30 and percentiles are also defined amongst this population.

Source: Authors' calculations using the Labour Force Survey.

<sup>1</sup> This is a slightly wider age band than we use for our analysis of educational attainment, where we focus on individuals aged 21-25. We use a larger age band here to ensure sufficient sample size and because when individuals make occupational decisions, they are likely to consider pay at later ages too.

The rest of this report proceeds as follows. In Section 2, we detail the data and methodology used in the analysis. In Section 3, we document how the educational attainment of new graduate recruits to major public sector occupations has changed over time. In Section 4, we dig deeper into issues around teacher recruitment as schools face some particular challenges in recruiting sufficient numbers of teachers across individual subject areas over the next few years. We conclude in Section 5 and we discuss the implications of our results for policymakers.

## 2. Methodology

The aim of this report is to analyse how the educational attainment of new recruits to major public sector occupations has changed over time, where educational attainment is used as an imperfect but informative proxy for worker quality. In this section, we outline the data and methodology we use in the later analysis. In Section 2.1, we describe the data in more detail. In Section 2.2, we discuss the choices we made in defining our sample in order to make our results as informative and representative as possible. In Section 2.3, we set out how we identify those going into major public sector occupations. Finally, in Section 2.4, we explain how we construct a measure of educational attainment that allows us to track trends and levels over time in a consistent way.

### 2.1 The DLHE data set

The DLHE survey is a survey of all graduates leaving higher education across the UK each year. The DLHE survey is sent to all leavers from higher education programmes to collect information on what they are doing six months after finishing their course. Along with a host of other information, this records detailed information on the occupations of those employed, in the form of Standard Occupational Classification (SOC) codes that allow us to identify those who have gone into major public sector occupations. Although not all graduates respond to the survey, response rates are relatively high, with approximately 79% of graduates responding to the latest survey.<sup>2</sup>

One limitation of these data is that the survey is carried out six months after graduation – plausibly before many graduates have made significant career choices. An additional follow-up survey is conducted three and a half years later (known as the Longitudinal DLHE sample); however, the response rate for this second survey is much lower, leading to problematic issues relating to non-random response. Thus, in this report, we focus on the six-month survey.

A further limitation of using these data is that it limits us to graduate recruits who have just left higher education in the UK. We are thus unable to look at those who move into major public sector occupations at a later stage, such as joiners from the private sector, or those educated abroad.

Each year's survey covers those graduating between 1 August and 31 July (e.g. the 2006–07 survey covers those graduating between 1 August 2006 and 31 July 2007). Data are collected each year in two tranches: those graduating between 1 August and 31 December are covered by the first collection in April, and those graduating between 1 January and 31 July in the following January. Thus, the information on most graduates' employment comes from around six months after graduation. In all graphs in this report, year refers to the final year of individuals' courses (e.g. 2008–09 means that they completed their course between 1 August 2008 and 31 July 2009).

The DLHE data can be linked to Higher Education Statistical Agency (HESA) record data, such as subject of study, institution, degree classification, key characteristics about individuals (e.g. gender and age) and examination results on entry into higher education.

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<sup>2</sup> <https://www.hesa.ac.uk/stats-dlhe>

This enables us to document changes in the educational attainment of recent graduate recruits into major public sector occupations.

## 2.2 Defining the sample

We use these linked data to look at graduates leaving higher education for the years from 2006–07 through to 2014–15. This time frame allows us to look at years before the Great Recession, falls in private sector wages and increasing public sector wages during the recession itself, and the subsequent recovery when growth in both public and private sector wages has been weak.

In doing so, we link together two different versions of the DLHE data, as the way data were constructed changed in 2011–12. However, there is no evidence of any clear structural breaks in the time series we observe.

We focus on young leavers – those aged between 21 and 25 – in order to ensure comparability of educational measures. Graduates outside this age group may have come through different education and examination systems, and it would be difficult to construct comparable relative educational measures for them because of their relatively small secondary school graduation cohorts in this data set. For example, someone graduating in 2010 at the age of 40 would likely have a very different A Level profile to someone aged 21. Furthermore, there would be relatively few others who had taken their A Levels in the same year as a 40-year-old individual in our sample, thus making it difficult to make consistent comparisons against others in their cohort. As a whole, excluding those outside the 21–25 age group excludes 40% of the sample.

Furthermore, we restrict our sample to those who have completed a full-time course in higher education, in order to restrict ourselves to those new to the job market, so that most entrants in our sample have comparable (i.e. not significant) work experience.

## 2.3 Defining major public sector occupations

This study aims to look at graduate entrants into major public sector occupations, in particular, teachers, doctors, nurses (including midwives), health professions allied to medicine, police workers, prison workers and civil servants. We define these by SOC codes, shown in Appendix Table A.1. Although we cannot explicitly separate out those working in these occupations in the private sector, most of these occupations are dominated by public sector workers and, where it is possible to separate out private sector workers, there seems to be little impact on our results.<sup>3,4</sup>

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<sup>3</sup> For the years 2011–12 to 2014–15, we are able to separate private sector teachers from those teaching in the public sector, who we exclude from the sample. These make up a small share of total teachers (less than 5%) and have a mean educational attainment only slightly below that of public sector teachers (around 5 percentage points). This results in a discontinuity in the analysis, slightly increasing the mean educational attainment percentile of teachers for the years 2011–12 to 2014–15. However, the effect is likely to be very small.

<sup>4</sup> For the years 2007–8 to 2010–11, there is some information in the data on whether those in the medical professions are working in the NHS or not. For professions allied to medicine and nursing, the educational attainment is very similar for those in and out of the NHS, and for doctors there is only a very slight difference – thus, we do not separate out non-NHS workers.

The problematic case is civil servants, where we are only likely to be capturing a subset of those going into public administration. The specific occupations we do consider are likely to be dominated by public sector workers. However, there are many other occupations that would include civil servants and also a large number of private sector workers (e.g. economists or statisticians). Therefore, we show the results for the civil servants we can observe, but we acknowledge that this is likely to be a partial picture.

We restrict the group of graduate entrants into the above professions that we look at to those going into full-time work. This is intended to exclude individuals who are not fully settled into these occupations, and this amounts to excluding 18% of those going into our set of occupations.

This group is further restricted to those going into the relevant occupations within the UK (excluding Guernsey, Jersey and the Isle of Man), as those working abroad are clearly not entering the UK public sector.

We define graduate entrants into major public sector occupations to include graduates from both degree and non-degree undergraduate courses. The inclusion of graduates from non-degree undergraduate courses is particularly important in looking at entrants into nursing – in the early years of the sample, non-degree graduates account for around 50% of higher education leavers entering nursing. This falls to almost zero by 2014–15 as many nursing courses were reclassified as degree courses over this period and the requirements for entry into nursing changed.

Unfortunately, the DLHE data do not contain A Level or UCAS tariff scores for the vast majority of individuals leaving postgraduate courses. This is because the application system for postgraduate courses is different, largely being run by individual institutions, and particular A Level scores do not generally form part of the entry requirements for postgraduate courses. This presents a problem because these are the measures that we use to compare educational attainment. The extent of this problem is shown by the percentage of leavers from higher education going into major public sector occupations that have come from postgraduate courses (see Appendix Figure A.1). Across most occupations, this is not a substantial problem. However, a high fraction of individuals enter teaching from postgraduate routes. For example, among secondary teachers, the number coming from postgraduate courses varies between 70% and 90% over the course of our sample. Thus, restricting the sample to undergraduates would miss a large proportion of new secondary teachers, as well as a smaller but still significant proportion of primary teachers.

To overcome this problem, we proxy for the missing postgraduates by including in the sample undergraduate leavers (for whom we do, for the most part, have educational attainment) who go directly on to postgraduate courses that have a high rate of feeding into public sector occupations. For the 2006–07 to 2010–11 data, postgraduate courses are classified by SOC codes and thus it is straightforward to match these courses to likely public sector occupations. For the 2011–12 to 2014–15 data, postgraduate courses are only defined by Joint Academic Coding System (JACS) codes, which classify courses into a set of particular subject groupings. In order to create a proxy postgraduate sample for these years, we first define a list of relevant postgraduate courses by subject. We then adjudge those courses from this list from which over 50% of postgraduate leavers went on to

public sector occupations as courses leading to public sector occupations.<sup>5</sup> The list of courses we use for years 2011–12 to 2014–15 is detailed in Appendix Table A.2.

For example, by far the most important group here is individuals who go to study a PGCE. This represents about 5,000 individuals each year, on average. We find that around 80% of those graduating from a PGCE work as a teacher six months after graduation. Thus, we use those who are enrolled on PGCE courses as a proxy for teachers from postgraduate routes. This is not a perfect measure as not all individuals who enrol on a PGCE course are teaching six months after their expected qualification date. However, the entry figure is high and this method clearly represents an improvement compared with excluding them.

One further problem is that the data do not allow us to sort these PGCE students into primary or secondary teaching. As a result, we look at three distinct sets of teachers: those working in primary schools, those working in secondary schools and those enrolled on a PGCE. Because those working in primary or secondary education in our sample have begun to do so immediately after graduating, the vast majority of the primary teachers in our sample have come from a B.Ed, whilst it is likely that a significant proportion of the secondary teachers in our sample are entering the profession through Teach First or School Direct (unsalaried). This latter group of individuals entering secondary school teaching after an undergraduate degree is relatively small in number in our sample, around 1,000 per year.

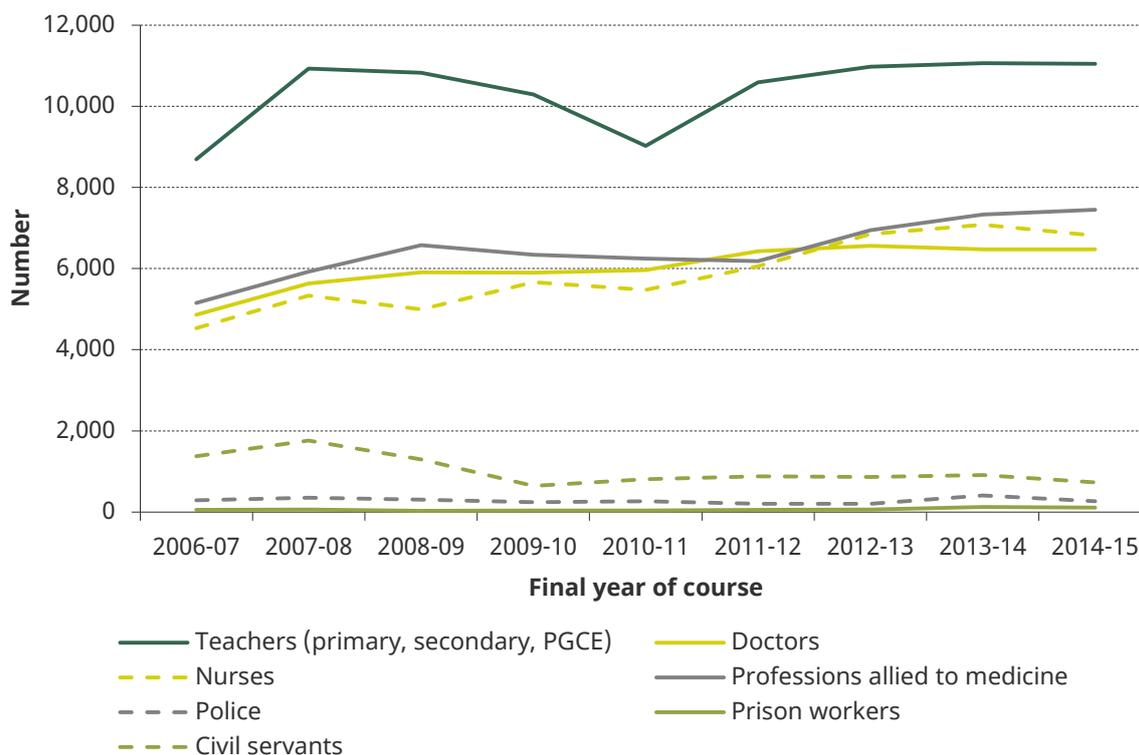
Figure 2.1 shows the total numbers of those we define as going into major public sector occupations in the UK over time given all the above adjustments. This shows that teaching is very clearly the largest recruiter of new graduates in the sample, with around 11,000 each year. Appendix Figure A.2 splits this into the three entry routes we observe (primary and secondary teachers coming from undergraduate courses, and entry onto a PGCE course). This shows that the PGCE route is the most common, followed by entry into primary school teaching straight from being an undergraduate. Entry into secondary school teaching straight from being an undergraduate is much smaller, though growing slightly over time.

The next largest recruiters are those working in health-related occupations, which have all grown significantly between 2006–07 and 2014–15. In particular, the number of individuals entering NHS professions allied to medicine (e.g. radiographers and physiotherapists) has grown from around 5,000 in 2006–07 to 9,000 in 2014–15, whilst the numbers of doctors and nurses have each grown from around 4,500–5,000 to nearly 7,000 over the same time frame.

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<sup>5</sup> We also include postgraduate courses in pre-clinical medicine, clinical medicine, and others in medicine and dentistry, despite their not exceeding this 50% pass-through threshold. Most of those we observe who have taken these courses and are not in work as a doctor (or a dentist) are individuals for whom their occupation is unknown. Thus, we think it is likely that having pursued postgraduate medical studies, many of them will seek, or are already seeking, jobs in the profession.

**Figure 2.1. Number of higher education leavers going into major public sector occupations**



Note: Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

The numbers of graduates going into policing, the prison service and the civil service are all relatively low. As a result, the main focus of this report is on teaching and the medical professions. For these professions, there is reason to believe the sample should be representative enough of new recruits to be informative. Data from the Schools Workforce Census show that there were 24,200 newly qualified entrants into teaching in state-funded schools in the UK in the year to November 2014 and thus, as can be seen from the graph, our sample is covering nearly 50% of this group (Department for Education, 2015). The reason we do not capture 100% of this group will be a combination of non-response to the survey and our sample restrictions (e.g. excluding entrants aged over 25).

To better understand the effects of our sample restrictions across all our occupational groups, Table 2.1 shows how the total number of individuals in each occupation across all years of our data (2006-07 to 2014-15) changes as we further refine the sample.

Restricting to individuals aged 21-25 clearly reduces the sample size across all occupations. Amongst nurses, the sample falls by about two-thirds, by around 50% for NHS professions allied to medicine and by around one-third for doctors and teachers. Restricting to those leaving undergraduate courses only has a significant impact on the numbers of observed primary and secondary teachers, which is unsurprising given the high rates of entry from postgraduate courses. Many of these will then already be counted

as individuals going on to PGCE courses. Restricting to those with non-missing UCAS scores does not have a substantial impact on sample sizes across most occupations, and this does not change significantly over time (see Appendix Figures A.3 and A.4). The only exception is nurses, where there is again a big reduction in the sample size and an increase over time in terms of the proportion of nurses with non-missing data (see Appendix Figure A.4). We therefore conduct additional sensitivity analysis for nurses.

**Table 2.1. Sample size, by occupation**

Occupation	All	All aged 21-25	All aged 21-25, graduating from full-time undergraduate courses	All aged 21-25, graduating from full-time undergraduate courses with non-missing UCAS tariff data
Primary teachers	102,979	68,355	37,842	30,163
Secondary teachers	89,221	54,243	10,848	6,110
PGCE teachers	66,203	50,121	47,396	42,828
Doctors	87,193	55,901	54,209	45,718
Nurses	181,526	56,774	52,794	27,356
NHS professions allied to medicine	129,417	63,843	56,316	49,485
Police	10,140	3,044	2,546	1,881
Prison workers	2,168	630	565	480
Civil servants	22,119	11,416	9,264	8,271

Note: Numbers for each occupation include individuals observed as on a postgraduate course six months after graduation likely to lead to employment in that occupation. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

## 2.4 Defining educational attainment

In defining our measure of educational attainment, we aim to create a measure that is comparable across all individuals and occupations in the sample across time, and which is readily understandable.

There are three main measures in the DLHE data set that could be used. First, the data include individuals' degree classifications at the end of their course. Second, the data include individuals' UCAS tariff points score on entry to higher education. Third, from 2007-08 onwards, the data also include individuals' best four A Levels, where available.

We do not use individuals' degree classification as our measure of educational attainment for two main reasons. First, the measure is relatively coarse, with over 70% of individuals

leaving with an upper-second or first-class degree in 2014–15.<sup>6</sup> This prevents us from detecting any fine changes over time. Second, there is evidence to suggest that there is significant heterogeneity in the returns to degrees in different subjects and from different institutions (Britton et al., 2016). It is therefore not clear that degree classifications from different subjects and institutions are always comparable.

We focus on prior measures of educational attainment on entry into higher education: the UCAS tariff score and individuals' best four A Levels. These measures are more comparable across individuals and more finely graded. The UCAS tariff points converts 'tariffable' qualifications on entry (generally A Level or other Level 3 qualifications) into a points score. Some common qualifications and their associated points are shown in Table 2.2. We also use this conversion table to convert individuals' best four A Levels into a points score.

**Table 2.2. Examples of UCAS tariff points**

Qualification	UCAS tariff points
A* – A Level	140
A – A Level	120
B – A Level	100
C – A Level	80
D – A Level	60
E – A Level	40
Distinction – BTEC (Group C)	40
45 – International Baccalaureate Diploma Points	720
30 – International Baccalaureate Diploma Points	392

Note: The International Baccalaureate Diploma is an internationally recognised qualification taken instead of A Levels, which involves assessment in six separate subjects as well as a general compulsory core.

Source: UCAS tariff points pre-September 2016 measure, available at <https://graduates.teachfirst.org.uk/sites/graduates.teachfirst.org.uk/files/ucas-points-tariff-pre-17.pdf>.

Using the raw scores of either of these measures to track educational attainment over time would suffer from a number of disadvantages. In particular, the average points score rises over time and the spread of results has also changed over time. Furthermore, the UCAS tariff scoring system was slightly adjusted for courses starting after 2006–07, which leads to a small discontinuity.<sup>7</sup>

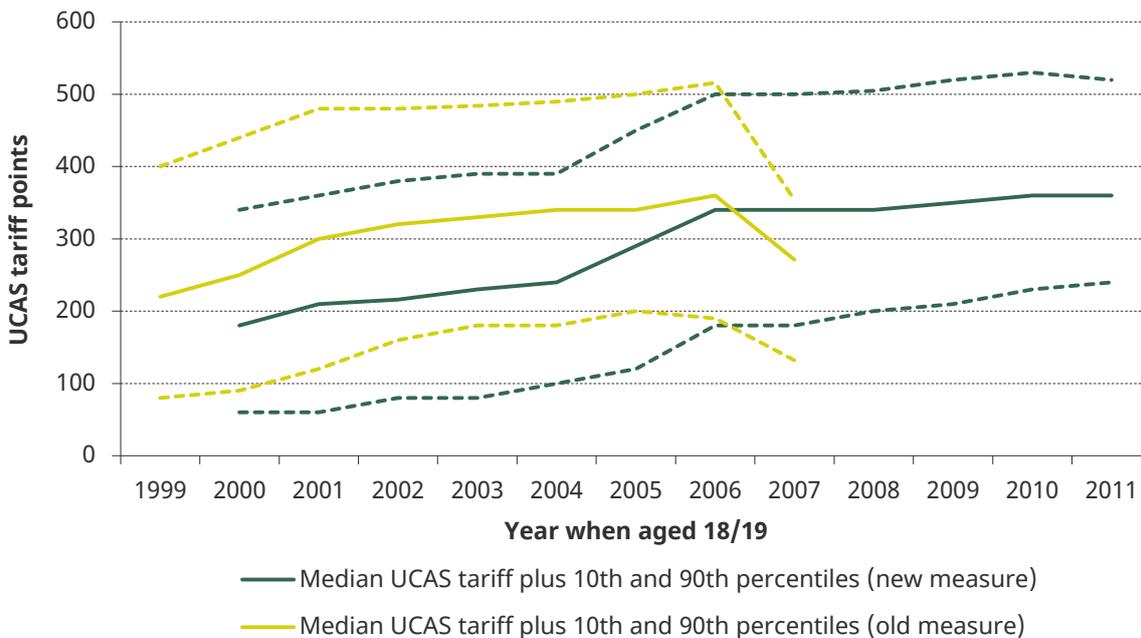
To illustrate this directly, Figure 2.2(a) shows the median UCAS tariff score over time under both the old and new UCAS scoring systems, together with the respective 10<sup>th</sup> and 90<sup>th</sup> percentiles, and by year in which we expect individuals took A Levels based on their age when leaving higher education. By and large, one should focus on the old system up to

<sup>6</sup> <https://www.hesa.ac.uk/data-and-analysis/students/qualifications>

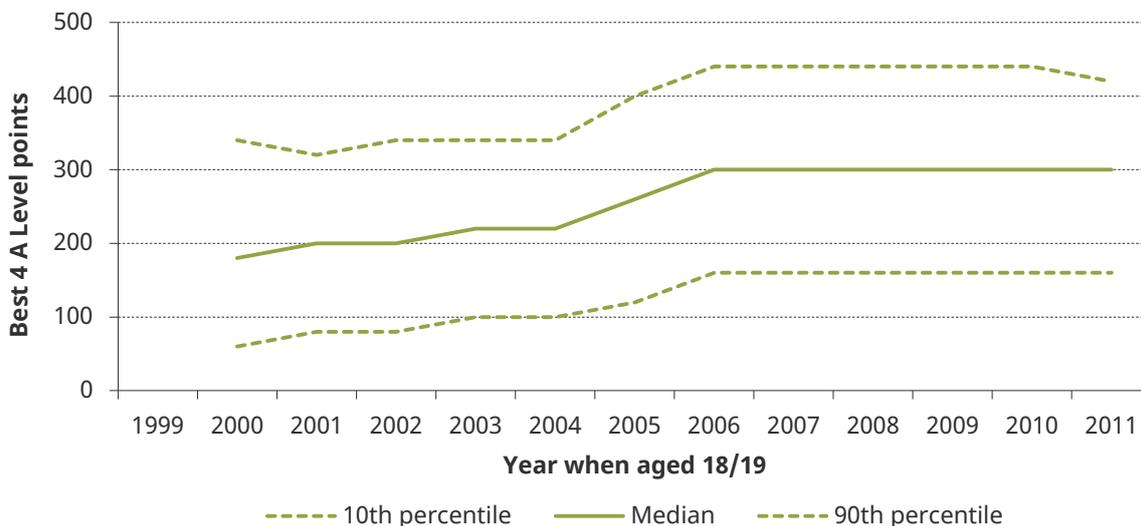
<sup>7</sup> Precise details on how the scoring system changed can be found at <https://www.hesa.ac.uk/support/documentation/tariffable>.

2006–07 and the new system afterwards. Some individuals were subject to the new system before this date and the old system afterwards, but these are small in number (as is shown directly in Appendix Figure A.5<sup>8</sup>). As can be seen, the median UCAS tariff score rises over time, from around 310 to 360 points under the old system from 2000–01 to 2006–07 and from 340 to 360 under the new system from 2006–07 to 2011–12. This also indicates that the shift to the new system in 2006–07 does not create a large discontinuity (as one

**Figure 2.2(a). Average UCAS tariff points score over time**



**Figure 2.2(b). Average best four A Level points score over time**



Note: Sample includes all individuals leaving higher education aged between 21 and 25 who completed their higher education course on a full-time basis.

Source: Authors’ calculations using DLHE survey 2006–07 to 2014–15.

<sup>8</sup> This could have occurred if individuals took A Levels later than expected, took a gap year or took courses of non-standard length.

would expect). A similar upwards drift also occurred in individuals' best four A Level scores (Figure 2.2(b)), though the raw average is lower, indicating that UCAS tariff scores are partly pushed up by qualifications other than A Levels.

This poses clear problems for the comparability of educational attainment over time. It is not clear whether such changes represent genuine changes in skills over time or changes in the way they are assessed.

For this reason, we adopt a *relative* measure of educational attainment over time. In particular, we use individuals' raw scores to construct a measure that reflects their position in the score distribution of their A Level cohort. We do this by calculating each individual's UCAS tariff score percentile within cohorts defined by year of taking A Level exams and the scoring system that was used. For example, someone who took their A Level exams in 2011–12 and scored 360 points under the new system would be at the 50<sup>th</sup> percentile (i.e. in the middle of the spread of UCAS points scores of those taking their A Level exams that year). The 50<sup>th</sup> percentile would also be assigned to an individual who took their A Level exams in 2002–03 and scored 310 UCAS points under the old system, because their UCAS score would fall in the middle of the spread of UCAS points scores of those taking their A Level exams in 2002–03. However, an individual who scored 230 UCAS points in 2010–11 under the new system would be at the 10<sup>th</sup> percentile. In this way, calculating percentile scores for each individual allows us to compare individuals' educational attainment without the comparison being skewed by general drifts over time in exam results. It allows us to say whether entrants into major public sector occupations have either high or low educational attainment as compared with all other graduates who took A Level or equivalent exams at the same time.

Clearly, expressing our results merely as percentiles or UCAS tariff scores is not particularly intuitive. We therefore convert a number of the key results into their equivalent in terms of A Level results. We convert results into 3.5 A Levels (i.e. three A Levels and an AS Level) as this represents the average number of entries for individuals currently taking A Levels.<sup>9</sup> For example the median UCAS score amongst individuals taking A Levels in 2011–12 was 360 points, equivalent to 3.5 A Levels at grade B.

The results presented later in this report are robust to changes in how these percentiles are calculated – in particular, calculating percentiles instead on cohorts defined by year of graduation from higher education has a negligible effect on either the trends or levels shown below.

We use percentiles calculated from UCAS tariff scores as our main measure rather than percentiles calculated from A level points scores as A Level scores are only available for individuals graduating from 2007–08 onwards and are relatively noisy in the early years of the data because of low sample sizes. In the later years, however, our results are robust to using percentiles calculated from A Level points scores (both for individuals' best three and best four A Levels). We show this directly as part of our robustness checks.

Throughout, we focus on median UCAS scores by occupation as our main measure of relative educational achievement, as well as presenting the 10<sup>th</sup> and 90<sup>th</sup> percentiles to give a sense of the spread of variation by occupation. We also show how the mean and

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<sup>9</sup> <https://www.gov.uk/government/collections/statistics-attainment-at-19-years>

median levels compare by occupation, which, by and large, give very similar sets of results.

One remaining issue with comparing educational attainment is that the UCAS tariff points scores awarded for Scottish Highers were revised upwards in 2010, meaning a jump in scores and percentiles for those taking them. We retain this group in our sample for completeness. Excluding them, however, makes little difference to the overall results, but the jump is clear when we isolate results for Scotland in Section 3.3. This is shown for illustrative purposes only and should not be interpreted as an increase in educational attainment in Scotland.

## 2.5 Statistical significance

When examining trends over time, it is important to analyse whether particular changes are statistically significant or not, i.e. whether or not they are likely to be driven by normal variation in the sample from year to year.

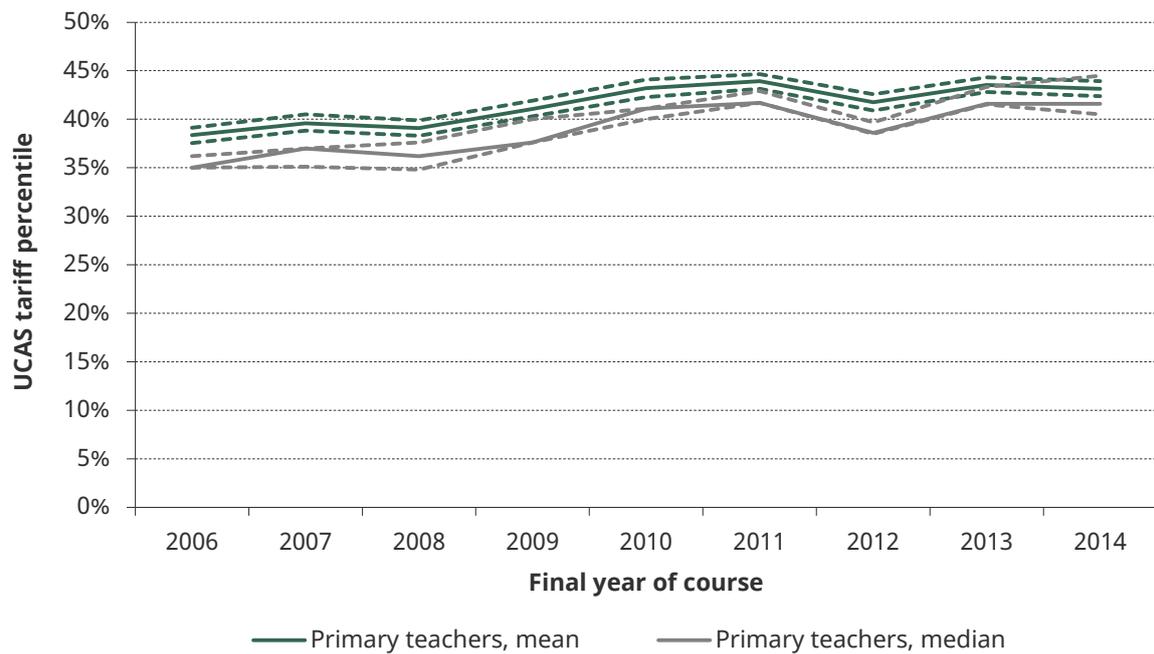
In analysing the median UCAS tariff points score over time, we are presented with two problems in judging whether trends are statistically significant or not. First, there is no well-defined expression for calculating standard errors around medians or percentiles. We therefore adopt the bootstrap approach, which is a method for estimating the distribution of a statistic or a feature of a distribution, such as the median (Horowitz, 2001). The approach taken here relies on repeatedly resampling from the data with replacement.<sup>10</sup> This allows one to calculate confidence intervals around particular statistics.

Second, UCAS tariff point scores are not wholly continuous, being multiples of 20. As a result, individuals can be grouped around particular values. If the number of individuals with a particular score is large enough, then this can lead standard errors to collapse to zero under the bootstrap approach. This creates a problem when we are using a particular variable as a proxy for some continuous underlying concept; for example, in this case, we are using UCAS tariff points scores as a proxy for underlying skills or ability. In particular, it can lead the confidence interval to alternate between zero and non-zero values, which is not helpful for testing hypotheses. To demonstrate this point and the problems it causes, Figure 2.3 shows the example of the implied 95% confidence interval around median UCAS tariff points for individuals starting as a primary school teacher from an undergraduate degree. As can be seen, the confidence interval for the median collapses at some points, as described above. This problem does not exist for the mean, where the confidence interval is more stable over time.

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<sup>10</sup> This ensures that bootstrapped samples are not identical to the original sample.

**Figure 2.3. Mean versus median UCAS tariff percentiles and confidence intervals – primary teachers**



Note: The figure only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1. Bootstrapping (with replacement) used to estimated confidence intervals (based on 500 repetitions).

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

In response to these issues, we only highlight notable trends in the text and we test whether these highlighted trends are statistically significant based on trends in the mean over time (shown in the Appendix). The calculated confidence intervals around the median are only shown for the example above, but the problem described above exists for all the trends we analyse, and figures are available from the authors on request.

### 3. Prior Educational Attainment, by Occupation

The overall aim of this report is to study the trends over time in the likely quality of new graduate recruits to major public sector occupations. As discussed in more detail in Section 2, we use data from the DLHE survey and we limit our sample to those aged between 21 and 25 and graduating between 2006–07 and 2014–15. Likely quality is proxied by educational attainment on entry into higher education (mostly A Level and equivalent exams) and measured as individuals' percentiles in the UCAS tariff distribution within their A Level exam cohort. As such, our measure of educational attainment is a purely relative one. This limits our ability to account for the possibility that skills in the overall population may be rising over time, but it allows us to be very clear in terms of how the skills of new entrants to public sector occupations are changing relative to other graduates in the same cohort.

The key question from a policymaker's perspective is whether changes in this measure of educational attainment can also be interpreted as changes in the quality of workers. In theory, this is an appealing link. Workers with higher levels of educational attainment are likely to have higher levels of cognitive skills, which may allow them to provide higher-quality public services. Furthermore, there is significant evidence to suggest that workers with higher levels of educational achievement also have higher levels of earnings, suggesting that these achievements are valued in the market (e.g. Blundell, Dearden and Sianesi, 2005; Walker and Zhu, 2011; Britton et al., 2016). However, the empirical link between educational achievement and direct measures of public sector worker quality is largely untested at present.<sup>11</sup>

However, public sector workers do seem to respond to differences in earnings potential outside of public sector occupations, and in ways that affect the quality of public services. Hoxby and Leigh (2004) find that earnings compression for teachers has reduced the number of very high skilled female teachers in the US. Britton and Propper (2016), Propper and Van Reenen (2010) and Crawford and Disney (2016) find that increased outside wage opportunities can reduce school quality, hospital quality and police applicant quality. This suggests a link between earnings potential in the private sector and worker quality in the public sector. Given that educational attainment is a strong predictor of earnings, it would therefore be surprising if there was no link between educational attainment and public sector worker quality.

Given the lack of availability of direct measures of worker quality, we therefore believe that our measure of educational attainment represents the best available proxy for changes in worker quality, and an increase in information for policymakers as compared with current evidence.

With these caveats in mind, we now present our main results. We start in Section 3.1 by showing the overall changes for the major public sector occupations. In Section 3.2, we

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<sup>11</sup> Empirical work to date has examined whether having a Masters level qualification affects the quality of teachers and it finds little evidence to suggest a strong connection (e.g. Rivkin et al., 2005; Aaronson et al., 2007). However, no work has examined the link between early and finer measures of educational achievement.

present some robustness checks for alternative definitions of educational attainment and in Section 3.3, we analyse whether there have been differential trends across particular subgroups. We summarise in Section 3.4 and we discuss the policy implications.

### 3.1 Results

In Figures 3.1–3.3, we show trends in the average (relative) educational attainment of graduate recruits by occupation. For each occupation, we show the median level of new entrants' educational attainment over time (as defined by their percentile amongst all graduates taking their A Level or equivalent exams in the same year) as well as the 10<sup>th</sup> and 90<sup>th</sup> percentiles of educational attainment among these new recruits. Figures showing trends in raw UCAS tariff scores, rather than percentile, are included in the Appendix for reference (see Figures A.6–A.8). We refer to these alternative figures throughout to aid interpretation.

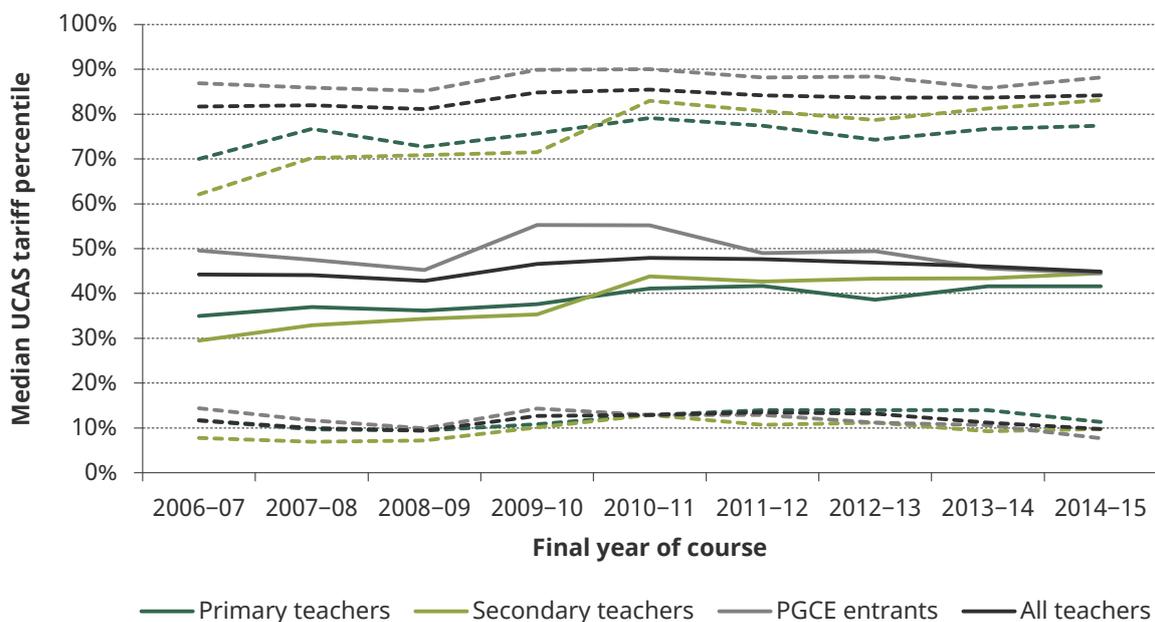
Figure 3.1 shows the median percentile of the educational attainment of new teachers from 2006–07 to 2014–15. This is shown separately for teachers starting primary and secondary school straight from an undergraduate degree (the latter group being relatively small in number) and those starting a PGCE course. We also show the trends for all three groups of teachers combined.

The three groups span the educational attainment distribution of graduates to a wide degree. The median amongst all three groups is just below the overall median in 2014–15 (42<sup>nd</sup>–45<sup>th</sup> percentiles). These median levels represent around 340–350 UCAS points across the three groups, equivalent to three A Levels and an AS Level at grade B.

Considering the wider distribution, the 10<sup>th</sup> percentile of new teachers is close to the 10<sup>th</sup> percentile of all graduates. There is more heterogeneity at the top of the distribution of teachers. The 90<sup>th</sup> percentile amongst undergraduate entrants into primary school is at around the 77<sup>th</sup> percentile in 2014–15, whilst the 90<sup>th</sup> percentile amongst PGCE entrants is close to the overall 90<sup>th</sup> percentile. Nevertheless, it seems very clear that the educational attainment of new entrants to teaching looks largely like that of all graduates, both for the average and the distribution.

There are different trends over time between groups, while teachers, as a whole, start and end the period at a similar level of educational attainment (around the 45<sup>th</sup> percentiles). There are clear increases in average educational attainment for both primary and secondary entrants from undergraduate degrees over the sample – primary entrants from the 35<sup>th</sup> to the 42<sup>nd</sup> percentiles and secondary entrants from the 30<sup>th</sup> to the 45<sup>th</sup> percentiles. These trends are also mirrored in the 90<sup>th</sup> percentile of educational attainment of entrants to both categories, although the 10<sup>th</sup> percentile of entrants to both categories remains more stable. One explanation for the upward trend in the educational achievement of secondary teachers coming from undergraduate degrees is the increasing role of Teach First, a programme aimed at attracting high-achieving graduates straight into teaching without requiring a pre-existing teaching qualification. However, this group as a whole is relatively small and there has been some volatility in the proportion of secondary school teachers coming from undergraduate degrees with non-missing data over time (see Figure A.3)

**Figure 3.1. Relative educational attainment of new teachers over time**



Note: Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1. Solid lines denote the median, and dashed lines denote the 10<sup>th</sup> and 90<sup>th</sup> percentiles, respectively.

Source: Authors’ calculations using DLHE survey 2006-07 to 2014-15.

In contrast, we see a decline over the period in the median education attainment of PGCE entrants. Following a brief rise from around the median to the 55<sup>th</sup> percentile by 2009-10, the average for this group declined to around the 45<sup>th</sup> percentile by 2014-15.

Importantly, the rise in average educational attainment between 2006-07 and 2014-15 for primary school and secondary school teachers joining teaching straight from an undergraduate degree is statistically significant, as is the decline in educational attainment amongst those starting PGCEs over the same time frame.<sup>12</sup>

As a result of these different trends, there has been a very clear narrowing of the gap in educational attainment by whether teachers came straight from undergraduate degrees or went on to PGCE courses. For those intending to become a secondary teacher, this could partly be a compositional shift, particularly if some Teach First entrants to teaching are high-achieving graduates who might otherwise have enrolled on a PGCE course. However, the number of such Teach First entrants is relatively small each year. The increasing educational attainment amongst undergraduate leavers going on to become primary school teachers is less likely to have been driven by compositional shifts and is more likely to represent a genuine increase in educational attainment over time.

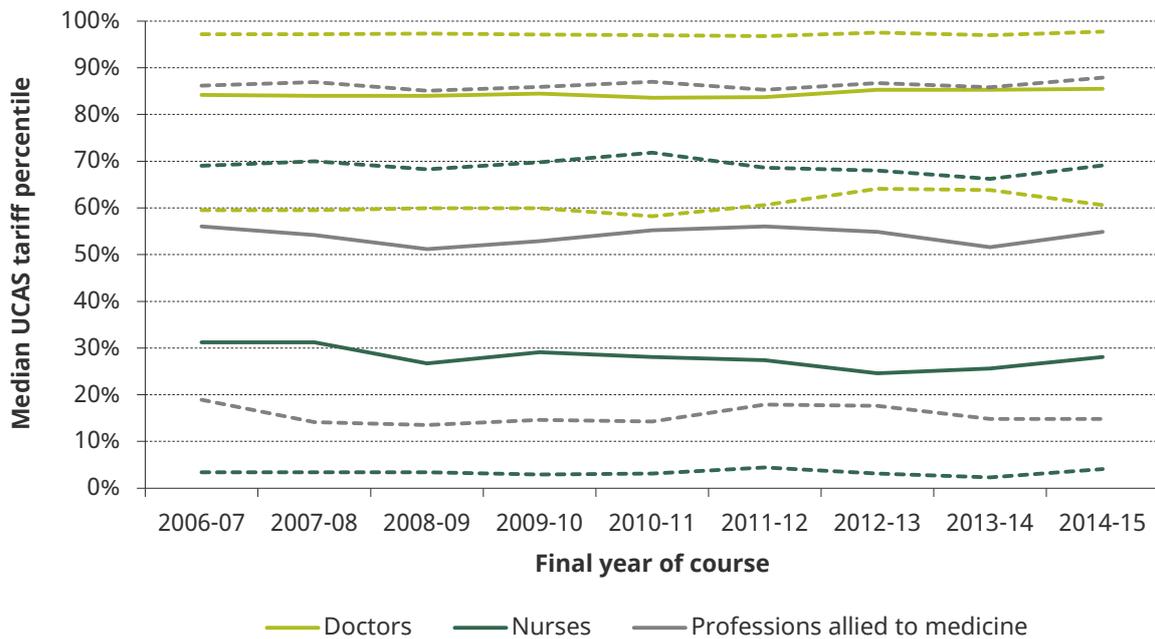
Considering all teachers together, we see a small rise in median educational attainment between 2008-09 and 2010-11, matched by falls after this, with no net change over the

<sup>12</sup> Statistical significance judged by comparing means rather than medians over time. Confidence intervals over time are presented in Figure A.14

period as a whole. These changes do coincide with the rise and gradual fall of the public relative to private sector pay, but it should be said that these changes in educational attainment are relatively small in magnitude, equivalent to changing one grade in a single AS Level.

Figure 3.2 shows the trends for graduate entrants into NHS and health-related occupations (doctors, nurses and NHS professions allied to medicine). Here, we see very little change in the levels over time in the relative educational attainment of medical workers. Instead, there are stark differences in both median levels and spread of relative educational achievement across occupations.

**Figure 3.2. Relative educational attainment of new medical workers over time**



Note and Source: As for Figure 3.1.

New doctors have a median UCAS tariff percentile of close to the 86<sup>th</sup> percentile (which equates to a UCAS tariff score of 480, i.e. four A grades at A Level) and doctors’ 10<sup>th</sup> and 90<sup>th</sup> percentiles of educational attainment span a relatively small band from the 60<sup>th</sup> to the 98<sup>th</sup> percentiles across all graduates in 2014–15. As a result, even the 10<sup>th</sup> percentile of educational attainment of new graduate doctors represents a score in excess of three A grades at A Level. This is partly by design given the very high entry requirements to most medical degrees, and may also be reassuring given that this is a group in which we would like to see relatively high average levels of quality and low levels of variation. In terms of the trends over time, the median, 10<sup>th</sup> percentile and 90<sup>th</sup> percentile are all extremely stable over time.<sup>13</sup>

New entrants to professions allied to medicine and nursing have a much wider distribution of educational attainment as well as having significantly lower averages across the whole period, though again there has been remarkably little change over time. The median percentile for new entrants to professions allied to medicine has remained

<sup>13</sup> Confidence intervals for the mean level of educational attainment amongst doctors, nurses and NHS professions allied to medicine over time are presented in Figure A.15.

relatively stable at around the 55<sup>th</sup> percentile, the 10<sup>th</sup> percentile remaining around the 15<sup>th</sup> percentile across all graduates and the 90<sup>th</sup> percentile close to matching that of all graduates across the whole period. This wide distribution is unsurprising given that our definition of professions allied to medicine spans a wide range of occupations.

New entrants to nursing have a lower median educational attainment than both the other groups, which remains relatively stable at around the 30<sup>th</sup> percentile, or around 300 UCAS points by 2014–15 (a little more than three A Levels and an AS Level at grade C). As well as having a significantly lower level of mean education attainment, entrants to nursing also have a correspondingly lower 90<sup>th</sup> percentile, at around the 70<sup>th</sup> percentile of education attainment of all graduates. The 10<sup>th</sup> percentile of entrants to nursing is also lower at around the 4<sup>th</sup> percentile of all graduates.

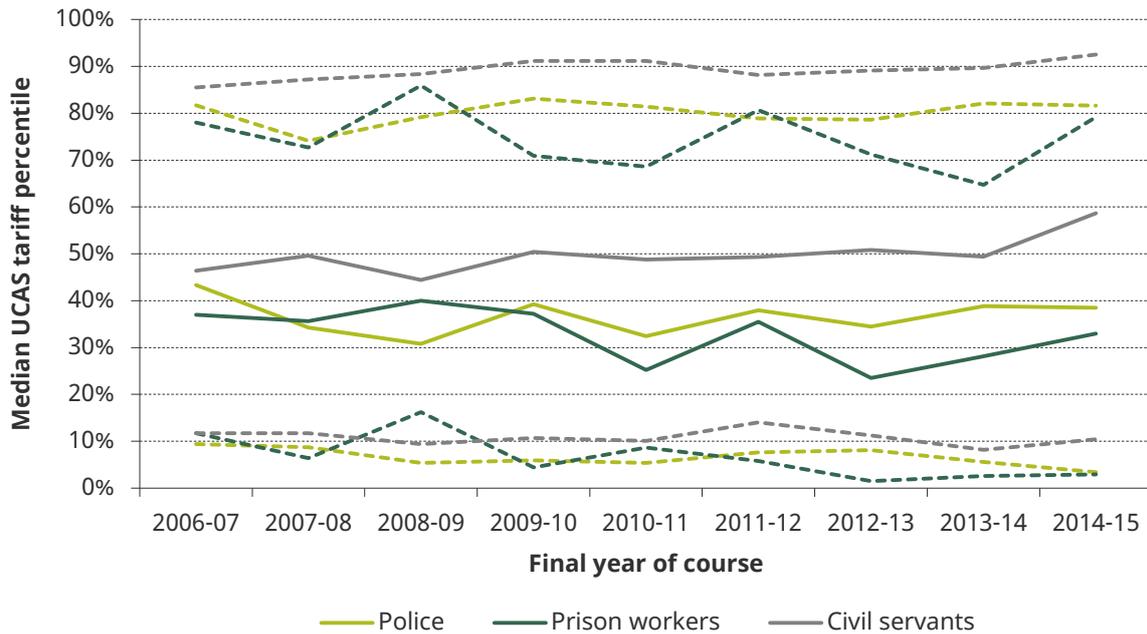
The stability of the relative educational achievement of nurses is somewhat surprising in light of the shift towards requiring new nurses to have completed a degree-level qualification. To look into this in more detail, Figure A.9 shows the median level of relative educational achievement by route into nursing (degree and non-degree). This confirms that new nurses from degree routes do have higher levels of relative educational achievement than those from non-degree routes, and the average levels for each group have been relatively stable over time. If anything, however, this actually makes the lack of growth in the relative educational achievement of nurses more surprising, as more have come from degree routes over time.

One *potentially* offsetting factor has been a substantial increase in the proportion of new nurses with non-missing data (see Figure A.4), from around 30% to 80% over time. It is possible that we are capturing more nurses over time with low levels of educational achievement over time and this has cancelled out any rise in educational achievement from the shift towards degree-based routes. However, it is, by definition, not possible to know the level of educational achievement for those with missing data. It is also true to say that the average levels of educational achievement for more recent nurses are still relatively low, despite the shift towards requiring new nurses to have degrees and the increasing coverage of the data. The patterns we witness of an increasing proportion of entrants to nursing coming from degree rather than non-degree courses may have just changed the nature of the course rather than shifted the actual groups going into nursing.

In Figure 3.3, we show the same trends for new graduate entrants into the police service, prison service and civil service. We find that the relative educational attainment of graduate entrants to civil service jobs has remained relatively stable between 2006–07 and 2014–15, at around the 50<sup>th</sup> percentile (i.e. around 350 UCAS points). The figures here are relatively stable and suggest that the average educational achievement of new entrants to the civil service jobs we do observe has been relatively stable over time.

The picture for the police and prison service is much more volatile. This is likely explained by the very small numbers of graduates going into these occupations in our sample (fewer than 500 for the police each year and fewer than 150 for the prison service). As a result of this volatility, one should not put too much weight on these trends over time. We do not break the results down any further for these two occupations. We also do not break the results down any further for the civil service as we only observe a subset of civil service jobs.

**Figure 3.3. Relative educational attainment of new police, prison workers and civil servants over time**



Note and Source: As for Figure 3.1.

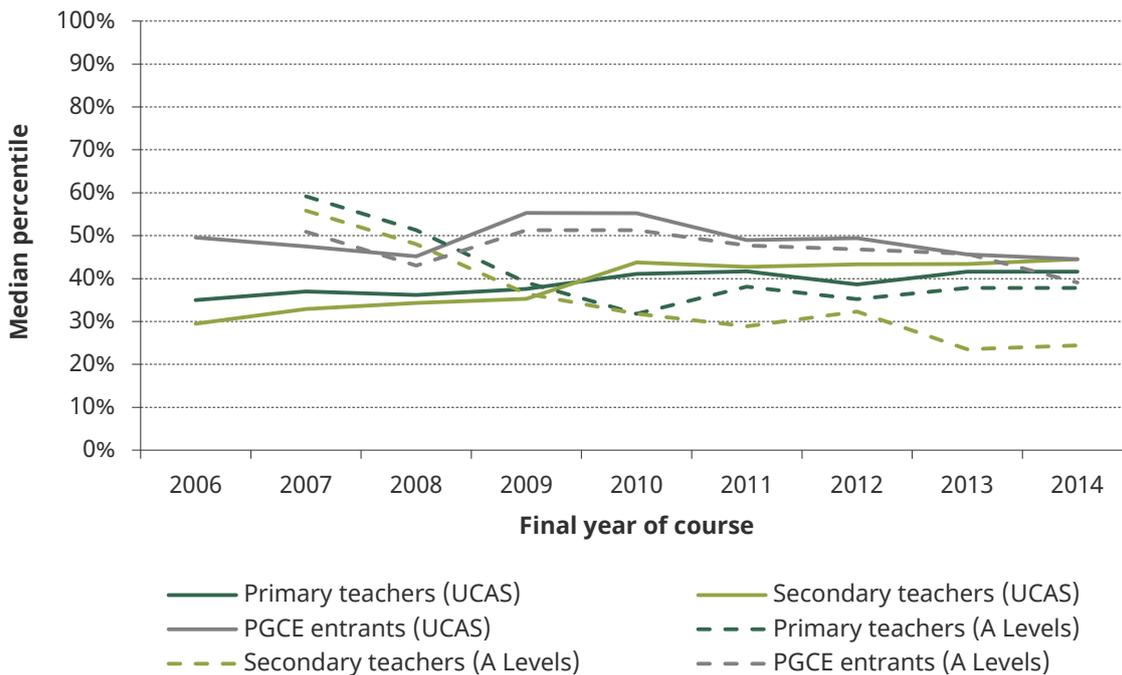
### 3.2 Robustness checks

As discussed in Section 2, we made a number of assumptions to construct a reliable and comparable measure of educational attainment over time. The main measure we use is percentile of the UCAS tariff score among those taking A Levels or equivalent in the same year. In this section, we test whether our results are robust to alternative assumptions.

Although not shown here, our results are all robust and largely unchanged if we define percentiles amongst cohorts of graduates rather than by the year in which A Levels are likely to have been taken. This is unsurprising, as most people graduating from undergraduate courses in our chosen age category are of a similar age and took their prior qualifications at similar points in time.

In Figure 3.4, we show how our results on the median educational attainment of teachers would differ if we were to use percentiles calculated by a point score of individuals' best four A Levels rather than UCAS tariff score. In the first few years of data, there are some very clear differences between the measures. However, A Level information is missing for many individuals in 2007-08 and 2008-09, and such differences should not be given too much weight as a result. Beyond this period, the results are highly similar. The only difference is that we see a lower average for secondary teachers in the later years. In the absence of more detailed information on individuals' qualifications beyond A Levels, it is difficult to say why this might be. This is also a relatively small group of entrants (around 1,000-2,000 each year).

**Figure 3.4. Relative educational attainment of new teachers – UCAS/A Level points comparison**



Note: Best four A Levels measure calculated on those with non-missing A Level scores. Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

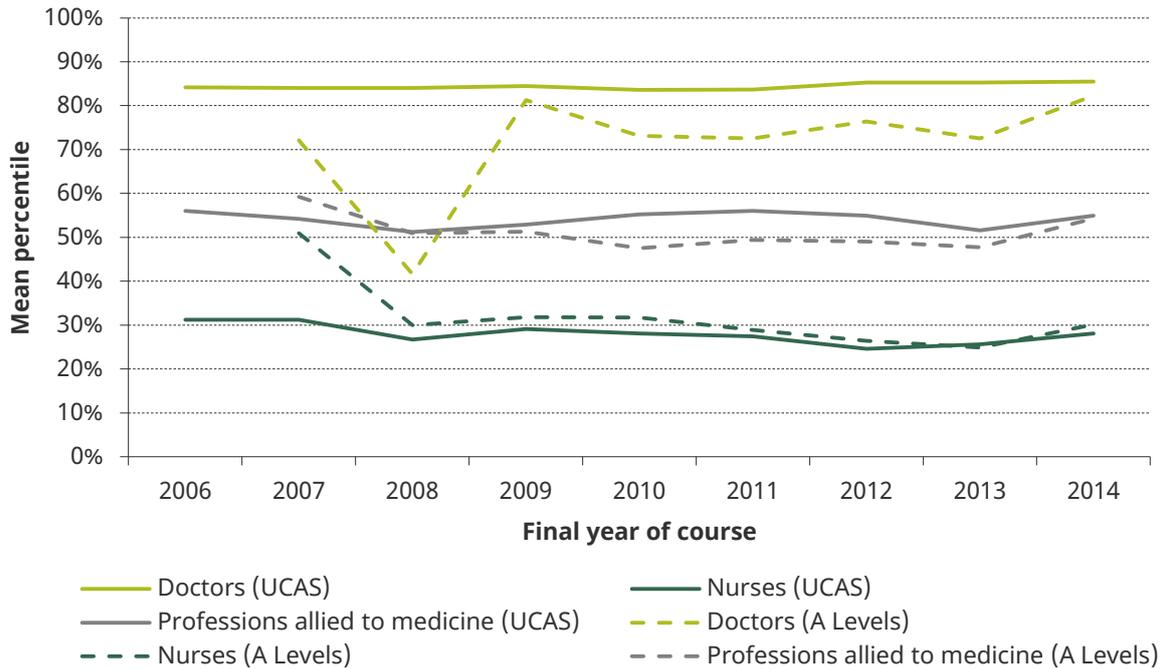
Source: Authors’ calculations using DLHE survey 2006–07 to 2014–15.

The same comparison is shown in Figure 3.5 for the NHS and health professions. Again, the differences between the two measures in 2007–08 and 2008–09 should not be seen as particularly informative because of missing data. The median percentiles are similar for both nurses and NHS professions allied to medicine, as well as similar trends over time. For new doctors, the trends are similar after 2009–10, but there is a pronounced difference in level, with new doctors about 10 percentiles lower when we only consider the four best A Levels.

Nevertheless, on the whole, calculating percentiles on a best four A Level score leads to similar results and trends to those calculated on UCAS tariff scores. As the above graphs show, missing data on A Levels leads to noisier trend lines in the earlier years. It is for this reason that our main measure of educational attainment uses percentiles calculated on UCAS tariff scores.

As further robustness checks on our results, we can confirm that trends and levels of relative educational achievement over time are similar if we use best three rather than best four A Levels (Appendix Figures A.10 and A.11) and if we use mean rather than median UCAS tariff points (Appendix Figures A.12 and A.13).

**Figure 3.5. Relative educational attainment of new medical workers – UCAS/A Level points comparison**



Note and Source: As for Figure 3.4.

### 3.3 Subgroup analysis

In this section, we examine how our results differ across subgroups of the population. In particular, we look at gender and regional differences. We do this given the fact that we observe a higher public sector pay premium for women as compared with men, and the observed differences in the pay between public and private sector workers across regions (Cribb et al., 2014).

Figures 3.6(a) and (b) show the median educational attainment of women and men going into teaching and health professions between 2006–07 and 2014–15. Both the levels and trends are highly similar for men and women going into teaching. The same can be said of doctors. For men and women going into professions allied to medicine, the levels and trends track each other quite closely, although the median educational attainment for men in this group is consistently around 2 percentiles lower than for women.

In Figures 3.7 and 3.8(a)–(c), we split our results by region of employment, showing the levels for 2006–07, 2010–11 and 2014–15. This is where the effect of the change in the points calibration of Scottish Highers in 2010–11 can be seen, and thus the jump in median percentile in Scotland between 2006–07 and 2010–11, shown in Figure 3.8, simply reflects that change.

Setting aside Scotland and Northern Ireland (which show consistently high levels of educational attainment amongst new teachers), the trends for teachers suggest that there

has been some equalisation across regions between 2006–07 and 2014–15.<sup>14</sup> This is mostly driven by fast increases in Wales, which moves from having comparatively low levels of educational attainment amongst new teachers in 2006–07 to around average by 2014–15. Another interesting finding from this figure is the fact that teachers in London in 2014/15 have the *lowest* levels of educational attainment across regions in England, and lower than in Wales, Scotland and Northern Ireland too. This is somewhat surprising given the higher levels of school performance in London compared with the rest of England (Blanden et al., 2015), which some have assumed reflects the higher quality of entrants into teaching. However, our sample here excludes PGCE entrants, who could be an important group of entrants into teaching in London.

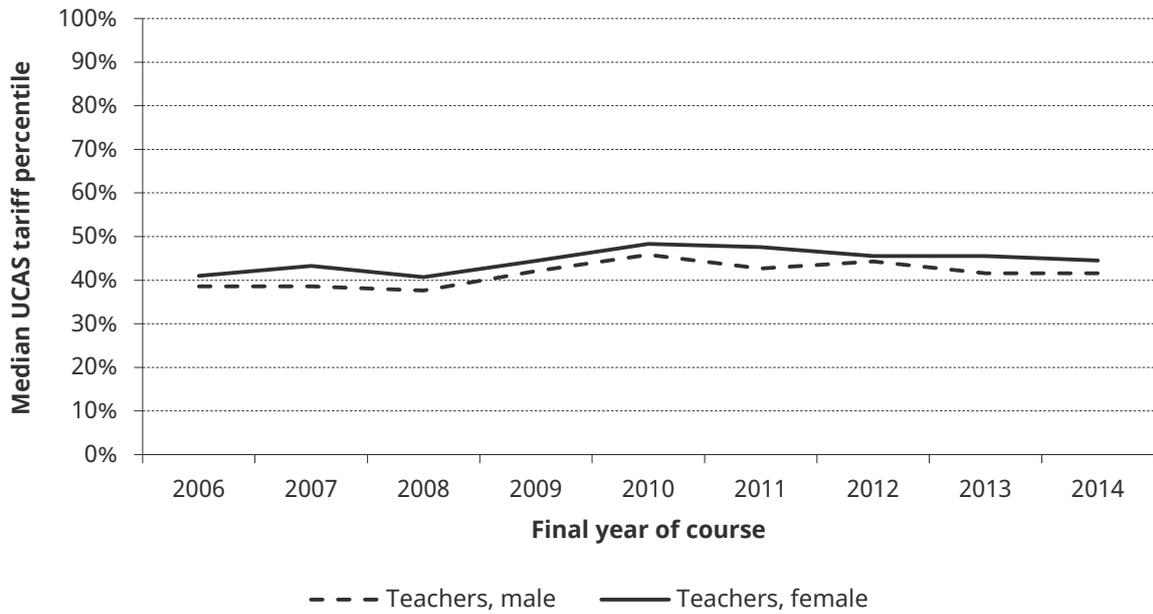
As with the nationwide figures, the median educational attainment of new doctors in Figure 3.8 remains relatively stable by region of employment, and very similar across individual regions and countries too, suggesting that the aggregate figures were not masking any regional changes. The same is largely true for the averages by region of employment for new entrants to NHS professions allied to medicine (Figure 3.8(b)).

However, we see differential changes by region of employment amongst new nurses. In particular, the median in Wales moves from the 26<sup>th</sup> to the 34<sup>th</sup> percentile of all graduates – from well below the UK average to significantly above it. A rise can also be seen in the North West of England. Across most other regions, there are small falls in educational attainment amongst new nurses. There is a surprisingly large drop in the median attainment of new nurses in Scotland from the 32<sup>th</sup> to the 14<sup>th</sup> percentile. This is a particularly sharp fall given the uprating of UCAS tariff points for Scottish Highers. It is worth noting, however, that the only information we have is on region of employment and not on where A Levels or equivalent exams were taken, so we are not able to say for sure that all of those working in Scotland would have benefited from the uprating of Scottish Highers.

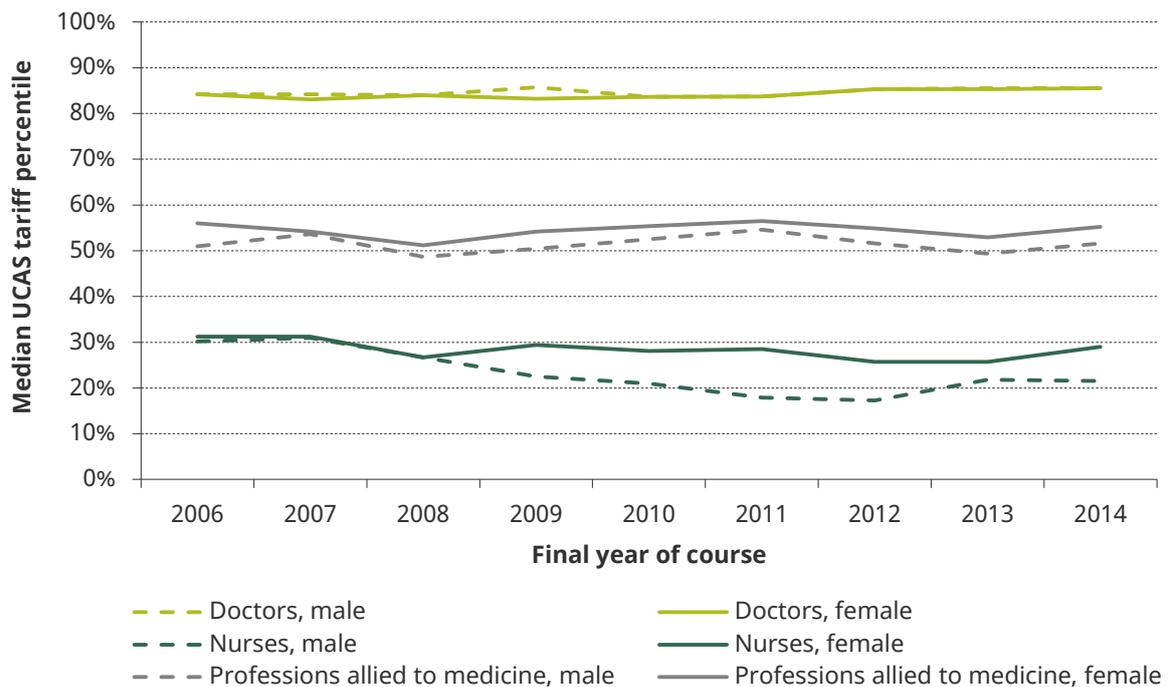
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<sup>14</sup> Please note that the mean percentiles for 2014–15 are below or around the 40<sup>th</sup> percentile (i.e. lower than the percentile shown earlier in this report for teachers as a whole, whose mean in 2014–15 is around the 44<sup>th</sup> percentile). This is explained by the fact that region of employment is missing for PGCE students, and thus the region statistics are mostly missing the group of teachers with the highest mean percentile.

**Figure 3.6(a). Relative educational attainment of new teachers, by gender**



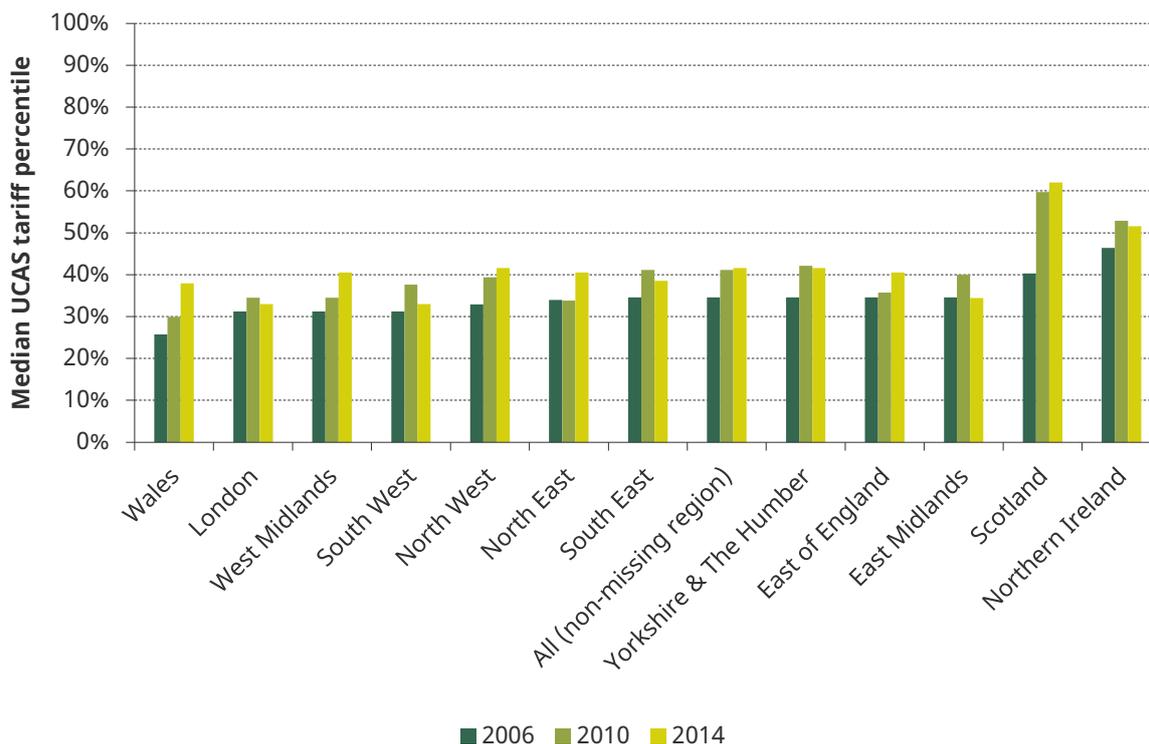
**Figure 3.6(b). Relative educational attainment of new medical workers, by gender**



Note: Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

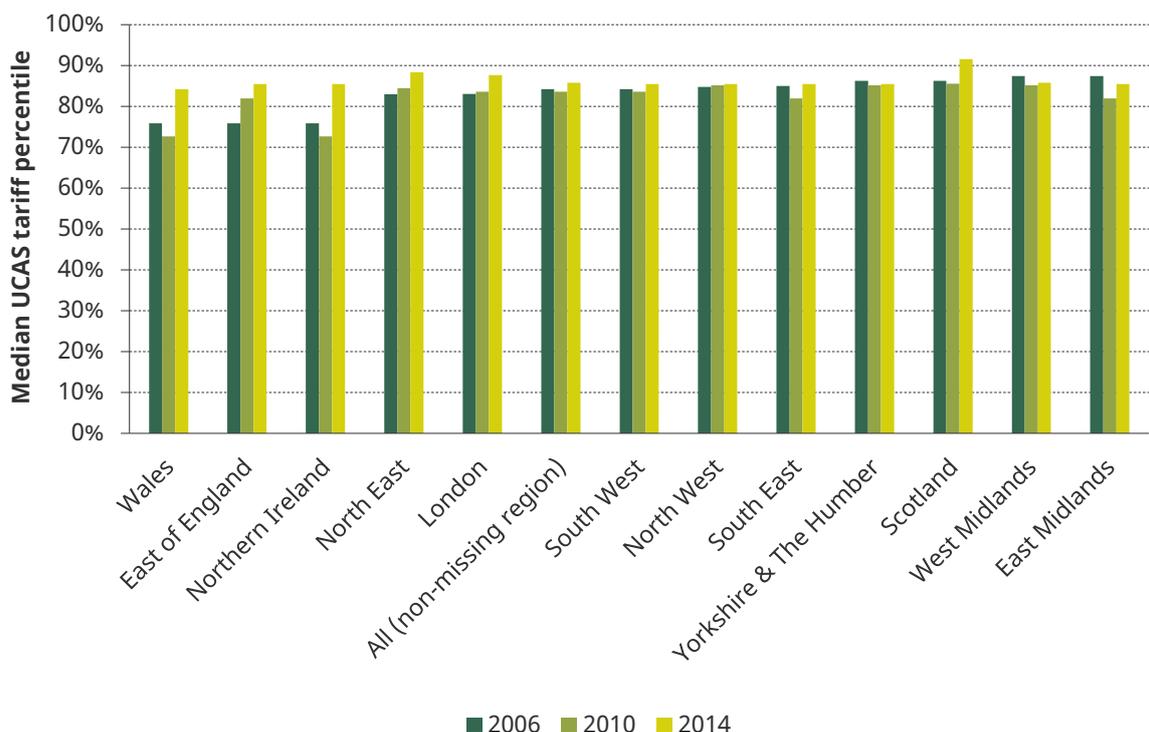
**Figure 3.7. Relative educational attainment of new teachers, by region and country**



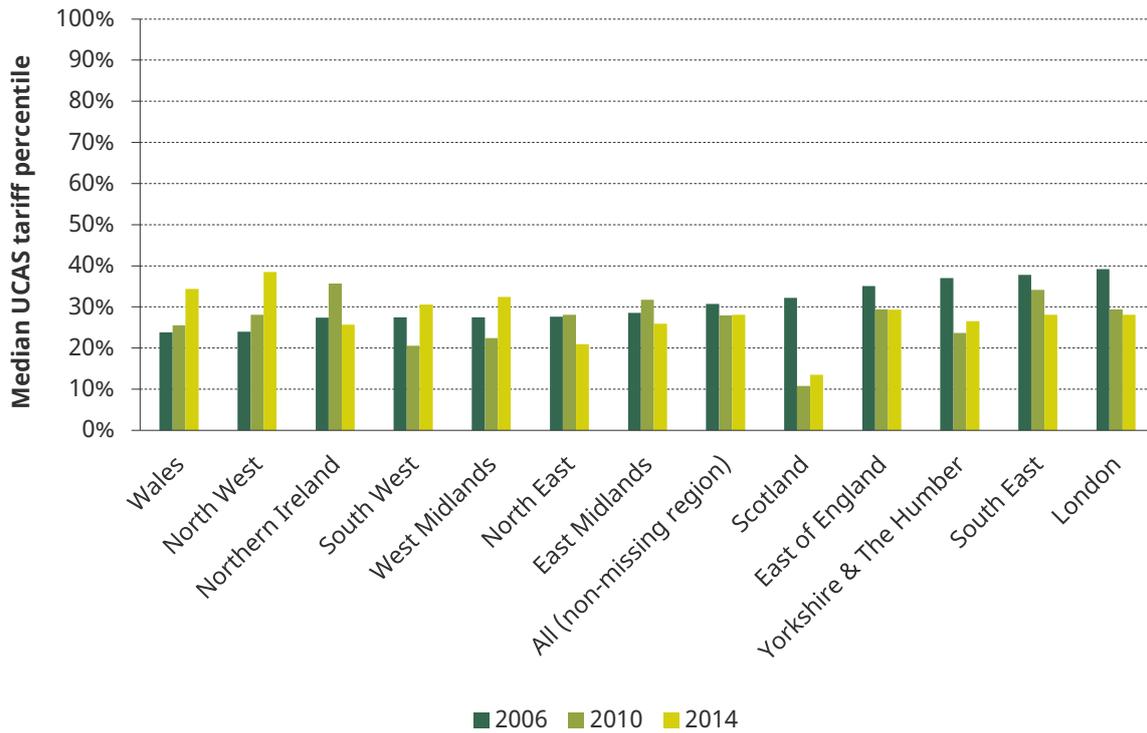
Note: Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1. Regions are recorded by location of employment.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

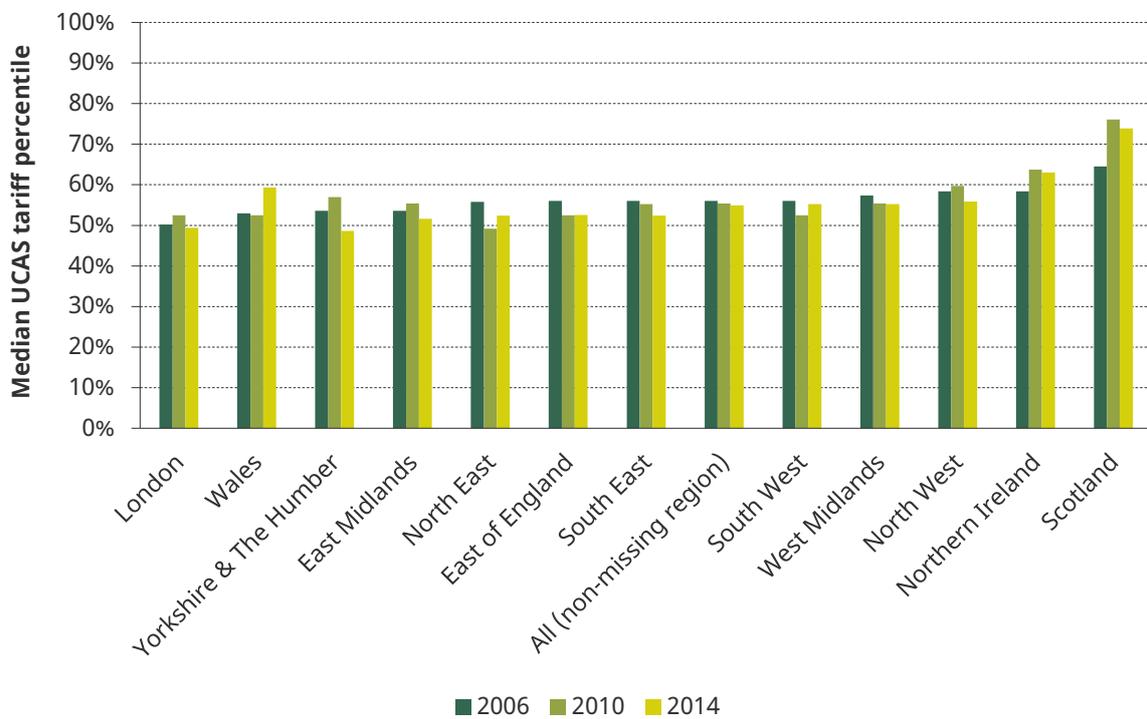
**Figure 3.8(a). Relative educational attainment of new doctors, by region and country**



**Figure 3.8(b). Relative educational attainment of new nurses, by region**



**Figure 3.8(c). Relative educational attainment of new recruits to professions allied to medicine, by region**



Note and Source: As Figure 3.7.

### 3.4 Summary and policy implications

In this section, we have analysed how the educational attainment of new graduate entrants into major public sector occupations has changed over time. We do this in order to provide a proxy for how the likely quality of new entrants to these occupations has been changing as the gap between public and private sector pay changed over the course of the Great Recession and fiscal consolidation.

The changes over time have been relatively small. For health-related occupations, the levels over time have been remarkably stable. For teachers, we see no decline in the educational attainment of teachers overall, though this masks changes within that group, with increases amongst those joining straight from undergraduate degrees (who are mainly primary school teachers) counterbalanced by falls amongst those starting PGCEs.

There is also quite a high level of stability over time across subgroups of public sector workers, with little evidence of differential trends for men and women going into the different occupations. Across regions and countries, the only clear trend is a narrowing of differences amongst those going into teaching.

What does this imply for the effects of the pay squeeze to date? It might imply that the effects of relative pay changes on quality are quite small and that non-pay factors (e.g. working conditions, motivation or other job benefits) may dominate the decision to enter the public sector. However, it might also be partly explained by the fact that both the public and private sectors have seen relatively weak growth in pay since 2010.

In the future, if public sector pay continues to be squeezed and private sector earnings growth returns to more normal levels, then public sector pay could start to fall quite substantially relative to the private sector. One would expect this to have a larger effect on the sorts of people going into public sector jobs.

## 4. Prior Educational Attainment of New Secondary School Teachers by Subject Area

Teaching is one of the largest public sector occupations and one of the biggest recruiters of new graduates each year. It is also an occupation that is likely to face significant challenges in recruiting sufficient numbers of high-quality teachers over the next few years, particularly in light of the ongoing squeeze on public sector pay.

The school pupil population in England is currently forecast to rise by 450,000 from 6.45 million in 2016 to 6.90 million in 2020,<sup>15</sup> which means that schools will need to recruit more teachers. This is likely to be particularly challenging when the government is already missing targets for numbers of trainees by an increasing margin over time, e.g. by 1% in 2010–11 up to 9% in 2014–15 (National Audit Office, 2016).

Changes in the focus of the secondary school curriculum towards more ‘academic’ subjects are likely to require additional teachers in subject areas that are already experiencing recruitment shortages (e.g. modern foreign languages and physics). For example, the National Audit Office reports that only 70% of trainee places for physics teachers were filled in the latest year of data.

The main way in which policymakers have responded to such recruitment concerns is to give schools more flexibility on teacher pay and the creation of relatively large bursaries targeted at particular subjects (such as physics and computing) and/or graduates with relatively high degree classifications. At the same time, the government has been expanding the number of training routes for teachers, with increasing emphasis placed on routes where teachers join after an undergraduate degree and receive on-the-job training linked to a specific school (e.g. through Teach First or School Direct (salaried)). See Allen et al. (2016) for more details on the differences and changes across initial teacher training routes over time.

In the previous section, we saw that the educational attainment of new graduate recruits to teaching has not fallen over time, despite the continued tight public sector pay settlement. In this section, we examine how trends have varied across teachers by major subject area (in terms of the main subject of study in their first undergraduate degree). In particular, we examine the average levels and the variation in relative educational attainment of new teachers by major subject area, as well as how this compares with all graduates in particular subject areas. This provides new empirical evidence for whether concerns about the quantity of recruits to particular subjects should also extend to quality. We also relate the trends to the timing of changes to bursaries by subject area in order to provide an indication as to their potential impact on the sorts of individuals choosing to become teachers.

In what follows, we start by briefly setting out the increases in bursaries over time (Section 4.1). We then illustrate how we measure the numbers of new teachers by subject area (Section 4.2), before showing our main results in terms of the educational attainment of

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<sup>15</sup> <https://www.gov.uk/government/statistics/national-pupil-projections-july-2016>

new teachers by subject area (Section 4.3). Then, in Section 4.4, we reflect on the main results and the policy implications.

## 4.1 Policy context

Bursaries for teachers in postgraduate training courses were introduced in 2000–01 at a level of £6,000 per trainee (tax-free). Over the course of the 2000s, greater differentiation by subject area was introduced, with higher levels paid to those training in high-priority secondary school subjects. These were gradually tweaked over time as shortages in particular subjects became more and less acute. By 2011–12, those training to be secondary school teachers in high-priority subjects (e.g. physics and maths) received £9,000, those training to be teachers in other priority subjects (e.g. modern foreign languages) received £6,000 and those training in other subjects received nothing.

In 2012–13, there was then a major shake-up of bursaries and an introduction of scholarships for particular subjects.<sup>16</sup> Even higher levels were paid to high-priority subjects, and differentiation by undergraduate degree classification was introduced. This is illustrated in Table 4.1, which shows the maximum bursary or scholarship that trainee teachers would be eligible for, by subject specialism and degree class. For brevity, we only show this for four example subjects that give a sense of the range and differences over time across subjects: physics, modern foreign languages, geography and English. We only focus on the period since 2011–12 as it is the period since then that has seen the most significant changes.

The highest bursaries are available for teachers with degrees in ‘high-priority’ subjects. The group of ‘high-priority’ subjects has changed over time, but most recently included: physics; biology; chemistry; languages; mathematics; computing; design and technology; geography; music; and primary mathematics specialists. However, even within this group, there is variation in the generosity of bursaries and scholarships. The highest levels are available for physics, maths, computing and chemistry. The scale of the increase for these subjects has been remarkable too. For example, Table 4.1 shows an increase from £9,000 in 2011–12 to £25,000 in 2014–15 for a physics graduate with a first-class degree. This has since been increased to £30,000 in 2016–17 for physics in particular. As a result, a physics trainee would have a higher net income in training than in their first year of teaching. It is also worth stating that these bursaries and scholarships are not conditional on becoming a teacher after achieving qualified teacher status.

The increases for other high-priority subjects such as modern foreign languages have been equally large, with increases from £6,000 in 2011–12 to £25,000 in 2014–15 for those with a first-class degree. However, those with degree classifications below a lower-second are no longer eligible for any bursary. For other high-priority subjects, there have been slightly smaller increases, though often from a base of zero (e.g. from nothing to £12,000 for a geography graduate with a first-class degree).

<sup>16</sup> These are like bursaries, but are set at a higher level and come with additional support from professional bodies. There are only a limited number and trainees must submit applications to competitive rounds.

**Table 4.1. Maximum bursary and scholarship eligibility for postgraduate teacher training (PGCE) courses by first degree subject and classification, selected subjects 2011–12 to 2015–16**

Subject/ degree classification	2011–12	2012–13	2013–14	2014–15	2015–16
<b>Physics</b>					
First class	9,000	20,000	20,000	25,000	25,000
Upper second	9,000	20,000	20,000	25,000	25,000
Lower second	9,000	12,000	12,000	15,000	15,000
Other	9,000	0	0	9,000	9,000
<b>Modern foreign languages</b>					
First class	6,000	20,000	20,000	20,000	25,000
Upper second	6,000	15,000	15,000	15,000	20,000
Lower second	6,000	12,000	12,000	12,000	15,000
Other	6,000	0	0	0	0
<b>Geography</b>					
First class	0	9,000	9,000	9,000	12,000
Upper second	0	5,000	4,000	4,000	9,000
Lower second	0	0	0	0	4,000
Other	0	0	0	0	0
<b>English</b>					
First class	0	9,000	9,000	9,000	9,000
Upper second	0	5,000	4,000	4,000	4,000
Lower second	0	0	0	0	0
Other	0	0	0	0	0

Note: Bursaries and scholarships are all tax-free.

Source: Initial Teacher Training Bursaries Funding Manual (2011–12 to 2015–16).

For lower priority subjects such as English, there have been much lower increases. Those with first-class or upper-second degrees became eligible for amounts of £9,000 and £4,000, respectively, by 2014–15 (compared with nothing in 2011–12). However, those with lower degree classifications continued to receive no bursary.

It is clear that there have been major changes to bursaries over the last five years, with the most dramatic changes for those aiming to teach in high-priority subjects and with higher degree classifications. These are partly aimed at increasing numbers of trainees, but also at improving their quality (particularly the differentiation by degree class). Despite the fact that these bursaries are estimated to cost about £150m per year (National Audit Office, 2016), we know very little about the impact of such bursaries on the quality of new entrants. Although our analysis of changes in the educational attainment of new

teachers by subject area does not qualify as a full evaluation of the change in bursaries on the quality of entrants, it is indicative and represents some of the first evidence aimed at understanding their impact.

## 4.2 Numbers of new teachers by subject area

The goal of our analysis is to examine how educational attainment has varied by teachers' major subject area, with a focus on the potential impact of the increasing generosity of bursaries. In order to do this, we again use data from the DLHE survey and take as our sample all leavers from undergraduate degrees from UK higher education institutions between 2006–07 and 2014–15 who are observed as going on to study a PGCE six months after completing their course. We exclude teachers who enter primary or secondary school teaching straight from an undergraduate degree as this group are not eligible for such generous bursaries (with the exception of those starting through the smaller, more recent route of School Direct (unsalaried)). By including those studying PGCEs, we will be including some trainees intending to become primary school teachers. Unfortunately, however, we are unable to identify this group separately.

We then focus on those working in the UK, who are under 25 and have non-missing UCAS tariff scores (proportion of individuals with non-missing UCAS data shown by subject in Figures A.16–A.18). We measure their educational attainment as their percentile of the UCAS tariff distribution as in the previous section (i.e. their position in the distribution of UCAS tariff scores of those who took their A Levels or equivalent exams at the same age and under the same UCAS system).

We classify teachers into separate subjects by the main subject area of their previous undergraduate degree. To do this, we use the JACS code of their degree subject(s). We classify these into a number of broad groupings that seek to maintain consistency over time and match secondary school subjects as closely as possible. The list of subject groupings is shown in Table 4.2 together with some of the main subjects included in each grouping.

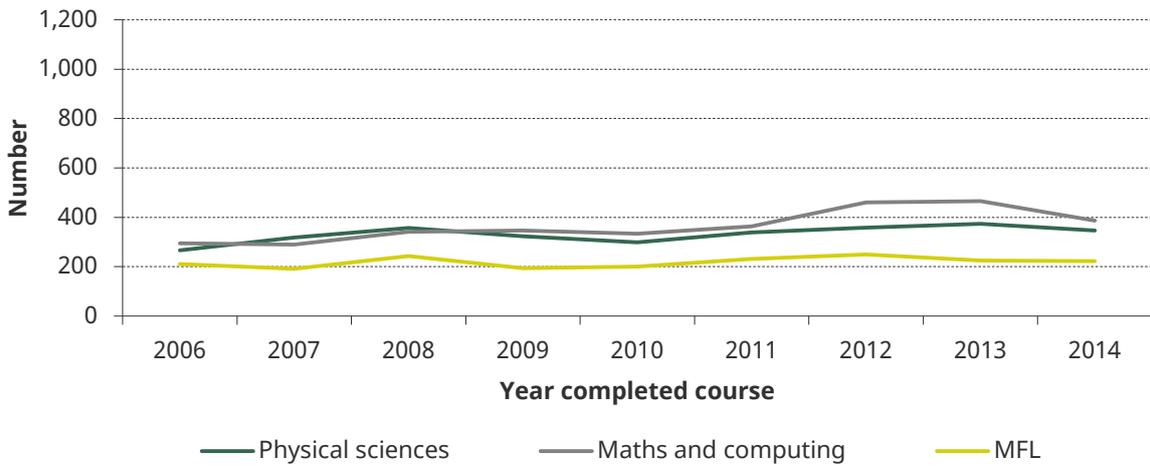
In Figures 4.1(a)–(c), we show the numbers of observed teachers in our sample over time by subject area meeting the above inclusion criteria. The first graph shows the number of new teachers in high-priority subjects in physical sciences, maths and computing and modern foreign languages. These are relatively few in number each year (between 200 and 500 for each subject grouping) and relatively constant over time, with the exception of maths and computing where there is an increase in 2012–13.

Figure 4.1(b) shows the number of new graduates across arts subjects over time. Here we see more of a pronounced decrease from 2008–09 to 2010–11, followed by an increase from 2010–11 onwards.

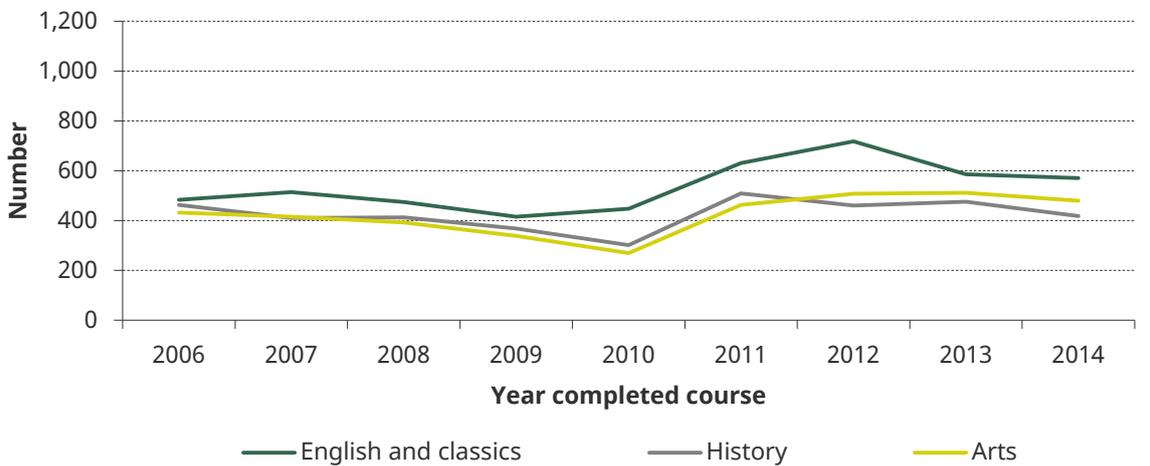
Figure 4.1(c) then shows other subjects. This shows that numbers from technology and engineering courses are relatively few in number over time. By contrast, those who have studied biological or medical sciences are large in number and show the same time trend as for arts subjects (decrease between 2008–09 and 2010–11 and increase from 2010–11 onwards).

**Figure 4.1. Number of new graduate teachers**

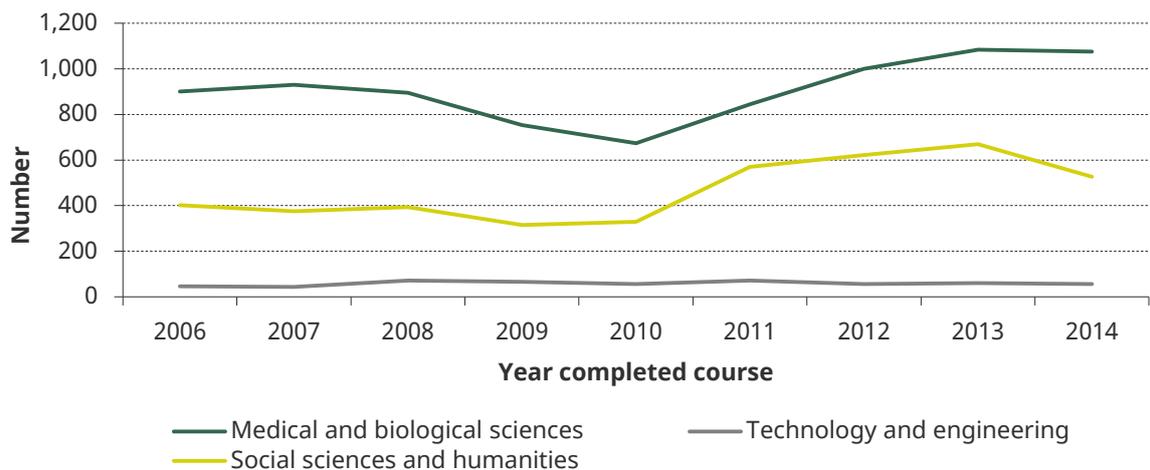
**(a) High-priority subjects**



**(b) Arts subjects**



**(c) Other subjects**



Note: Sample includes individuals observed as a teacher or on a PGCE course six months after graduating from a UK higher education institution. Only includes individuals aged between 21 and 25 inclusive who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by subject defined in Table 4.2.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Table 4.2. Degree subject groupings**

<b>Subject grouping</b>	<b>Main subjects included</b>
Medical and biological sciences	Biological sciences, psychology, clinical medicine, clinical dentistry and nursing
Physical sciences	Physics, chemistry, geology, astronomy
Maths and computing	Maths, statistics, computer science
Technology and engineering	All types of engineering and technology courses; architecture, urban planning and landscape design
Humanities and social sciences	Geography, economics, politics, sociology, anthropology, law, social work
English and classics	English language and literature, linguistics, classics, Ancient Greek, Latin
Modern foreign languages	All modern foreign languages
History	History, philosophy, theology, archaeology
Arts	Fine art, music, drama, creative writing

### 4.3 Educational attainment of new teachers by subject area

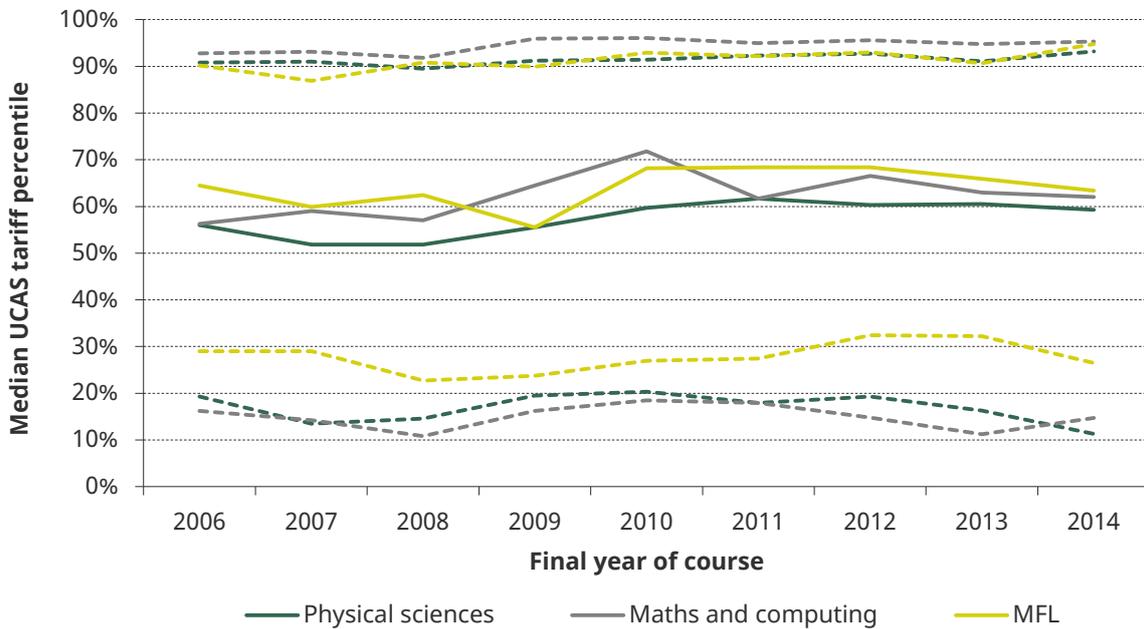
In Section 3, we showed that, despite the pay restraint in operation over recent years, the relative educational attainment of new graduate recruits to teaching has not fallen significantly over time. The educational attainment of new teachers coming through a PGCE has fallen slightly over time, from just above to just below the median, but it has risen over time amongst teachers coming from undergraduate routes.

In this section, we analyse how these trends have varied by major subject area (in their first undergraduate degree) amongst PGCE entrants. Figure 4.2(a) shows the trends in the relative educational attainment of new teachers who studied high-priority subjects and were therefore potentially eligible for the highest levels of bursaries (physical sciences, maths and computing, and modern foreign languages). For each subject, we show the median level of new teachers' educational attainment over time (defined as a percentile of all graduates taking their A Levels or equivalent exams at the same point in time) and the 10<sup>th</sup> and 90<sup>th</sup> percentiles amongst these new teachers. In Figure 4.2(b), we show how the averages by subject compare with the average amongst all graduates taking that subject.

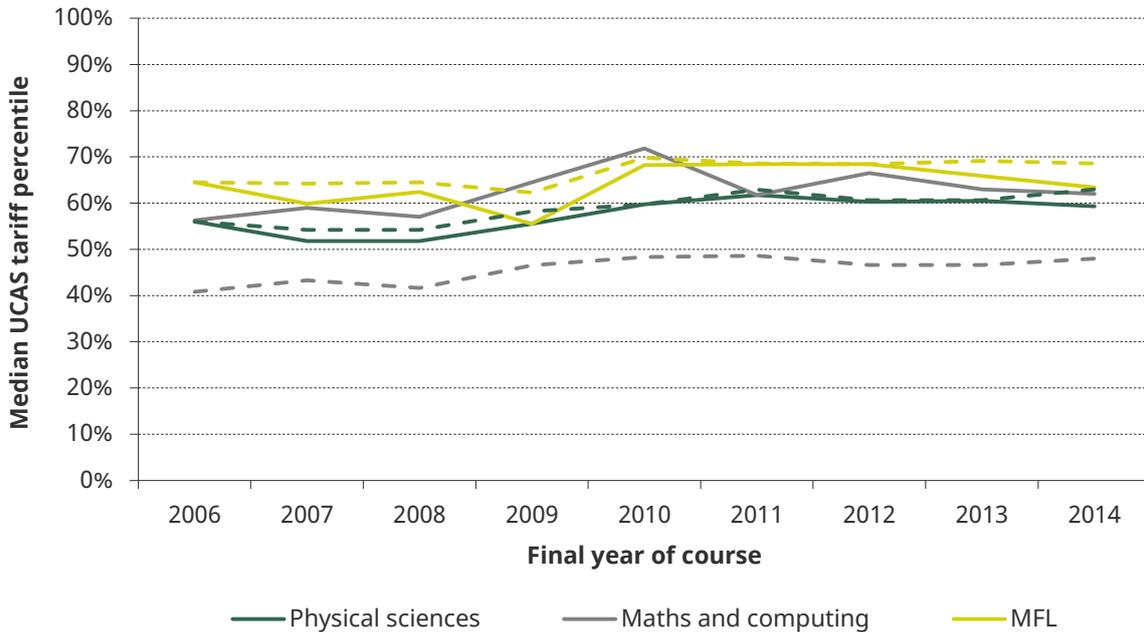
The relative educational attainment of new teachers in high-priority subjects rises slightly for those graduating between 2008–09 and 2010–11, followed by slight falls in 2011–12 and a levelling off for those graduating afterwards. The net result is little net change over the period as a whole. There is also little net change in the 10<sup>th</sup> or 90<sup>th</sup> percentiles for each subject. From this, we see no evidence of an increase in the relative level of educational attainment of new teachers in these high-priority subjects since the introduction of much more generous bursaries from 2012–13 onwards. However, it is not clear what the counterfactual scenario would have looked like and it is certainly possible that such bursaries could have prevented a decline.

**Figure 4.2. Relative educational attainment of new graduate teachers in high-priority subjects, 2006–07 to 2014–15**

**(a) Average and distribution over time**



**(b) Comparison with all graduates in each subject area**



Note: Teachers in individual subjects defined as in Table 4.2 and Figure 4.1(a). Percentiles defined relative to all graduates who took A Levels or equivalent exams at the same point in time. Dashed lines in Figure 4.2(a) show 10<sup>th</sup> and 90<sup>th</sup> percentiles of educational attainment within each subject area, whilst dashed lines in Figure 4.2(b) show the trend amongst all graduates in the sample taking that particular subject.

Source: Authors' calculations using DLHE survey 2006–07 to 2014–15.

What is clear is that the level of educational attainment of new teachers in these shortage subjects is relatively high (over the 60<sup>th</sup> percentile for modern foreign languages, physical sciences and maths and computing). This equates to over 380 UCAS tariff points in each case, the equivalent of two A grades and a grade B at A Level plus an AS Level at grade B. As shown in Figure 4.2(b), the averages for teachers in physical sciences and modern foreign languages are at the same level as all other graduates in these subjects and above it for maths and computing. The trends over time also closely match one another.

There are, however, clear differences in the distribution of educational attainment across these subjects. For physics and maths and computing, the 10<sup>th</sup> and 90<sup>th</sup> percentiles are close to those for all graduates as a whole, just as we saw for all teachers. For teachers in modern foreign languages, the distribution is much narrower, with the 10<sup>th</sup> percentile amongst this group at around the 30<sup>th</sup> percentile amongst all graduates.

Figure 4.3 shows the equivalent trends for arts subjects (English and classics, history, arts) and Figure 4.4 for other subjects (social science and humanities, technology and engineering, medical and biological sciences). With the notable exception of geography, included within social sciences and humanities, teachers who studied subjects in these latter two groups are eligible for much lower levels of bursaries.

There are very similar trends across all the arts subjects, with increases in 2009 followed by a gradual fall in the relative level of educational attainment of new teachers in history, English and classics and other arts subjects. For example, amongst those who studied English and classics, the median level of educational attainment has fallen from around the 65<sup>th</sup> percentile in 2009–10 to the 47<sup>th</sup> percentile by 2014–15, and from the 68<sup>th</sup> to the 55<sup>th</sup> percentile for those who had studied history over the same time frame. These falls are seen at both the average and the 10<sup>th</sup> percentile of new teachers in these subjects, but not at the 90<sup>th</sup> percentile. Interestingly, we see that the falls in average educational attainment for arts subjects are not matched amongst all graduates in these subjects. In 2009, history and English graduates going into teaching had a similar level of educational attainment to all graduates in these subjects. By 2014–15, they had a median level of educational attainment around 7 percentage points below for history and about 15 percentage points below for English and classics.

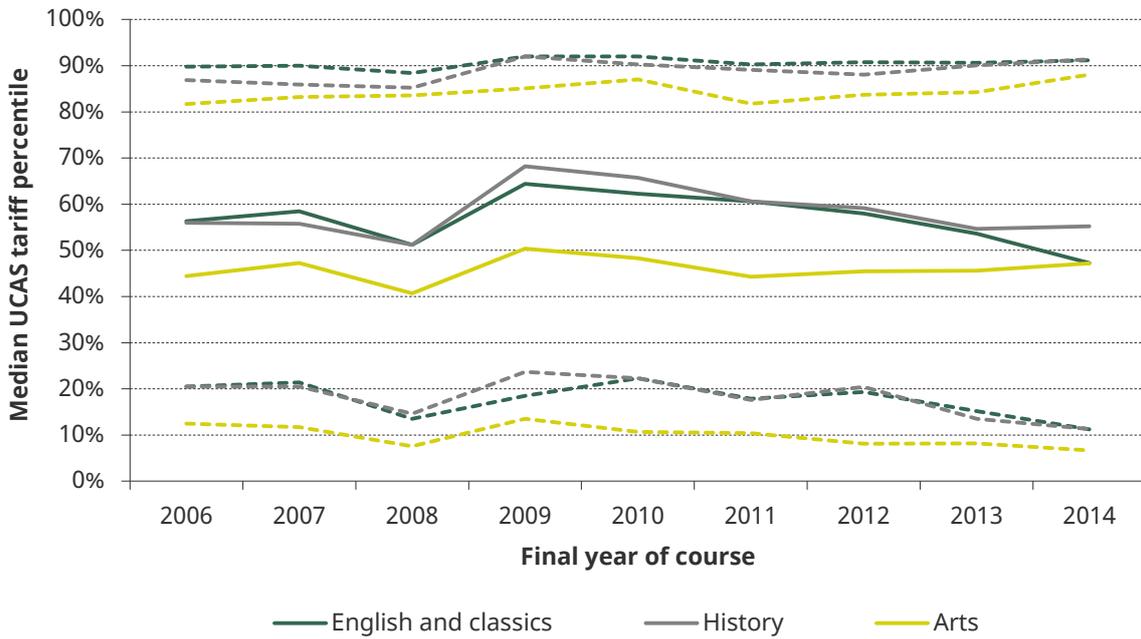
Importantly, we also note that the falls in average educational attainment amongst new teachers in these arts subjects between 2010–11 and 2014–15 are statistically significant, whilst the changes over time in high-priority subjects are not statistically significant.<sup>17</sup>

Looking at Figure 4.4, we see similar trends for medical and biological sciences and social sciences and humanities, with a rise in the years just before 2010 and gradual falls thereafter. Here, however, there is no clear decline relative to all graduates in these subject areas. The trends for technology and engineering are subject to more noise, which is unsurprising given the relative low numbers, but they generally oscillate around the median.

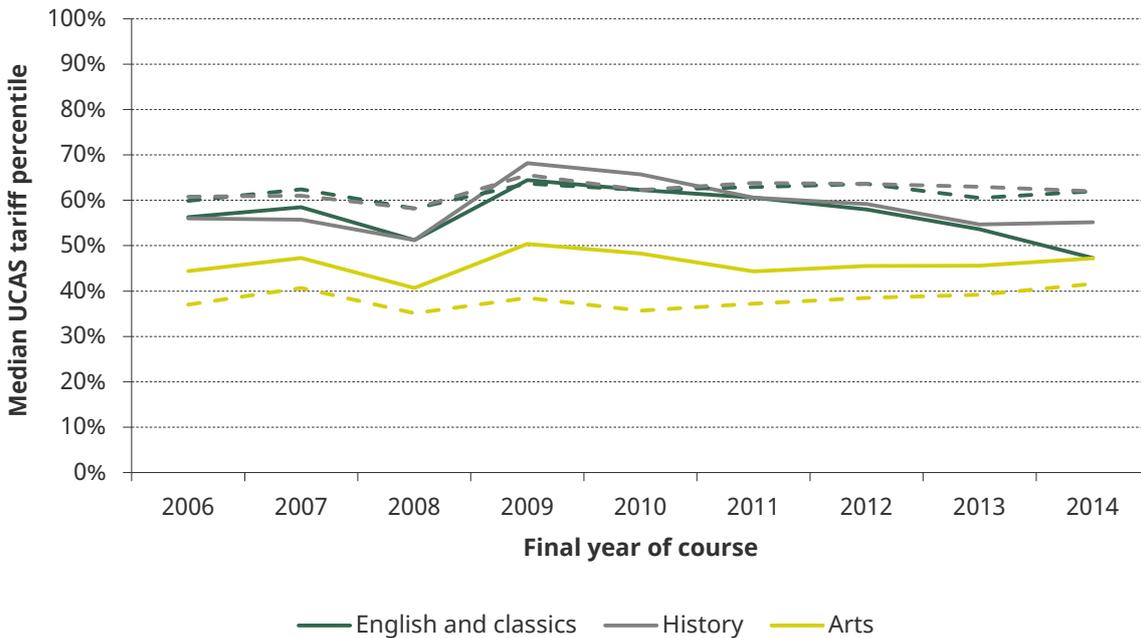
<sup>17</sup> Statistical significance judged using changes in the mean over time. Appendix Figure A.14 shows confidence intervals for mean educational attainment over time for teachers in all subjects.

**Figure 4.3. Relative educational attainment of new graduate teachers, arts subjects**

**(a) Average and distribution over time**



**(b) Comparison with all graduates in each subject area**

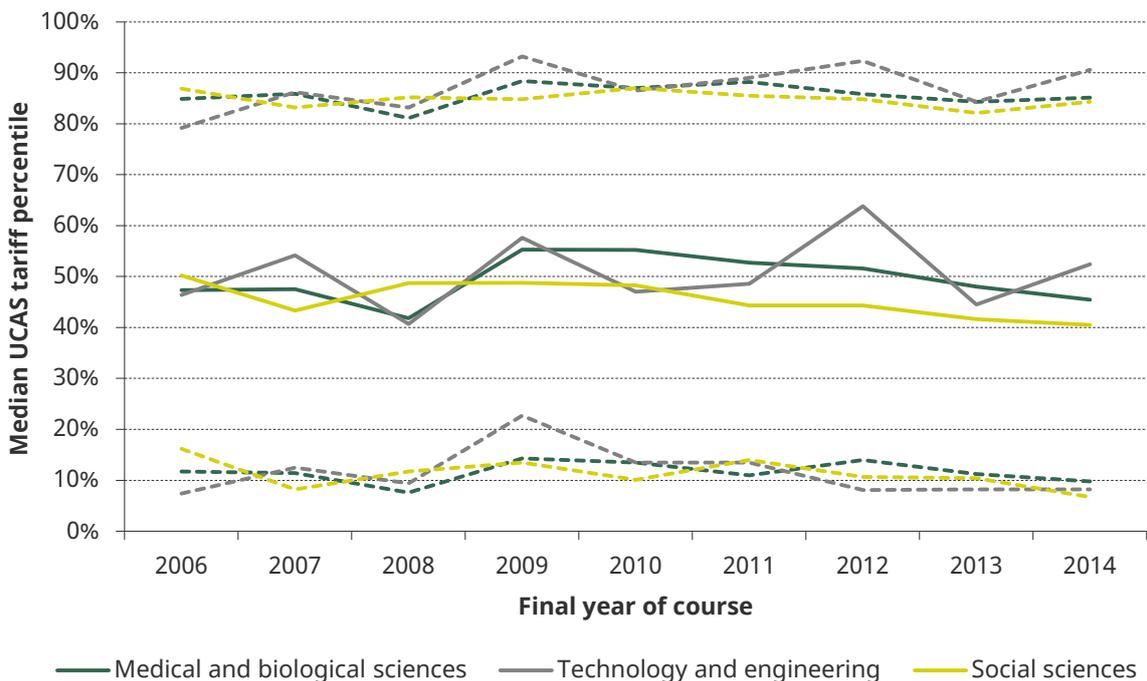


Note: Teachers in individual subjects defined as in Table 4.2 and Figure 4.1(a). Percentiles defined relative to all graduates who took A Levels or equivalent exams at the same point in time. Dashed lines in Figure 4.3(a) show 10<sup>th</sup> and 90<sup>th</sup> percentiles of educational attainment within each subject area, whilst dashed lines in Figure 4.3(b) show the trend amongst all graduates in the sample taking that particular subject.

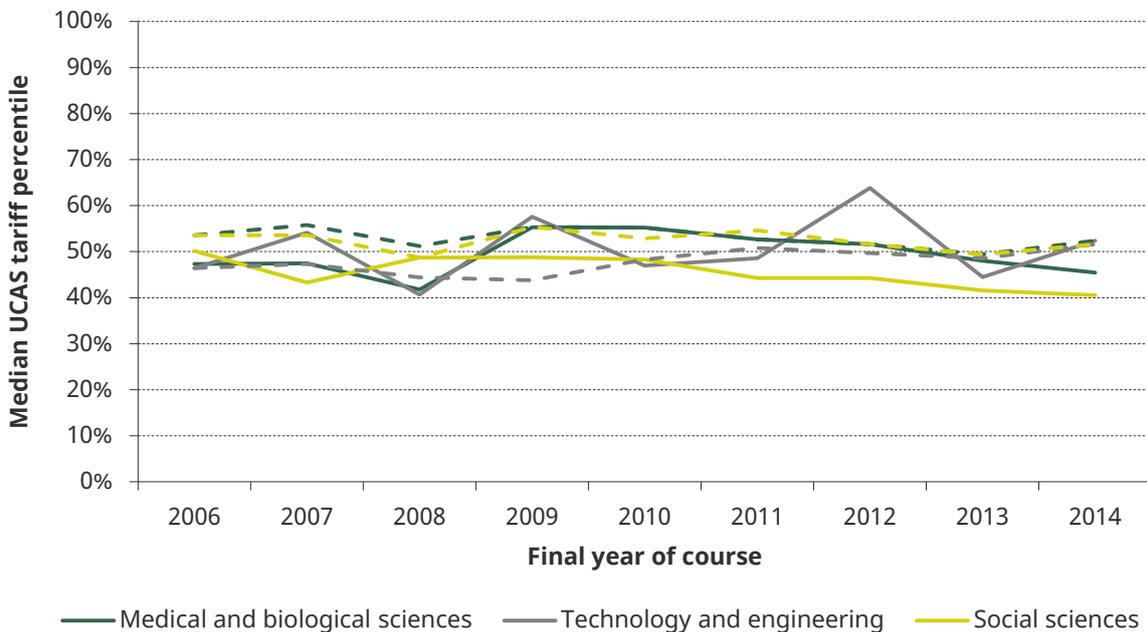
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure 4.4. Relative educational attainment of new graduate teachers, other subjects**

**(a) Average and distribution over time**



**(b) Comparison with all graduates in each subject area**



Note: Teachers in individual subjects defined as in Table 4.2 and Figure 4.1(a). Percentiles defined relative to all graduates who took A Levels or equivalent exams at the same point in time. Dashed lines in Figure 4.4(a) show 10<sup>th</sup> and 90<sup>th</sup> percentiles of educational attainment within each subject area, whilst dashed lines in Figure 4.4(b) show the trend amongst all graduates in the sample taking that particular subject.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

Comparing levels and trends across all subjects, there are clear differences across high-priority and lower-priority subjects. In terms of the level, we see higher levels of educational attainment in high-priority subjects in 2014–15 than in other subjects. In terms of trends, we see no evidence of falls since 2010 for the high-priority subjects, whilst we see more evidence of falls for other subjects. Indeed, for two of the subject groups experiencing clear falls since 2010 (English and classics, and history) we also see falls in the level of educational attainment of new teachers in each subject as compared with all graduates in that subject. Interestingly, this is the group of subjects with the lowest potential levels of bursaries. The other major subject areas experiencing declines since 2009–10 are social sciences and humanities, and medical and biological sciences. The former group includes geography, where teachers are eligible for bursaries above that seen for arts subjects, whilst trainee teachers with biology degrees are also eligible for medium levels of bursaries.

Taken together, this evidence suggests that although there remain shortages of teachers in high-priority subjects, those that do choose to teach in these subjects have relatively high levels of educational attainment, both compared with all graduates and compared with all graduates in those subject areas. Furthermore, whilst we see no evidence of a clear increase in the educational attainment of new teachers in high-priority subjects since high-value bursaries were introduced from 2012–13 onwards, we do see declines in subjects with lower-value bursaries, both relative to all graduates and relative to all graduates taking those degrees. It is therefore possible that high-value bursaries in high-priority subjects prevented a decline, or that potential teachers in non-priority subjects were discouraged from pursuing teaching by the signal that their subject was not considered a priority.

#### 4.4 Summary and policy implications

In summary, the variation in educational attainment by teachers' major subject area and the difference in trends over time both have interesting implications for policymakers. Although there is a shortage of trainee teachers in some subjects, such as physics and modern foreign languages, those that do train to become teachers from these backgrounds have relatively high levels of educational attainment. This is true compared with all graduates, all graduates in those respective subjects and trainee teachers in other subjects.

In terms of trends over time, the level of educational attainment for new or trainee teachers in high-priority subjects has been relatively steady since 2010. This might seem initially disappointing given the rapid increase in bursaries and scholarships for these subjects. However, there were declines for other subject areas and a clear hierarchy of changes by level of bursary offered. For example, the largest reductions were for English, classics and history, where educational attainment declined compared with all graduates and compared with all graduates in these specific subjects. Although a full-scale evaluation of the increase in bursaries is beyond the scope of this report, the initial evidence we present is suggestive that the higher levels for high-priority subject may have prevented a decline in educational attainment amongst new teachers.

Whilst this could represent a sign of success for the bursaries policy, it is not yet clear whether it represents value-for-money. We have only considered entrants to PGCE courses. The achievement of qualified teacher status, the entry to teaching after

qualification and the retention of high-quality teachers are also crucial. Importantly, bursaries are also not paid conditional on a teacher starting a teaching job. Empirical evidence also suggests that attrition from teaching is relatively high, with only 60% of trainee teachers in a teaching post after starting training (Allen et al., 2016). One of the most cited reasons for attrition from teaching is workload (Sellen, 2016). The previous Secretary of State set out an initiative to reduce teacher's workload.<sup>18</sup> The government has also encouraged schools to use their new freedoms on teacher pay to reduce attrition. The success of these policies to date is not clear. Future research should therefore consider the extent to which the new bursaries, and other elements of policy such as pay and workload changes, encourage teachers to train in high-priority subjects and to stay as teachers for the longer term.

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<sup>18</sup> See <https://www.gov.uk/government/publications/reducing-teachers-workload/reducing-teachers-workload>.

## 5. Conclusion

In this report, we sought to provide new evidence on how the quality of graduate recruits to major public sector occupations has changed over time. We used educational attainment on entry into higher education as an indirect proxy for quality. Although not a perfect measure of quality, such a measure is likely to be a good proxy for overall skills. In order to abstract from increases in exam results over time, we measured educational attainment relative to all other graduates who took their A Levels or equivalent exams at the same time. We focused our attention on teachers, doctors, nurses and NHS professions allied to medicine, as these are the largest groups of graduates entering the public sector.

We found that there is no evidence of substantial declines in educational attainment across these occupations over time (relative to those employed in other sectors). For teachers, there are some small reductions in the relative educational attainment of individuals starting PGCE courses, offset by increases in relative educational attainment amongst those going straight into teaching from an undergraduate degree (who are mostly primary school teachers). These trends started before public sector pay restraint came into operation after 2010 and there has been no net fall in relative educational attainment amongst teachers since then.

Amongst the health occupations, relative educational attainment has remained remarkably constant over time, both during the Great Recession and afterwards. There is, however, a large degree of variation in the level of educational attainment of individuals going into the different occupations. Doctors, unsurprisingly given the course entry requirements, have the highest level of educational attainment (at the 85<sup>th</sup> percentile, on average, which is equivalent to around four A grades at A Level). NHS professions allied to medicine have an average level of educational attainment just above the median for all graduates (equivalent to three A Levels and an AS Level at grade B), though there is a very wide level of variation amongst this group. Nurses have educational attainment at around the 30<sup>th</sup> percentile of all graduates, equivalent to just above three A Levels and an AS Level at grade C). Some of these stark differences are no doubt by design and will partly result from the differences in entry requirements. However, it is clearly important that policymakers are aware of the range of differences that exist.

Why has there been no decline in the educational attainment amongst graduates going into these major public sector occupations, given the substantial squeeze on public sector pay since 2011? One explanation is that the public–private sector pay gap has not actually changed that much over time. In 2015–16, the pay difference was basically at the same level as it was in 2006–07. In the introduction, we also showed that the earnings of graduates in the public sector occupations that we consider have largely followed the same patterns as the earnings of other young graduates. A lack of change since 2010 is less surprising in light of such evidence.

This is unlikely to be the full story, however, as the public–private sector pay gap clearly increased during the recession before falling back in more recent years. We see no evidence of this translating into rising and falling levels of educational achievement amongst new entrants over time. Furthermore, the expected lifetime remuneration of public sector workers has probably fallen by more than these figures suggest. Reforms to public sector pensions have reduced the value of the pension public sector workers can

expect to enjoy in retirement, though this is still probably more than private sector workers can expect (Cribb and Emmerson, 2016). Those going into the public sector also probably expect pay restraint to continue in the future too, which is exactly what the government committed to in July 2015.

Another explanation for the lack of decline in the educational achievement of new entrants since 2010 is that non-pay aspects of the job are a greater draw to potential recruits, and that changes in remuneration have only had a minor impact on the relative attraction of these public sector occupations. For example, academic evidence suggests that individuals who move into public sector occupations have higher levels of 'public service motivation'; see, e.g. Perry and Wise (1990) and Perry et al. (2010).

There is a lot of uncertainty about what will happen to the relative pay levels of public and private sector workers in the future. Currently, the Office for Budget Responsibility expects public sector earnings to fall by 5 percentage points relative to private sector earnings between 2015–16 and 2019–20. This would take the public–private sector earnings gap to well below any level seen in the past two decades. It is hard to imagine that this would not affect the sort of individuals going into public sector occupations. It is true that we have not seen this happen over the period of pay restraint to date, but we have not yet seen a big fall in the public–private sector pay gap.

One area where we have seen some large financial changes – and where we looked in further depth – is with regards to the bursaries and scholarships paid to trainee teachers with particular subject expertise and degree classifications. In 2011–12, teachers training in shortage or high-priority subjects could expect bursaries of about £6,000–£9,000. Since then, bursaries have been increased and scholarships have been introduced. As a result, some trainee teachers can expect a lot more, e.g. a physics trainee with a first-class degree can now expect about £30,000 (tax-free). These were introduced to counter shortages of teachers in particular subjects and with a view to increasing the quality of individuals going into these subjects.

We therefore examined the relative educational attainment of new or trainee teachers by the main subject of their undergraduate degree. What we found was that teachers joining in high-priority areas had relatively high levels of educational attainment, both compared with all graduates and compared with teachers coming from other subject backgrounds. Indeed, they had similar levels of educational attainment to all graduates studying that subject, e.g. the average educational attainment of new physics trainees was similar to that of all physics graduates. There has, however, been no increase since the very generous bursaries were introduced in 2012–13. This does not necessarily mean that they have not had an impact. Indeed, they may have prevented a fall from occurring. If we look at new teachers from other subject backgrounds with no or low eligibility for bursaries (e.g. English, history, classics), their educational attainment has fallen over time, relative to other teachers, all graduates and all graduates in their respective subjects. Although we have not conducted a full evaluation of the introduction of more generous bursaries, the empirical trends are suggestive of the idea that they may have prevented a decline in the quality of entrants over time.

Throughout the report, we have only focused on recruitment to major public sector occupations. This is only one side of the story, however. Other important issues to consider are the retention and motivation of high-quality workers. This is important across

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all public sector occupations, and of particular relevance to shortages of teachers within particular subject areas. Across almost all the public sector occupations we consider, significant concerns have been raised about how workloads of individual staff are affecting retention and possibly motivation (e.g. see the most recent School Teachers' Review Body and NHS Staff Pay Review Body reports<sup>19</sup>).

Teachers, in particular, have a relatively high attrition rate. IFS researchers have estimated that only about 60% of teachers who start training are in a teaching post five years later (Allen et al., 2016). Significant levels of resources are devoted to training teachers and incentivising particular groups via bursaries and scholarships. However, this only represents value-for-money if teachers stay in post for a significant length of time and the bursaries are not particularly well-targeted here (e.g. they are not conditional on becoming a teacher). Further attention may need to be paid to the retention of high-quality teachers, in addition to recruiting them. The higher bursaries, for example, will only be a success if they encourage more high-quality teachers into shortage subjects for the long term. At the moment, we do not know whether this has happened or not, partly through lack of data and partly because it is too early to tell. In the future, we hope to extend our analysis to consider such issues using the 'longitudinal' DLHE data, which surveys students three and a half years after leaving higher education. This is less representative of all graduate leavers, but it may be a good way to start to examine retention issues. One could also use the new School Workforce Census, were this to be linked to teachers' earlier levels of educational achievement.

To conclude, the overall set of results presented in this report shows no evidence of a widespread decline in the average educational attainment of graduates entering schools or health professional occupations since public sector pay restraint began to take effect in 2010–11. Where resources have been targeted, such as high bursaries for teachers in high-priority subjects, they may have helped to prevent declines in the skill levels of new recruits. However, there has been a decline in secondary school teachers of history, English and classics, and other arts subjects. Furthermore, whilst there has clearly been a significant squeeze on public sector pay to date, this is set to accelerate significantly over the current parliament. Continuing to monitor the quality and average skill levels of new recruits should therefore be a priority for policymakers.

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<sup>19</sup> The most recent reports at the time of writing can be found at <https://www.gov.uk/government/publications/school-teachers-review-body-26th-report-2016> and <https://www.gov.uk/government/publications/national-health-service-pay-review-body-29th-report-2016>, respectively.

# Appendix

**Table A.1. SOC codes**

Occupation	SOC codes
Doctors/dentists	2211 – Medical practitioners, 2215 – Dental practitioners
Nurses	2231 – Nurses, 2232 – Midwives
NHS professions allied to medicine (PAM)	2212 – Psychologists, 2213 – Pharmacists, 2214 – Ophthalmic opticians, 2217 – Medical radiographers, 2218 – Podiatrists, 2219 – Health professionals n.e.c., 2221 – Physiotherapists, 2222 – Occupational therapists, 2223 – Speech and language therapists, 2229 – Therapy professionals n.e.c., 3213 – Paramedics, 3218 – Medical and dental technicians, 3219 – Health associate professionals n.e.c., 6141 – Nursing auxiliaries and assistants. 6142 – Ambulance staff (excluding paramedics), 6143 – Dental nurses
Teachers	2314 – Secondary education teaching professionals, 2315 – Primary and nursery education teaching professionals, 2316 – Special needs education teaching professionals
Police	3312 – Police officers (sergeant and below), 1172 – Senior police officers
Prison workers	1173 – Senior officers in fire, ambulance, prison and related services, 3314 – Prison service officers (below principal officer)
Civil servants	1111 – Senior officials in national government, 1113 – Senior officials in local government, 2441 – Registrars, local government officers and national government administrative professionals, 3561 – Public services associate professionals, 4111 – Civil service executive officers, 4112 – National government administrative occupations, 4113 – Local government administrative occupations

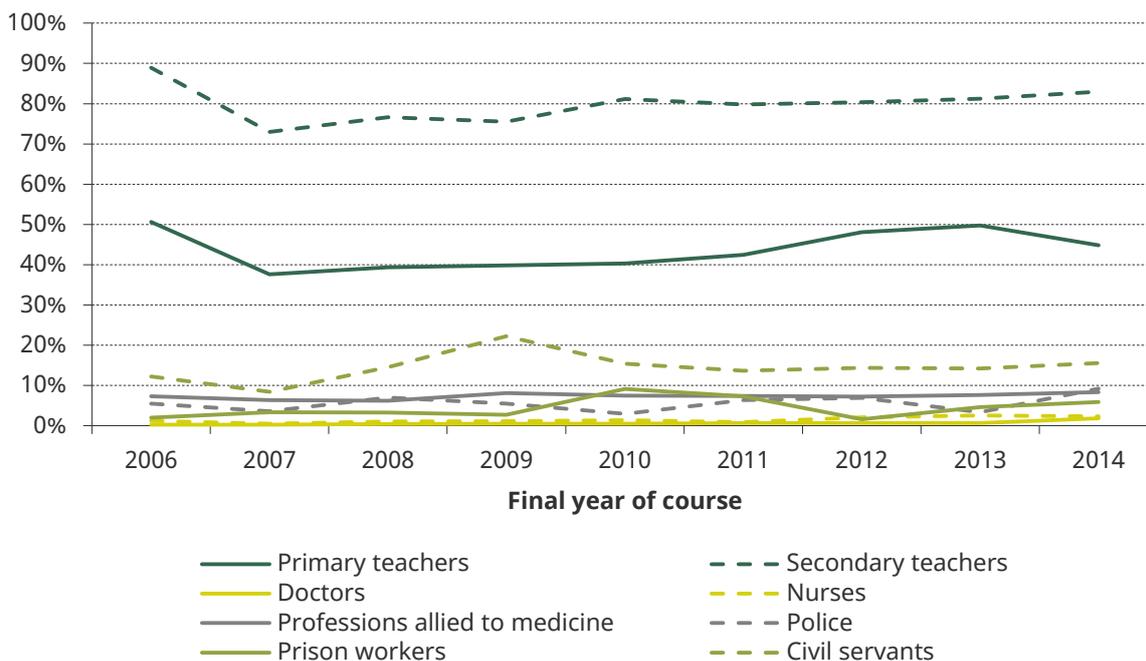
**Table A.2. List of postgraduate courses used as likely to lead into a major public sector occupation**

<b>Course (JACS code)</b>	<b>Occupation likely to lead to</b>	<b>% of postgraduates who go on to expected occupation</b>	<b>Number of undergraduate leavers entering postgraduate courses</b>
Pre-clinical medicine (A1)	Doctor	25%	1,353
Pre-clinical dentistry (A2)	Doctor (our definition includes dentists)	59%	124
Clinical medicine (A3)	Doctor	32%	2,596
Clinical dentistry (A4)	Doctor	78%	368
Others in medicine and dentistry (A9)	Doctor	42%	617
Pharmacology, toxicology and pharmacy (B2)	NHS professions allied to medicine	54%	1,512
Complementary medicines, therapies and well-being (B3)	NHS professions allied to medicine	64%	484
Aural and oral sciences (B6)	NHS professions allied to medicine	67%	185
Nursing (B7)	Nurse	53%	2,222
Medical technology (B8)	NHS professions allied to medicine	65%	351
Training teachers (X1)	Teacher	80%	24,571

Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors calculations using DLHE survey 2011–12 to 2014–15.

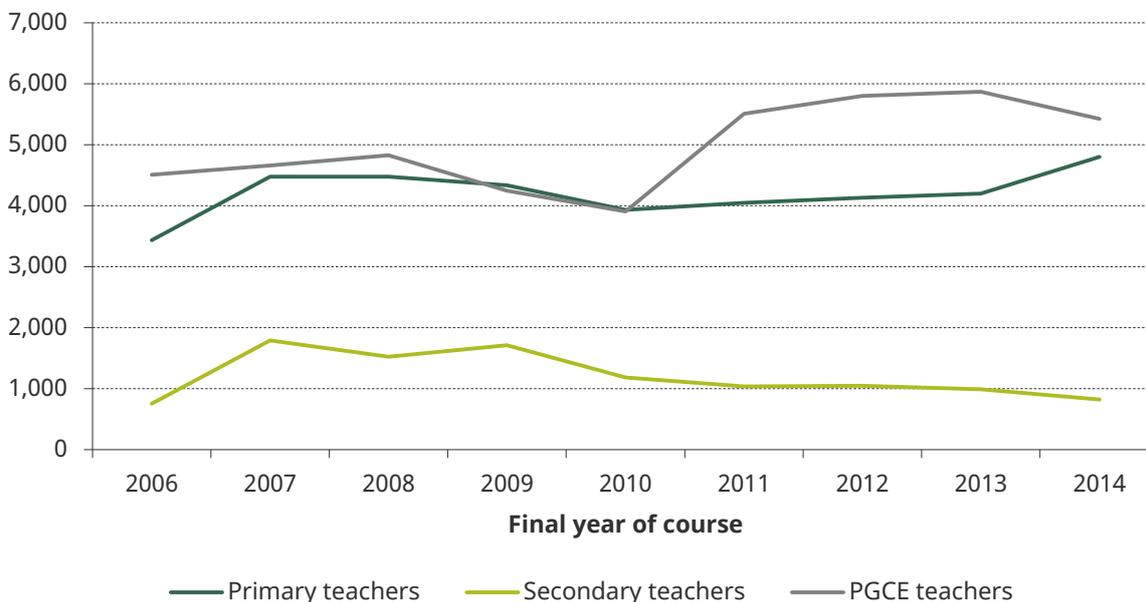
**Figure A.1. Percentage of new graduate entrants joining from postgraduate courses**



Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

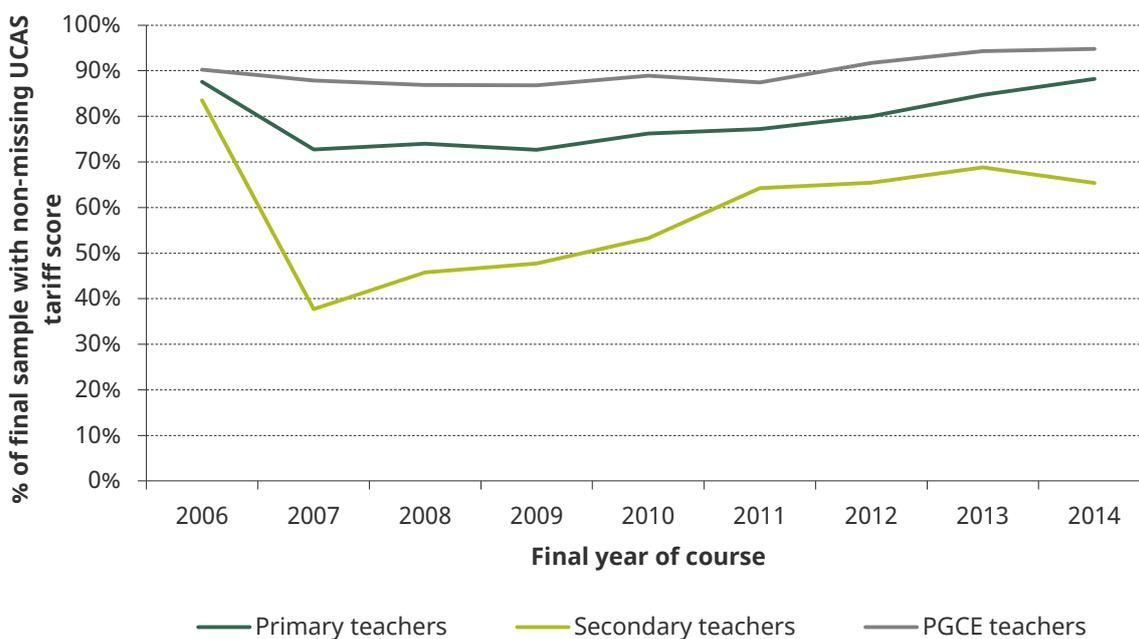
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.2. Number of new teachers over time, by type**



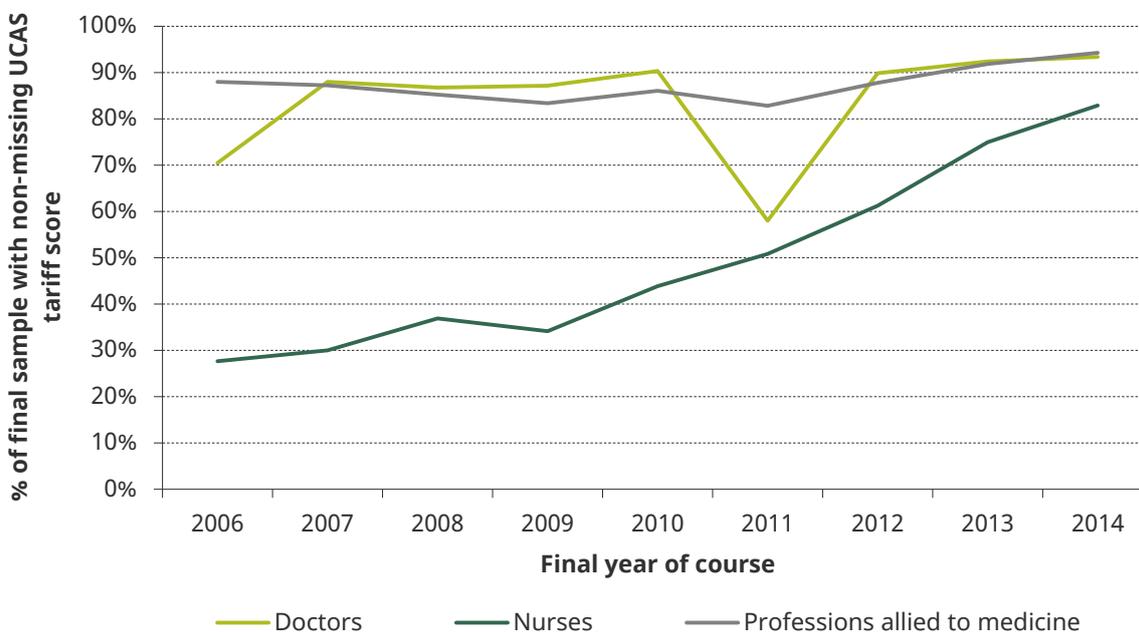
Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1. 'PGCE teachers' represents higher education leavers going on to PGCE courses, as discussed in Section 2.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.3. Percentage of teachers in sample with non-missing UCAS tariff score data**

Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

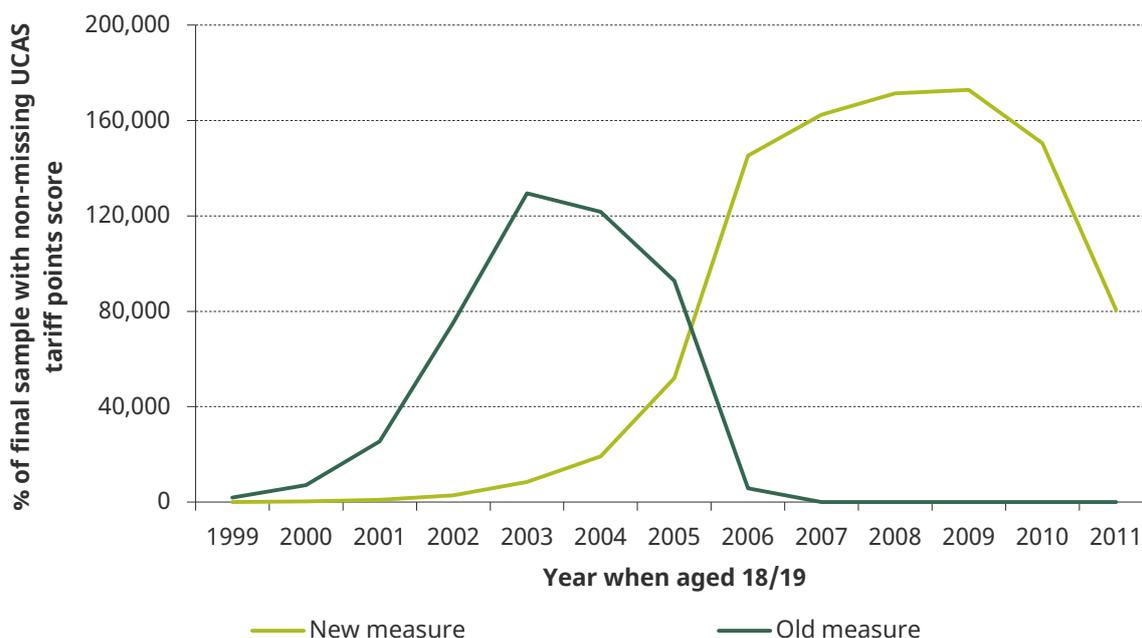
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.4. Percentage of medical workers in sample with non-missing UCAS tariff score data**

Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

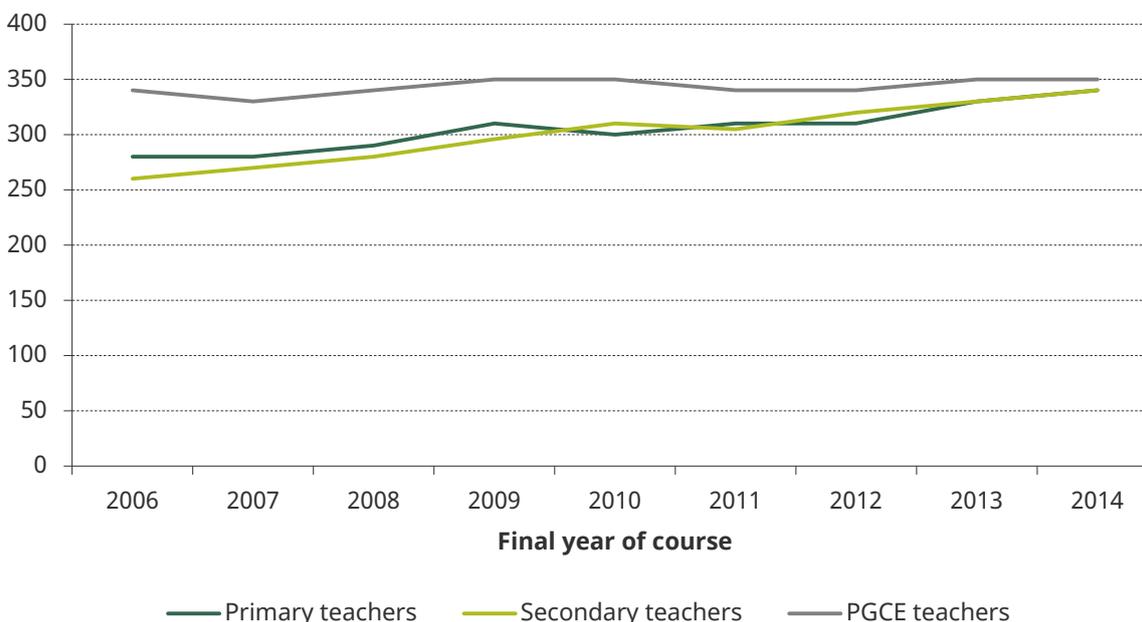
**Figure A.5. Numbers in sample by UCAS tariff system**



Note: Sample includes all individuals leaving higher education aged between 21 and 25 who completed their higher education course on a full-time basis.

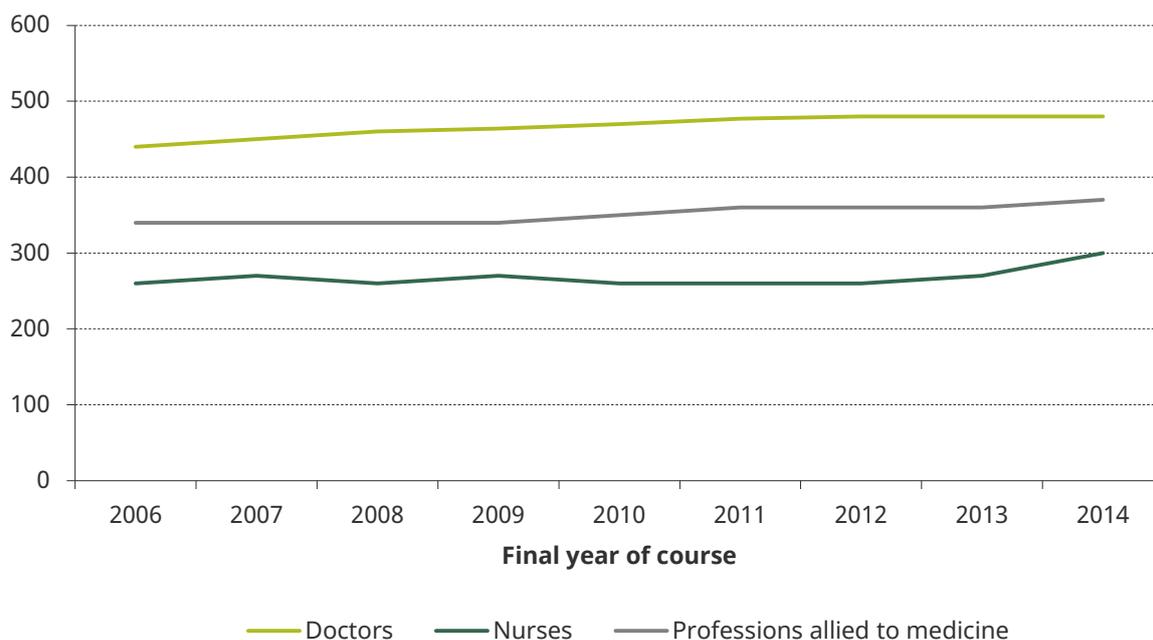
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.6. Median raw UCAS tariff points score of new teachers**



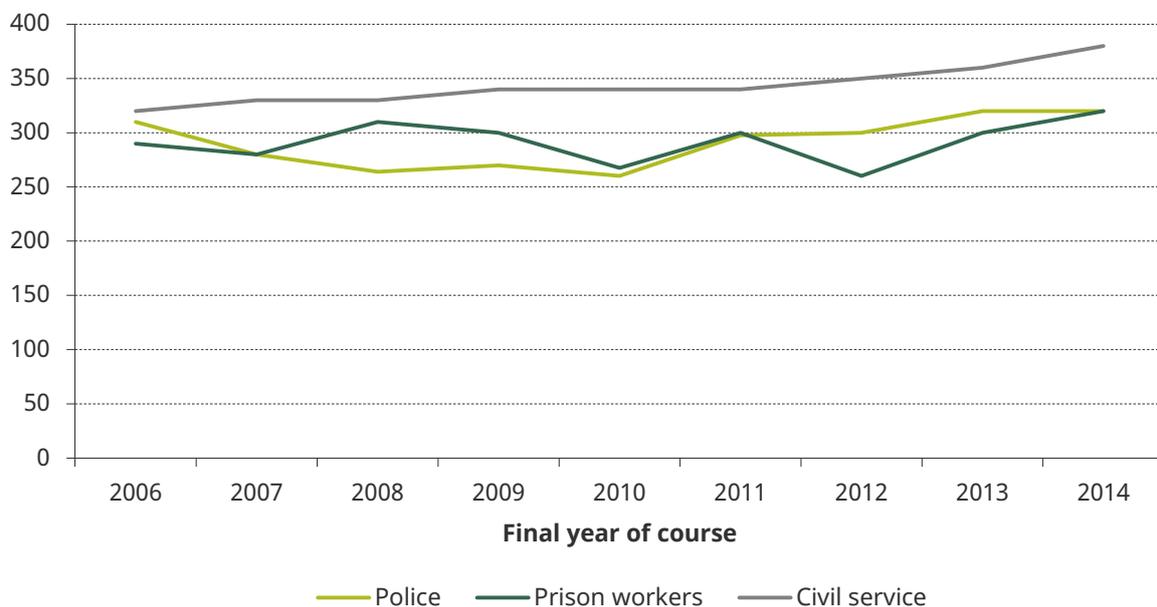
Note: Only includes individuals aged between 21 and 25 with non-missing UCAS tariff scores who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.7. Median raw UCAS tariff points score of new medical workers**

Note: Only includes individuals aged between 21 and 25 with non-missing UCAS tariff scores who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

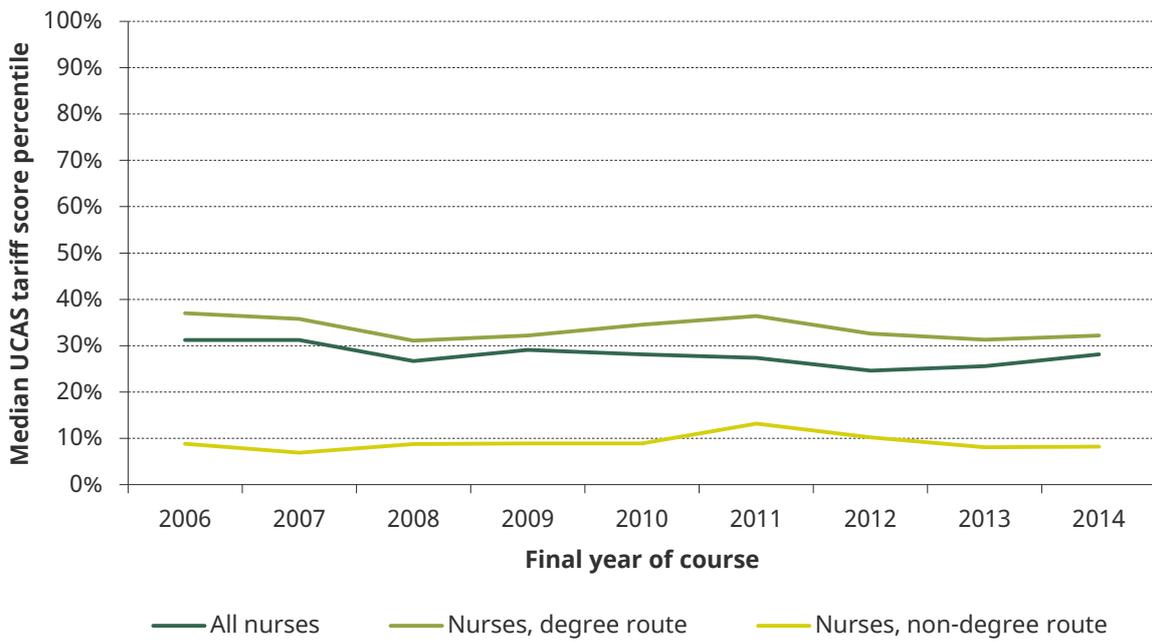
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.8. Median raw UCAS tariff points score of new police, prison workers and civil servants**

Note: Only includes individuals aged between 21 and 25 with non-missing UCAS tariff scores who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

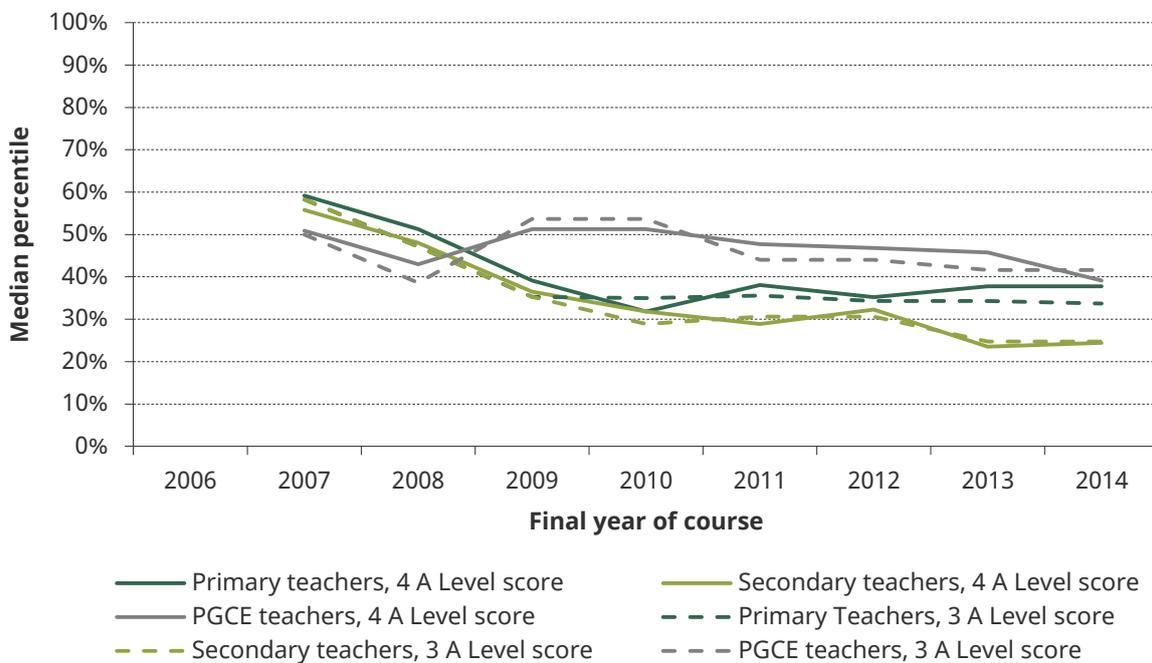
**Figure A.9. Relative education attainment of nurses, by qualification route**



Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

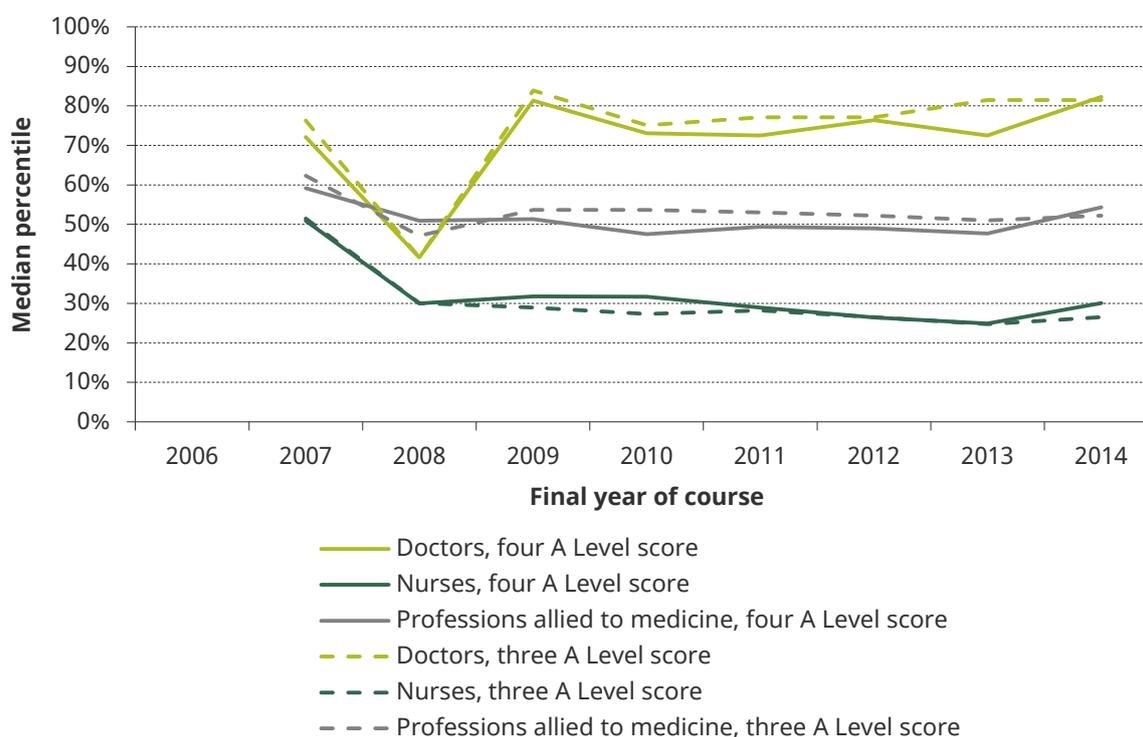
**Figure A.10. Comparison of best four A Levels and best three A Levels measures of education attainment, teachers**



Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

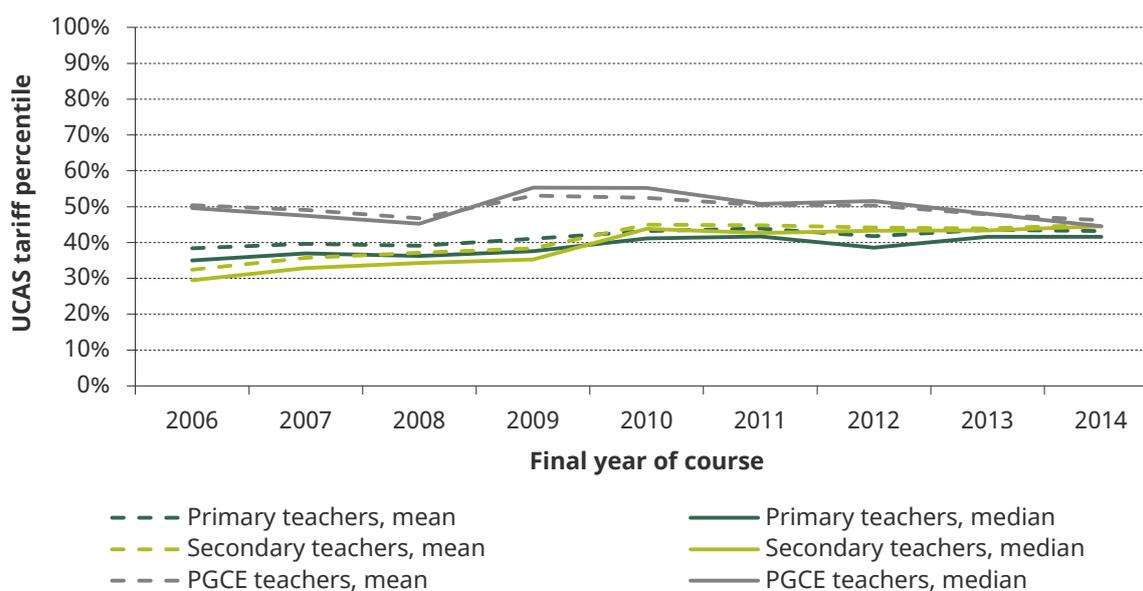
**Figure A.11. Comparison of best four A Levels and best three A Levels measures of education attainment, medical workers**



Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

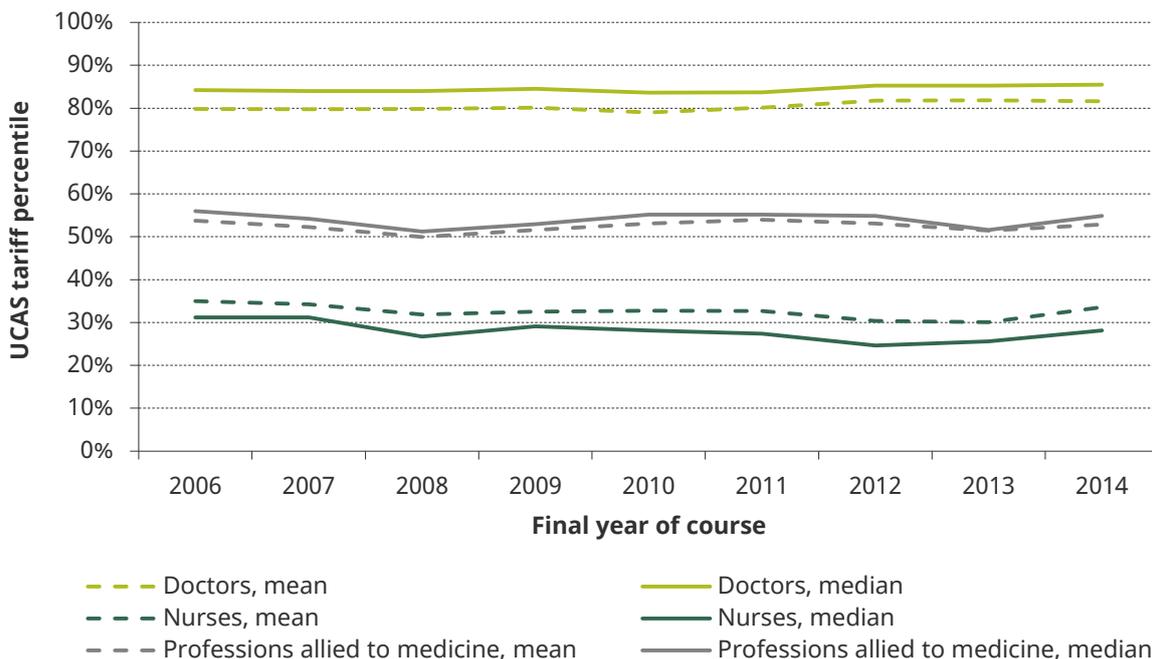
**Figure A.12. Mean/median comparison of UCAS tariff points score percentile for teachers**



Note: Only includes individuals aged between 21 and 25 with non-missing UCAS tariff scores who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

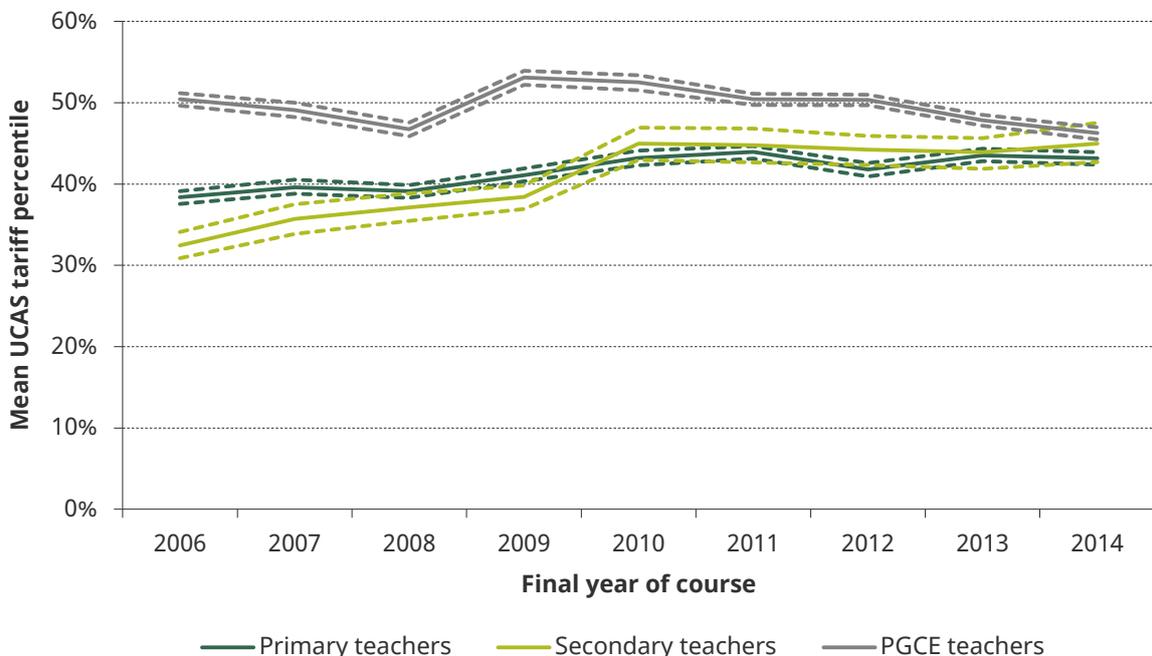
**Figure A.13. Mean/median comparison of UCAS tariff points score percentile for medical workers**



Note: Only includes individuals aged between 21 and 25 with non-missing UCAS tariff scores who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

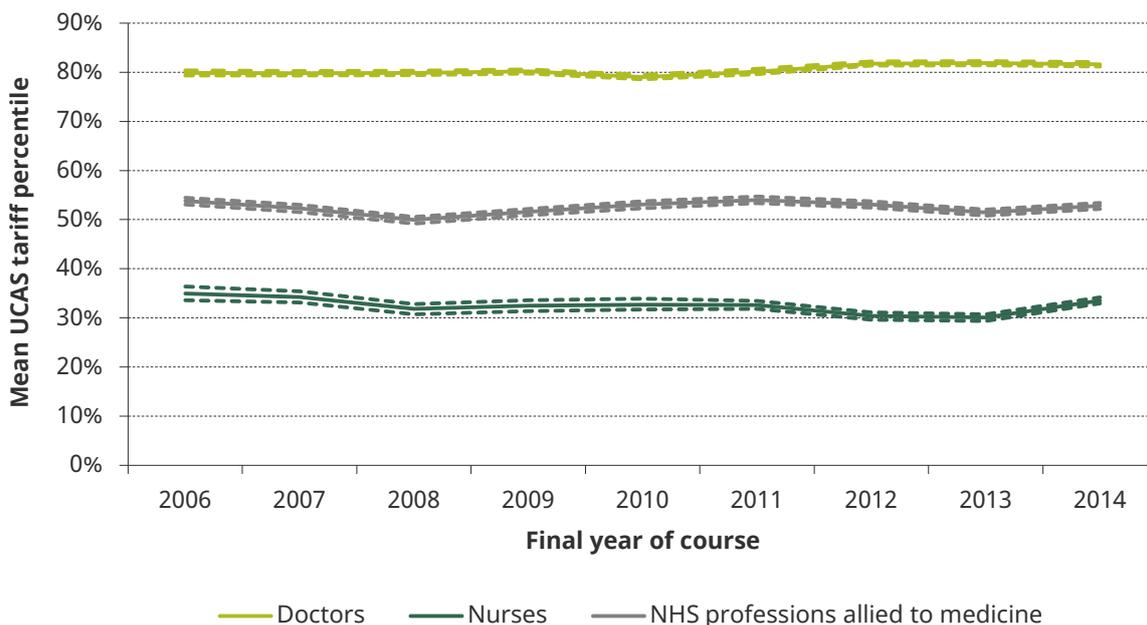
**Figure A.14. Mean UCAS tariff percentiles and confidence intervals, teachers**



Note: Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1. Bootstrapping used to estimate confidence intervals.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

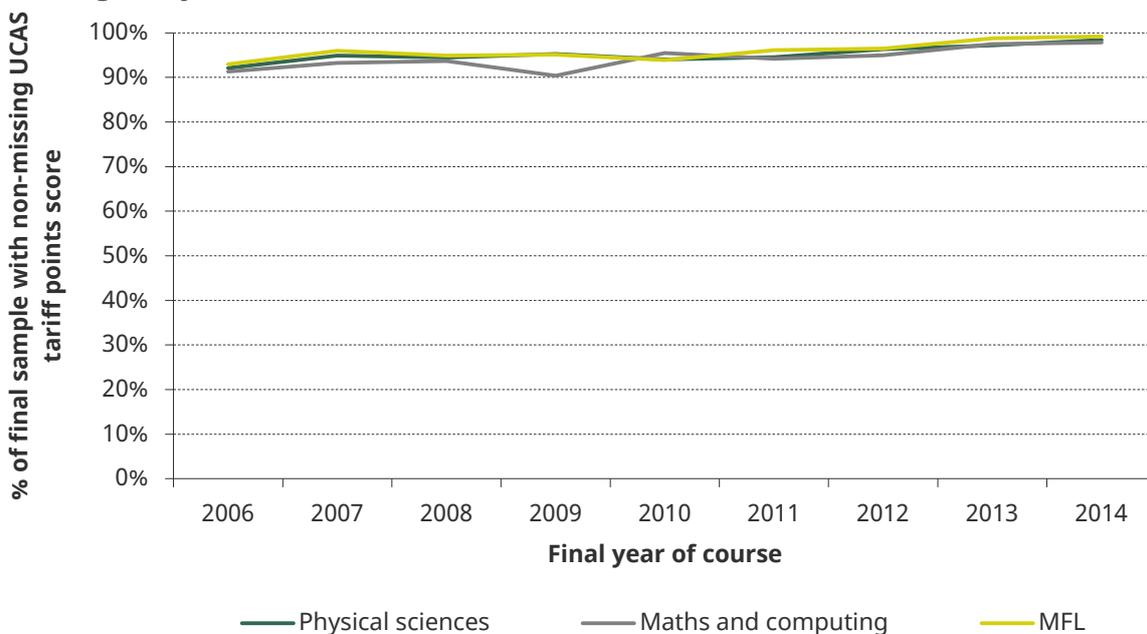
**Figure A.15. Mean UCAS tariff percentiles and confidence intervals, health professions**



Note: Sample includes individuals observed as on a postgraduate course six months after graduation likely to lead to employment in one of our major public sector occupations. Only includes individuals aged between 21 and 25 who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by occupation defined as in Table A.1. Bootstrapping used to estimate confidence intervals.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

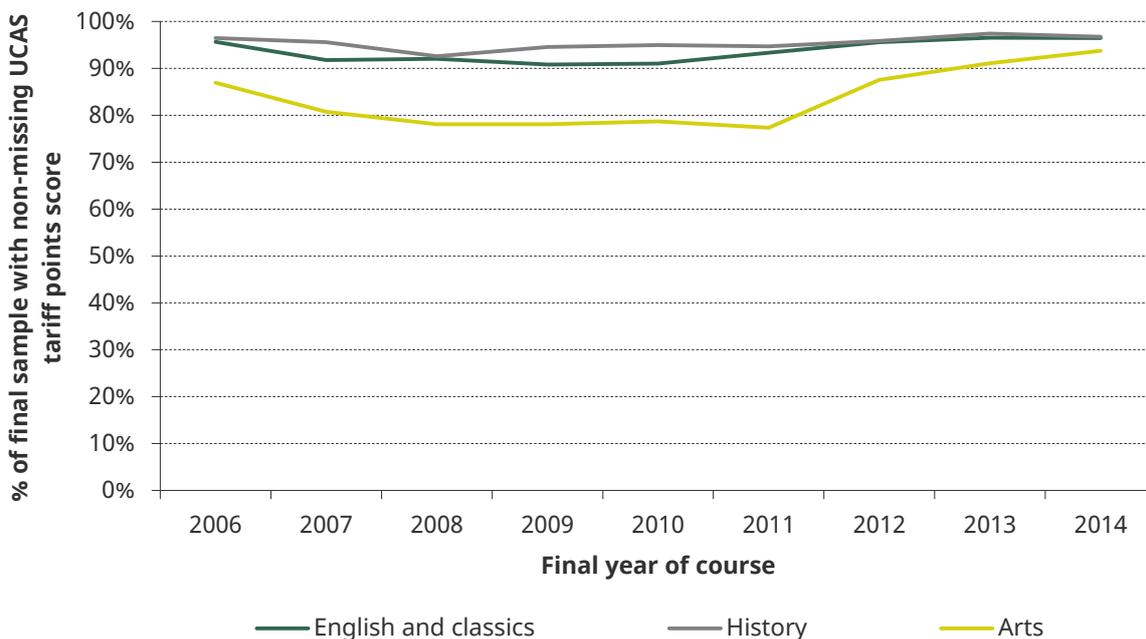
**Figure A.16. Percentage of teachers in sample with non-missing UCAS tariff score, shortage subjects**



Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by subject defined as in Table 4.2.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

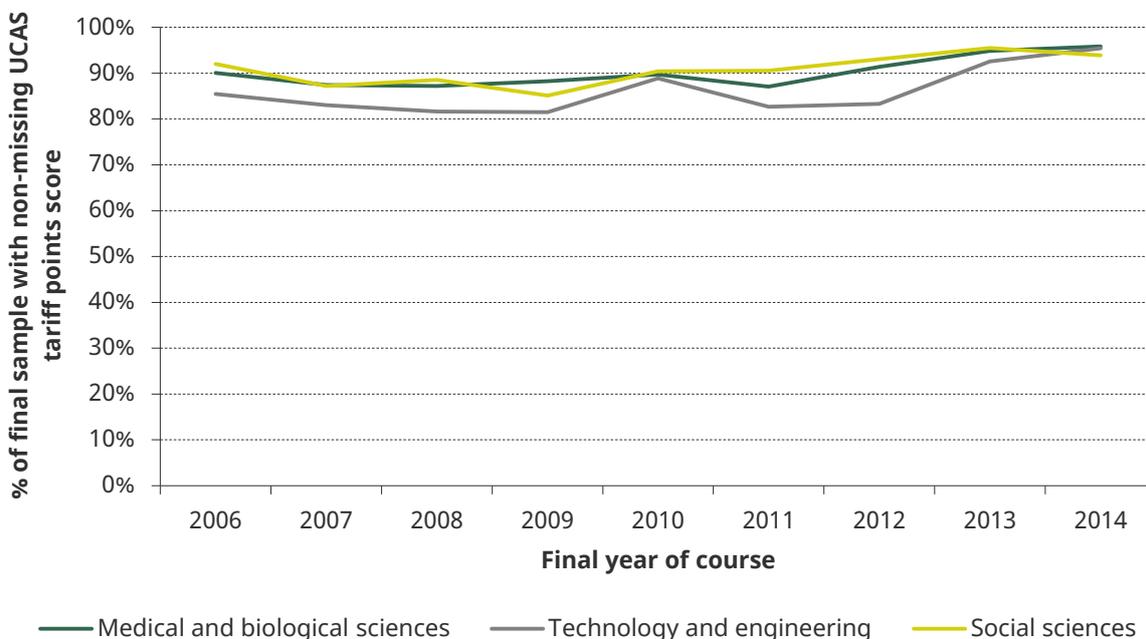
**Figure A.17. Percentage of teachers in sample with non-missing UCAS tariff score, arts subjects**



Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by subject defined as in Table 4.2.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.18. Percentage of teachers in sample with non-missing UCAS tariff score, other subjects**

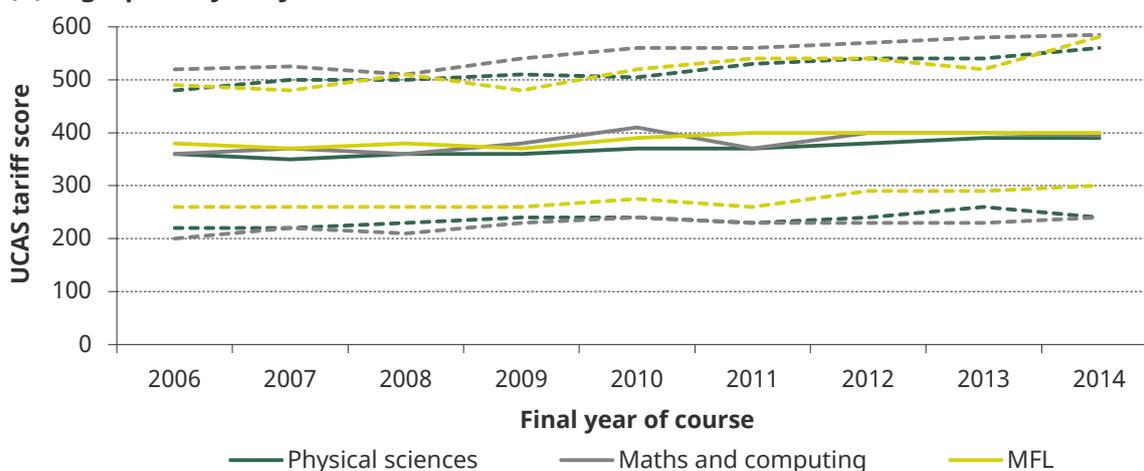


Note: Only includes individuals aged between 21 and 25 who completed their higher education course on a full-time basis. Classification by subject defined as in Table 4.2.

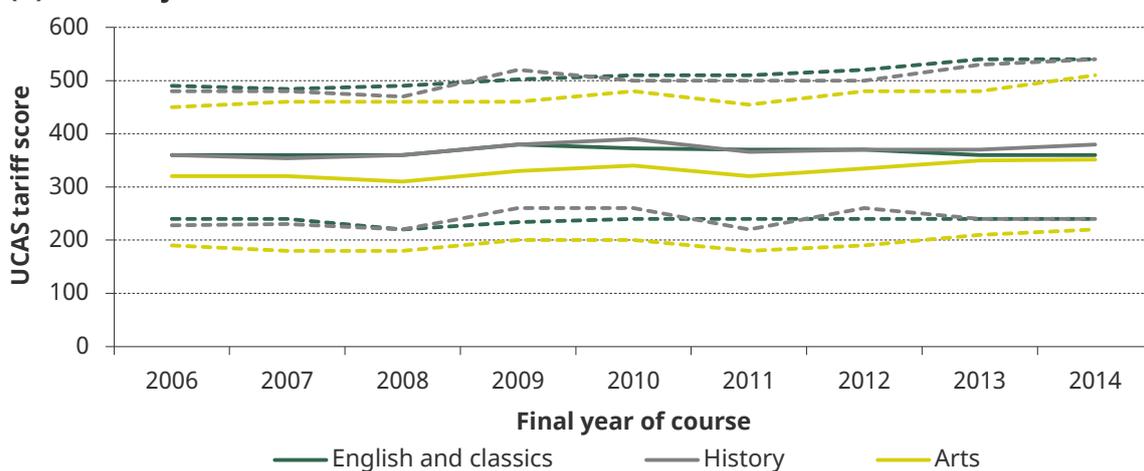
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

Figure A.19. Median and 10<sup>th</sup> and 90<sup>th</sup> percentiles of UCAS tariff scores for new teachers by subject area

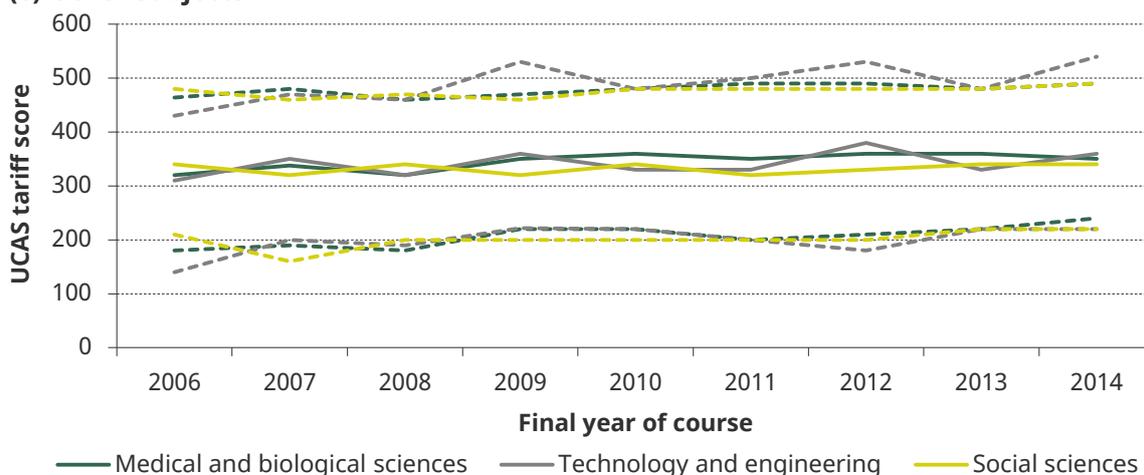
(a) High-priority subjects



(b) Arts subjects



(c) Other subjects

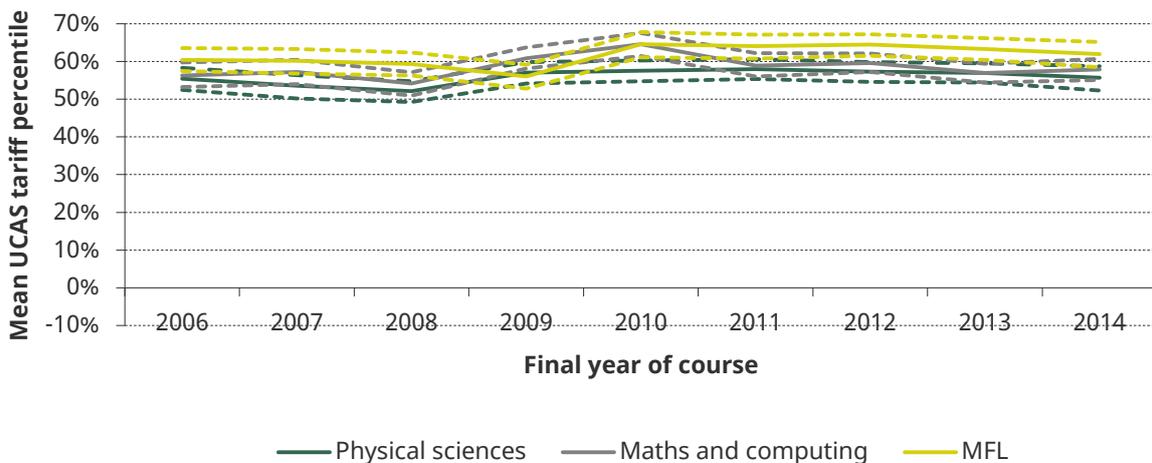


Note: Teachers in individual subjects defined as in Table 4.2 and Figure 4.1(a). Dashed lines show 10<sup>th</sup> and 90<sup>th</sup> percentiles of educational attainment within each subject area.

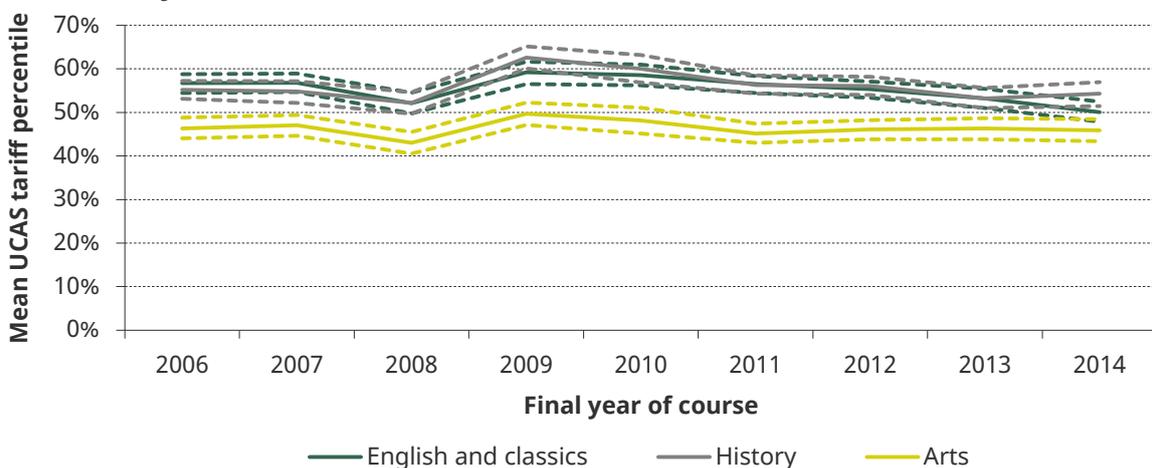
Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

**Figure A.20. Mean UCAS tariff percentiles and confidence intervals, teachers**

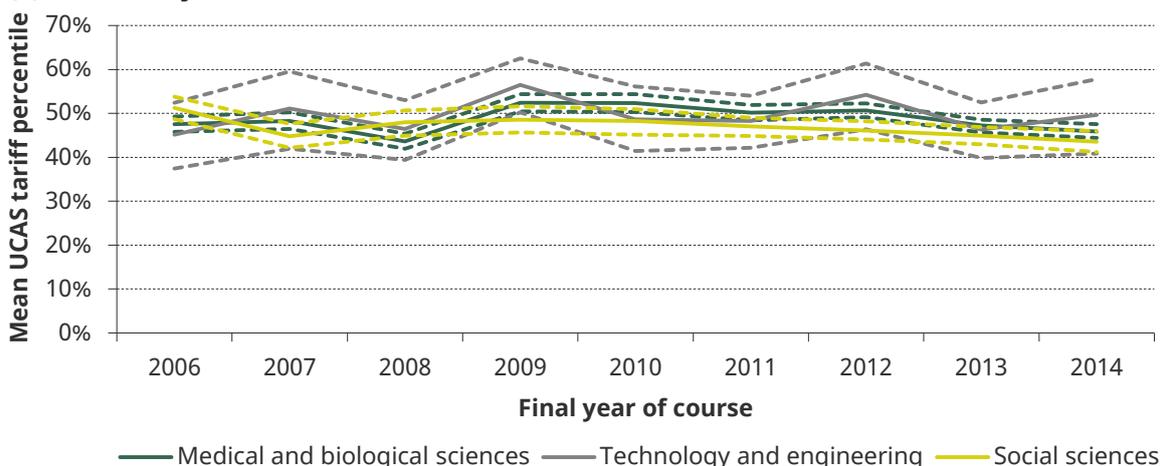
**(a) High-priority subjects**



**(b) Arts subjects**



**(c) Other subjects**



Note: Confidence intervals constructed using bootstrapping. Sample includes individuals observed as teachers or on a PGCE course six months after graduating from a UK higher education institution. Only includes individuals between 21 and 25 inclusive who have non-missing UCAS tariff scores and who completed their higher education course on a full-time basis. Classification by subject defined in Table 4.2.

Source: Authors' calculations using DLHE survey 2006-07 to 2014-15.

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