Institute for Fiscal Studies

Where is the money going? Estimating the government cost of different university degrees

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Chris Belfield
Jack Britton
Laura van der Erve
Neil Shephard

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Jack Britton, Laura van der Erve, Neil Shephard and Chris Belfield

Executive summary

There have been several significant changes to the way higher education (HE) is funded in England over the past 20 years, moving from a heavily grant-based system to a heavily loan-based system. All students can borrow up to £9,250 per year to cover their fees and, on average, around £6,500 per year in maintenance loans to help with their living expenses. Because the loans are *income contingent* – meaning graduates only repay 9% of their income above £25,000, with any outstanding debt written off after 30 years – the government can expect to write off around half of loans issued. In fact, loan write-offs now account for more than 90% of government spending on undergraduate HE. As a result, the government is much less able to target the money it spends on HE and, instead, the subsidy mechanically accrues to those graduates with the lowest lifetime earnings. Although there are several very good reasons for the government to subsidise HE, this distribution of spending may not necessarily align with the students, or subjects, that the government wishes to prioritise.

This work estimates how government spending is distributed by subject studied and university attended, based on grants and unrepaid student loans (including both tuition and maintenance loans). This has not been previously possible due to data limitations, but we are able to circumvent those limitations using a specifically created linked administrative data set. We estimate the implied levels of spending for each subject area via unrepaid loans and direct teaching grants, noting that in practice this may not reflect the true distribution of spending because universities are likely to cross-subsidise courses that are expensive to teach with courses that are relatively cheap to teach. It is also important to note that this work is not estimating *returns* to different degrees, and is instead estimating the value of loan repayments, which is of course determined by many factors other than the degree itself, such as gender and prior attainment.

Estimating loan subsidies – formally, the total amount the government issues in loans, minus the discounted present value of all loan repayments made by all students across their lifetimes, all divided by the total value of all loans issued (in other words, the share of all loans the government issues that it expects to write off) – is an inherently speculative exercise. It requires the forecasting of earnings of graduates over a 30-year period and relies heavily on how graduate earnings have evolved in the past, as well as economic forecasts over the next 30 years. Our results are sensitive to these assumptions and therefore should be treated with caution.

> **Key findings**
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> **Our best estimates suggest considerable variation in loan subsidies by subject area.** The government only expects to write off around a quarter of the value of the loans it issues to economists, while for many subjects the expected loan subsidy is in excess of 60%. For creative arts, it is around three-quarters. The subject area with the lowest loan subsidy is medicine & dentistry, with around a fifth of loans written off.

Differences in loan write-offs across subjects largely reflect differences in loan repayments, rather than differences in the size of the loans. The size of the loans students are eligible for does not depend specifically on the subject they study, but rather on the length of their course and their parental income. In fact, annual tuition fees are the same (£9,250 per year) for almost all students, regardless of course or institution. Tuition and maintenance debts are treated as indistinguishable by government (i.e. one is not repaid before the other), so our estimates therefore include write-offs from both. This is appropriate since we think of government contributions to living costs during study as a cost of funding HE.

The subjects with the highest loan write-offs typically receive the highest government spend per student. The cost to government is around £11,000 per economics student taking out full tuition fee and living cost loans. The equivalent figure for an engineering student is roughly £27,000, while for a creative arts student it is around £37,000. Despite having a low loan subsidy, medicine & dentistry is still one of the higher-cost degrees to government, at around £45,000 per degree, due to large teaching grants.

The government cost per student also varies a lot by institution type. Because students from Russell Group universities typically have relatively high earnings, the government cost per borrower at a Russell Group university is around £24,000, while for 'post-1992' and 'other' universities the cost is around £31,000. Again, this is the *total cost to government*, including its contributions towards living costs, and does not include the contributions of graduates (in fact, total funding *received* is extremely similar across different universities).

The distribution of spending by subject and institution has been hugely affected by reforms since 2011. For example, the cost to government of providing engineering degrees *decreased* by around £9,000 per student during this period, while the equivalent figure for creative arts degrees *increased* by more than £6,000. The government now spends over 30% *more* per creative arts degree than it does per engineering degree, whereas if the 2011 system were still in place today, it would spend nearly 20% *less* per degree on creative arts than engineering. Similarly, government spending per borrower at Russell Group universities is around £6,000 lower under the 2017 system than under the 2011 system, while it increased for the 'post-1992' and 'other' university groups by more than £2,000.

Consequently, the distribution of total government spending on HE is very different today from what it would have been with no reforms. Holding the set of students and their earnings fixed, if the 1999 system were still in place today, around 57% of government spending on undergraduate HE – teaching grants to universities, grants to students and unrepaid fee/maintenance loans – would be going towards students studying science, technology, engineering and maths (STEM) courses, with 30% going towards arts and humanities (AH) students. Under the current system, 48% goes towards STEM students, with 37% going to AH students.

The recent ONS review on the accounting treatment of student loans dramatically affects the impact of different subject areas on the deficit. Under the old accounting treatment, grant spending today counted towards the deficit today, while write-offs from loans issued today only affected the deficit 30 years down the line. Under the new system, expected write-offs from loans issued today count towards the deficit today. Consequently, many subject areas go from adding almost nothing to the deficit today under the old system to adding significant sums to it under the new one. For example, we estimate the deficit impact per cohort of creative arts students will increase from around £25 million to around £1.2 billion as a result of the change. These changes could dramatically increase scrutiny from policymakers concerned about deficit spending today.

Combined with the design of the finance system, the recent removal of controls on student numbers exposes the government to risk of spiralling costs. Until 2014, there were tight restrictions on student numbers to help control costs. Under the current system, total spending and the distribution of that spending both depend on student choices: large increases in the number of students doing degrees that currently result in lower earnings could dramatically increase government costs, especially given recent increases in the costs to government associated with lower-earning subjects.

Lowering the fee cap from £9,250 to £6,000 could give the government more flexibility to target spending and reduce exposure to risk. This change would save the government around £7,000 per borrower due to lower loan write-offs, with most of the savings coming from lower-earning subjects. The money saved from lower loan write-offs would free up funds for the government to target other priority areas more directly – for example, if *all* of the government savings were put into grants for STEM courses (keeping total long-run government spending constant), the share of government spending on STEM would increase from 48% to 62%. University funding overall would drop under this policy due to lower contributions from higher-earning graduates that are not fully replaced by increased grants.

Variable fee caps could also allow the government to regain flexibility in where it targets spending – but there are significant caveats. Reducing the fee cap for non-STEM subjects to £6,000 per year would reverse part of the funding increase that AH subjects have seen in the last 20 years and would reduce the government exposure to big changes in student choices. But it might increase demand for non-STEM courses, or perversely lead to a reduction in funding for STEM due to subsequent reductions in within-university cross-subsidisation.

Any cuts to tuition fees would reduce the progressivity of the system. The design of the current system means that repayments are highly progressive, as borrowers with the highest lifetime earnings repay dramatically more than those with the lowest lifetime earnings. Any cuts to tuition fees would reduce repayments of the highest-earning borrowers the most, reducing this progressivity. A 'negative teaching grant' policy, where government charges universities a fee for setting tuition fees above a certain level for certain subject areas, is an alternative way to regain control of spending that would not reduce progressivity. This would mean universities receive less money for those courses, but would not affect graduate debts or repayments. However, the wider impact of this policy is still extremely difficult to predict.

1. Introduction

Over the past 20 years, higher education (HE) policy in England has shifted dramatically away from a fully funded teaching-grant-based system towards one almost entirely funded by tuition fees (see Table A1 in the appendix for a detailed summary of the changes). Tuition fees of £1,000 were first introduced in 1998, then increased to £3,000 in 2006 and increased again to £9,000 in 2012. With the last change, teaching grants – direct transfers from government to universities – were dramatically reduced for all but the most expensive-to-teach courses. However, a significant subsidy remains as the government provides income-contingent loans to all students, who each year can borrow up to £9,250 to cover tuition fees and around £6,500 on average to cover some living costs, and a considerable portion of these loans is not expected to be repaid.

The primary rationale for the 2012 reforms was to improve the quality of HE provision, both by increasing funding for universities (notably, at a time of severe fiscal austerity) and by increasing competition for students. On the latter, it was envisaged that increasing the fee cap to such a high level would result in competition between universities on price. However, in practice, this did not materialise and, within a short space of time, almost all universities set their fees at £9,000 for all courses. These higher-than-expected fees increased non-repayment of loans and mean that the long-run government cost of HE is much higher than was expected prior to the reform.

The changes in the long-run government cost have been well documented in previous IFS research,[1] but what has not been well documented is how the dramatic changes to the funding of HE have affected government spending on different sub-populations of students. Historically in England, as most of the government spending came through grants, the government was able to target certain groups of students by providing maintenance grants to help with their living costs during study, and certain courses by issuing different teaching grants for different subject areas. Under the current system, however, grants account for less than 5% of the government's 'up-front' spending on HE, with the rest consisting of tuition fee loans which are paid directly to universities on behalf of the student and maintenance loans which are paid to the student. Consequently, the vast majority of *long-run* government spending – i.e. the sum of all up-front spending on grants, *plus* the part of student loans that are not repaid – now comes through unpaid loans. This means that the government has been much less able to target the money it spends on HE and instead the subsidy mechanically accrues to those graduates with the lowest lifetime earnings. This may not necessarily align with the students, or subjects, that the government wishes to prioritise.

The present-day value of the long-run cost to government of HE is now around £9 billion per cohort of undergraduate students, with more than £8 billion coming through unpaid tuition and maintenance loans. Understanding how such a large amount of government money is being spent is highly important. Furthermore, as a result of the recent announcement by the Office for National Statistics (ONS)[2] that the government

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[1] C. Crawford and W. Jin, *Payback Time? Student Debt and Loan Repayments: What Will the 2012 Reforms Mean for Graduates?*, IFS, Report R93, 2014, https://www.ifs.org.uk/publications/7165; C. Belfield, J. Britton, L. Dearden and L. van der Erve, 'Higher education funding in England: past, present and options for the future', IFS, Briefing Note BN211, 2017, https://www.ifs.org.uk/publications/9334.

[2] Office for National Statistics, 'New treatment of student loans in the public sector finances and national accounts', December 2018,

accounting treatment of student loans will be changed, it is expected that student loan write-offs will be under considerably more scrutiny by policymakers. Previously, losses on student loans only counted towards the government deficit when they were actually realised at the end of the 30-year loan period. This meant that any changes to the student loans system that affected the expected loss on these loans did not have an immediate deficit impact. As a result of the accounting change, however, it is now going to be the case that all expected losses on student loans issued *today* count towards the deficit *today*.[3]

Previous work investigating the costs of student loans has relied heavily on survey data, which limits the extent to which cost for sub-populations of borrowers can be studied. This is due to a combination of small sample sizes, a lack of appropriate data on subgroups (such as subject studied or institution attended) and insufficiently long panels of earnings data (meaning individuals are not tracked over time for long enough). Making use of a linked administrative data set created specifically for this purpose, this report investigates in detail how much of the government subsidy goes to different subjects and institution groups, finding large variation.[4] We also show how this has changed through the major changes to the system since 1999. We do this by showing the estimated long-run government contribution by subgroup under the 1999, 2005, 2011 and 2017 systems.[5]

It is important to note that we are not estimating the causal returns to different degrees here. We are estimating long write-offs based on the set of students taking those degrees and not saying anything about what people's earnings would have looked like had they not gone to HE or had they studied a different subject. It is consequently the case that some subgroups we look at will have high costs, largely because of the set of students that they accept: for example, creative arts courses attract many more women than men, and we know women on average earn less than men. However, the point of estimating the distribution by subject is to outline the distribution of government spending under the current system, and how that has changed – it is not intended to be a valuation of the merits of different courses.

The results presented in this report should be treated with caution. Modelling the long-run costs of student loans is a highly speculative exercise that requires the simulation of the future earnings of graduates over the next 30 years. This involves making assumptions about how persistent people's earnings are, as well as what will happen to earnings growth. Our estimates draw heavily on the earnings patterns we have seen in the past, but there are numerous reasons why these will not reliably reflect the earnings of graduates in the future. The speculative nature of the exercise is even greater when focusing on subgroups of students. Therefore, while we report our best estimates

https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/publicsectorfinance/articles/newtreatmentofstudentloansinthepublicsectorfinancesandnationalaccounts/2018-12-17.

[3] For more details on this change, see J. Britton, C. Emmerson and T. Pope, 'Better accounting of student loans to increase headline measure of the government's deficit by around £12 billion', IFS, Observation, 2018, https://www.ifs.org.uk/publications/13773.

[4] This report is a policy-focused piece that accompanies our academic paper, which contains considerably more detail on the data and methodology used to produce the estimates given here (see J. Britton, L. van der Erve and N. Shephard, 'Econometrics of valuing income contingent student loans using administrative data: groups of English students', IFS, Working Paper WP19/04, 2019, https://www.ifs.org.uk/publications/13852).

[5] Table A1 gives more details of the student loan systems in place in 1999, 2005, 2011 and 2017.

throughout the paper, it is important to recognise that there are in some cases fairly wide confidence intervals around those estimates.

Given the degree of variation in government contribution by different subject groups that we observe, we explore a set of potential reforms to the HE system, showing how they affect overall government spending and the breakdown of the government subsidy between different subjects. We do this by investigating various variable tuition fee policy options, including the cutting of fees to £6,000, the increase of fees to £12,000, and variable fee caps for science and non-science subjects. We do this under the strict assumption of no behavioural responses to these reforms for illustrative purposes; in reality, it is of course likely that both students and universities would respond to large changes in tuition fees.

The report is set out as follows. Section 2 introduces the data and methodology. In Section 3, we estimate the overall cost to government of student loans, before showing the breakdown by subgroup and how this changes over time. We investigate several variable fee scenarios in Section 4 and a more specific policy of removing student loans for teachers in Section 5. Section 6 concludes.

2. Data and methodology

This section outlines the data and methodology used to generate our subsequent estimates. This report takes its methodology from our accompanying academic paper, which contains more detail on the data and methodology used.[6]

Data

We use a linked administrative data set, accessed at a secure facility at Her Majesty's Revenue and Customs (HMRC). The data set is described in significantly more detail elsewhere.[7] It contains Student Loans Company (SLC) data, which include all England-domiciled students who first entered university between 1998 and 2008 and who borrowed from the SLC. We define the 'cohort' of students based on their year of entry.

For a random 10% sample of the SLC data set, we are able to hard-link their SLC records based on their National Insurance number (NINO) to HMRC tax records from 2001–02 to 2013–14. The tax records include both employer-filed earnings from employment (PAYE earnings) and the complete self-assessment (SA) tax forms, which include income from employment, self-employment and profits from partnerships. Our 10% random sample is drawn based on the last digit of the NINO and means we have detailed earnings information for around 25,000 individuals from each cohort.[8]

This data set contains information on gender, age, cohort, higher education institution (HEI), subject at the level of the first digit of the 'JACS code',[9] region of domicile upon application to HE, total amount borrowed, amount borrowed in first year and earnings for up to 11 years after graduation. We make use of information on gender, subject, HEI and amount borrowed.

In order to accurately model earnings profiles by subject, it is crucial to have earnings data as far into the life cycle as possible. Observing early-career trajectories is important because graduates from different institutions and degree subjects can have very different earnings growth rates early in their careers. This means that earnings differences only a few years out of university are not representative of later-life earnings differences. Figure 1 shows the differences in median earnings by subject grouping for men[10] from the 1999 cohort in 2012–13 (when these individuals are approximately 31 years old),[11] which are

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6   J. Britton, L. van der Erve and N. Shephard, 'Econometrics of valuing income contingent student loans using administrative data: groups of English students', IFS, Working Paper WP19/04, 2019, https://www.ifs.org.uk/publications/13852.

7   J. Britton, N. Shephard and A. Vignoles, 'A comparison of sample survey measures of earnings of English graduates with administrative data', *Journal of the Royal Statistical Society: Series A*, forthcoming, 2019.

8   The number of students attending HE has expanded between 1998 and 2008; consequently, our sample sizes get larger for later cohorts.

9   See https://www.hesa.ac.uk/support/documentation/jacs/jacs3-principal.

10   The overall pattern in Figure 1 is very similar for women. All of our analysis below includes both men and women.

11   The subject groupings are based on the JACS coding that was given to us by the Student Loans Company. There are three unclassified categories – other LEM, other STEM and other AH – which are given for individuals on courses where the number of students was very small (below 10). In these cases, we were only given broad subject classifications rather than JACS code. See Table A2 in the appendix for the definition of

much larger than the differences we would observe immediately after graduation. In order to account as best we can for this divergence in early-career earnings, we utilise as much data as possible by using the 1999 cohort for our analysis.[12] Depending on graduation year, we have up to 11 full years of earnings data for the 1999 cohort;[13] for those who entered university at age 18, these correspond to their earnings records from age 22 to age 32.[14]

There are some issues with using earnings data of the 1999 cohort. We uprate the earnings of all individuals at the average rate of earnings growth using observed earnings growth until 2018 and using the Office for Budget Responsibility (OBR)'s predictions of future earnings growth thereafter. But this does not resolve the issue that the earnings of today's cohort of students and those in the past may look very different – due to compositional changes in the student body or changes in the remuneration of degrees in the labour market, for example. Accounting for this will always be a significant challenge in estimating future student loan costs. On balance, we believe that our assumptions here are conservative, and are on average likely to *underestimate* differences in the estimated loan subsidy by subject area.


LEM (law, economics and management), STEM (science, technology, engineering and maths) and AH (arts and humanities) subjects.

[12] This is the first full cohort we have data on, as the 1998 cohort is incomplete due to unusually low student loan uptake in that year (presumably due to the transition from the old mortgage-style loan system).

[13] As individuals become subject to repayments the April after they graduate, 2003–04 will be the first full tax year of earnings eligible for repayment for an individual from the 1999 cohort on a three-year course.

[14] Students who enter university at age 18 will in practice be between 21 and 23 during the first full tax year after graduation and hence these students will be between 31 and 33 during the last tax year we observe them.

Figure 1. Median earnings by subject for men from the 1999 cohort in 2012–13
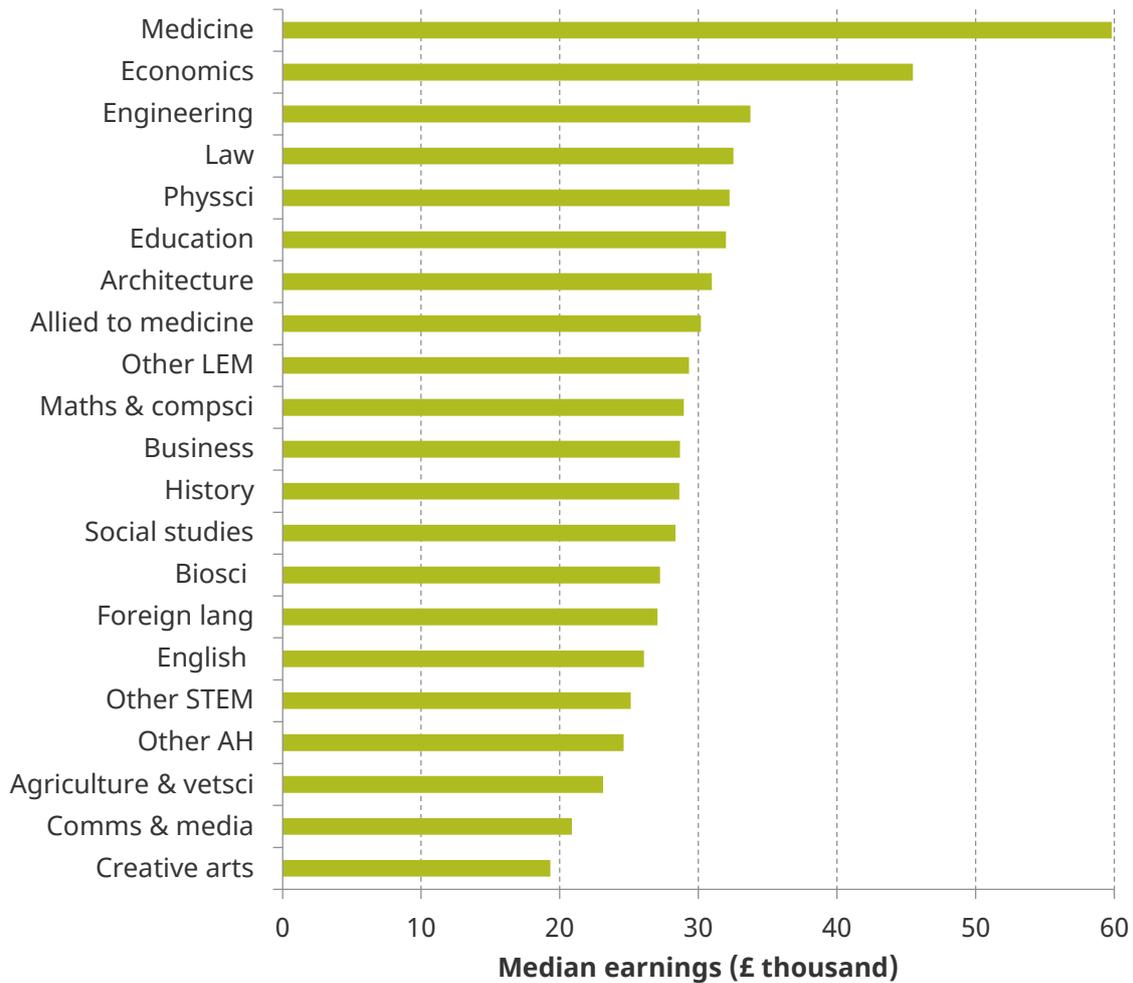
Note: Includes zeros. See Table A2 in the appendix for subject classifications.

Source: Figures are taken from J. Britton, L. Dearden, N. Shephard and A. Vignoles, 'How English domiciled graduate earnings vary with gender, institution attended, subject and socio-economic background', IFS, Working Paper W16/06, 2016, https://www.ifs.org.uk/publications/8233 and uprated to 2018 prices using the CPI.

Earnings methodology

In order to calculate government loan subsidies, we need to calculate repayments over the full loan repayment period. As outlined in Table A1, the repayment period is up to age 65 for the 1999 cohort, and 25 or 30 years from graduation for the later cohorts. Since repayments are a function of earnings, calculating repayments requires information on graduates' earnings over this whole period. In the HMRC data, we only observe earnings up to 11 years after graduation for our 1999 cohort. We therefore need to simulate earnings at later ages. This is a complicated process; we provide a short summary here but refer the interested reader to our accompanying academic paper for more detail. The text below does not make any reference to gender, though in practice the whole process is done entirely separately for males and females.

We simulate lifetime earnings in two steps. First, we model and simulate each individual's earnings rank in their subject discipline from the age at which they are last observed (32)

up to age 70. Second, we transform these ranks into actual earnings figures (or being unemployed) using estimates of the cross-sectional earnings distribution at each age and for each subject.

The simulation of the dynamics of earnings rank is very important as different assumptions can result in very different student loan repayments. As outlined in Table A1, graduates make student loan repayments of 9% of income above a specific threshold. A very noisy earnings process that puts someone below the threshold in one year and above it in the next would result in very different repayments from one that puts someone exactly at the threshold in each year. We therefore model the rank dependence of earnings over time by making use of earnings dynamics data from the British Household Panel Survey (BHPS). From that model, we simulate subject-specific earnings ranks for each individual at each age.

To convert these ranks into earnings figures, we need information on the cross-sectional earnings distribution and the unemployment rate at each age by subject. One approach here would be to use UK Labour Force Survey (LFS) data, following previous IFS work.[15] However, there are some important differences between the LFS and the HMRC earnings records.[16] To allow for this, we create multipliers based on the relationship between quantiles of the LFS distribution at each age after age 32 and that same quantile at age 32. These multipliers are effectively telling us the 'growth rate' of each quantile over the life cycle. We then multiply each quantile in the HMRC data at age 32 by the multipliers obtained for each quantile and each age from the LFS. This gives us cross-sectional earnings distributions for each future age.

As the LFS data are too thin to create these multipliers for each subject, we create multipliers by subject group (defined as 'STEM', 'LEM' and 'AH' – see Table A2 for definitions). For each subject in the HMRC data, we apply the multiplier for the corresponding subject group.

In order to take into account changes in unemployment (or economic inactivity) throughout the life cycle, such as due to retirement or taking time out of the labour market when having children, we have to predict the expected unemployment rate for each subject at every age. We do this by changing the unemployment rate for each subject that we observe in the HMRC data at age 32 in line with the change in unemployment we see in the LFS at each age.

An additional complication is that there is a clear pattern of retirement at around age 60 in the LFS that we are not likely to find for more recent cohorts. As the state pension age has been increasing, there has been an increase in the age at which individuals retire. We allow for this by applying the LFS multipliers for age 50 to HMRC earnings at ages 50–60 and applying the LFS multipliers for ages 51–60 to HMRC earnings at ages 61–70. This effectively assumes that when those currently attending university turn 70, they will be as likely to still be in work as someone aged 60 in our historical data.

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[15] For example, C. Belfield, J. Britton, L. Dearden and L. van der Erve, 'Higher education funding in England: past, present and options for the future', IFS, Briefing Note BN211, 2017, https://www.ifs.org.uk/publications/9334.

[16] As outlined in J. Britton, N. Shephard and A. Vignoles, 'A comparison of sample survey measures of earnings of English graduates with administrative data', *Journal of the Royal Statistical Society: Series A*, forthcoming, 2019.

Once we have a simulated earnings profile up to age 70 for each individual in the 1999 cohort, it is straightforward to apply the loan parameters to estimate repayments in each year. From these, we can calculate the government subsidy for each subgroup that we are interested in. We obtain earnings profiles for the 2017 cohort by increasing the earnings of the 1999 cohort by the observed and forecasted earnings growth between 2003 and 2021 (the years in which the 1999 and 2017 cohorts graduate). We use the OBR's forecasts of short- and long-run earnings growth and assume that earnings growth will be the same throughout the earnings distribution.

It is important to stress the uncertainty involved in this exercise. While it produces our best estimates of life-cycle earnings for individuals currently at university, it unavoidably involves making many assumptions about what future earnings will look like. For example, if earnings growth turns out differently from its forecast, or if the life-cycle earnings patterns of current students look very different from those of past cohorts of students, our forecasts of earnings may over- or under-estimate actual earnings. This uncertainty means that there are sometimes quite large confidence intervals around our estimates.

Loan methodology

As well as being interested in how government spending is distributed under today's system, we are also interested in how changes in the loan system have impacted the government cost and its distribution across subjects. Specifically, we compare the 1999, 2005 and 2011 HE systems with the 2017 one. We do this by uprating grant and loan amounts in the 2017 system by the Retail Prices Index (RPI) for future years – following (roughly) government policy in the past. For the 1999, 2005 and 2011 systems, we take the actual loan amounts students of the 1999, 2005 and 2011 cohorts faced and put these into 2018 prices using the Consumer Prices Index (CPI). Throughout, we hold the composition of students and their earnings fixed. We are therefore investigating the differences between systems, had they been in place today, but assuming there would be no impact on the behaviour of students in terms of their degree choices and subsequent earnings.

Our data do not have any information on individual loans taken out under the more recent systems. While we do have this information for the 1999 and 2005 cohorts, we would expect borrowing patterns to have changed considerably by 2017 had those systems still been in place.[17] To ensure comparability across the different systems and with previous work, we therefore assume throughout that students take up the full loan they are eligible for. In practice, loan eligibility differs by parental income, which unfortunately we do not observe. However, we can make some inferences about parental income based on the exact amounts the individual has borrowed. In 1999, students were only able to obtain student loans to cover maintenance costs, and the maximum amount that could be borrowed was dependent on parental income. This allows us to classify some of our sample as coming from lower- or higher-income backgrounds if they borrow exactly the maximum amount for lower- or higher-income parents respectively.[18] For people who borrow different amounts, we randomly assign them a parental income, and match the

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[17]   Take-up rates of loans have increased considerably over time.

[18]   For more detail and validation of this measure, see J. Britton, L. Dearden, N. Shephard and A. Vignoles, 'Is improving access to university enough? Socio-economic gaps in the earnings of English graduates', *Oxford Bulletin of Economics and Statistics*, 2019, https://doi.org/10.1111/obes.12261.

total share of higher- and lower-income parents to match average loan and grant amounts.

From this classification of students into those with lower and higher parental income, we then assign lower-income individuals the maximum loans and grants for students from low-income families, and higher-income individuals the maximum loans and grants for students from high-income families in 2005, 2011 and 2017.[19]

We assign degree lengths so as to match HESA proportions of students in each subject studying for three-, four-, five- or six-year degrees. We assume students take up the full loan they are eligible for in all years of their course. For medicine and dentistry students, we assign no fee loans from the fifth year of the course onwards as students are able to get an NHS bursary covering their fees for those years. We estimate the distribution of HEFCE course bands for each subject (see Table A3 in the appendix), and assign teaching grants so as to be consistent with those proportions.

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[19] For the exact rules on the amount of student loans and grants individuals are eligible for, see https://www.slc.co.uk/official-statistics/full-catalogue-of-official-statistics/student-support-for-higher-education-in-england.aspx.

3. Government spending by subgroups

This section presents estimates of overall and per-head government spending by subgroups of the population of student loan borrowers. Previous work has investigated overall subsidies and how they vary by the lifetime earnings of graduates, but it has not been able to look at specific subjects or universities as we do here. We first show an overall estimate and how it breaks down by gender, before focusing on university subjects,[20] institutions and groups of institutions.

There are many factors that affect earnings other than degree choice. It is important to understand that we are not estimating causal returns to degrees here, and instead are estimating long-run loan subsidies and implied overall spending based on the set of students who do different courses. Some subjects and institutions will attract a set of students with very low earnings potential, which will result in large loan subsidies. Consequently, even programmes that are significantly *increasing* the lifetime earnings of their students may receive large subsidies. The aim of this exercise is to better understand how money is spent under the current system, and how that is affected by different policies; it is not its aim to comment on whether that is the *correct* distribution of spending.

Overall government spending

Under the current HE finance system, almost 96% of initial government outlay on HE is through the provision of student loans for tuition fees and living costs. As a result, the largest determinant of the total long-run government cost of HE provision is unrepaid student loans. Of particular interest to policymakers is the commonly used 'Resource Accounting and Budgeting' (RAB) charge, which is equal to *the sum of total loans the government issues, minus the sum of discounted present-value*[21] *repayments across all students across their lifetimes, all divided by the sum of total loans issued*. Another way to think of this is as the proportion of the value of student loans issued today that the government expects to write off – we use the phrases 'RAB charge' and 'loan subsidy' interchangeably.

As shown in Figure 2, we estimate that the overall RAB charge for the 2017 cohort is around 54% – that is, slightly more than half the value of the loans issued to the set of students who started university in 2017 are forecast to be written off by the government, once the lifetime earnings (and implied repayments) of that cohort are taken into account. For this cohort, the government will pay out around £15.7 billion in loans, which means that it expects to write off around £8.5 billion of the loans issued. On top of this, the government will pay out £0.7 billion in teaching grants, bringing the expected long-run cost for the 2017 cohort to £9.2 billion.

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[20] Defined by the first digit of the JACS code, with economics separated out from the rest of social sciences.

[21] This discounting reflects the fact that the government treats future repayments as less valuable than repayments made today. We follow the government's policy for student loans of applying a real discount rate of 0.7%. There is a strong economic argument that the yield on index-linked government bonds would be a better discount rate for these calculations as it more closely matches the government cost of funding these loans since wages and the repayment mechanism have index-linked features. On 21 January 2019, 10-year real yields were –1.8%, while 30-year yields were –1.5%. Using these rates instead of 0.7% would dramatically reduce our estimated RAB charge.

Figure 2. RAB charge
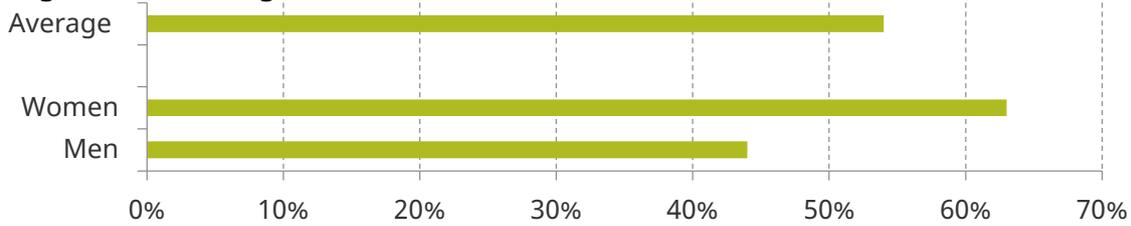
Source: Calculations based on HMRC administrative data sets.

This estimated RAB charge of 54% is larger than our previous estimates.[22] This is partly because of important differences in the earnings distribution between the HMRC tax data and the LFS data, as discussed in Section 2: the HMRC data suggest there are more people earning small amounts in the tax data than there are in the LFS.[23] However, the higher RAB charge is also partly driven by our assumption of greater persistence in earnings in this model, compared with previous versions, which is driven by patterns observed in the HMRC data.

We again note carefully that the RAB charge number is based on forecasts of earnings up to 30 years into the future. Although we do not provide formal estimates of the confidence intervals here, they are likely to be wide because of the uncertainty associated with this exercise; consequently, the 54% estimate is highly unlikely to be *statistically significantly different* from our previous estimates. By way of an example, we make an assumption that the overall level of graduate earnings will grow in real terms by 2.3% on average over the next 30 years. As shown in previous work,[24] adding 1 percentage point to this assumption can reduce the estimated RAB by around 10 percentage points.

Figure 2 also shows the RAB charge by gender. We estimate that men are expected to repay a higher proportion of their student loans and hence have a lower RAB charge, of 44% compared with 63% for loans to women. This difference is largely a result of women taking more time out of the labour market and working fewer hours, particularly after having children. It is therefore the case that, under the current system, the government is contributing more towards the university education of women than of men. It is important here to note that, although women graduates earn on average less than men, it is well established that the average economic return to HE for women is much higher than that for men, largely because a significant share of women who do not go through HE tend to perform particularly poorly in the UK labour market.[25] These higher returns greatly benefit the government's fiscal position, as increases in earnings also increase the income taxes women pay.

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[22] For example, the 47% estimate in C. Belfield, C. Farquharson and L. Sibieta, *2018 Annual Report on Education Spending in England*, IFS, Report R150, 2018, https://www.ifs.org.uk/publications/13306.

[23] As documented in J. Britton, N. Shephard and A. Vignoles, 'A comparison of sample survey measures of earnings of English graduates with administrative data', *Journal of the Royal Statistical Society: Series A*, forthcoming, 2019.

[24] See C. Belfield, J. Britton, L. Dearden and L. van der Erve, 'Higher education funding in England: past, present and options for the future', IFS, Briefing Note BN211, 2017, https://www.ifs.org.uk/publications/9334.

[25] See, for example, C. Belfield, J. Britton, F. Buscha, L. Dearden, M. Dickson, L. van der Erve, L. Sibieta, A. Vignoles, I. Walker and Y. Zhu, *The Impact of Undergraduate Degrees on Early-Career Earnings*, Department for Education Research Report, 2018, https://www.ifs.org.uk/publications/13731.
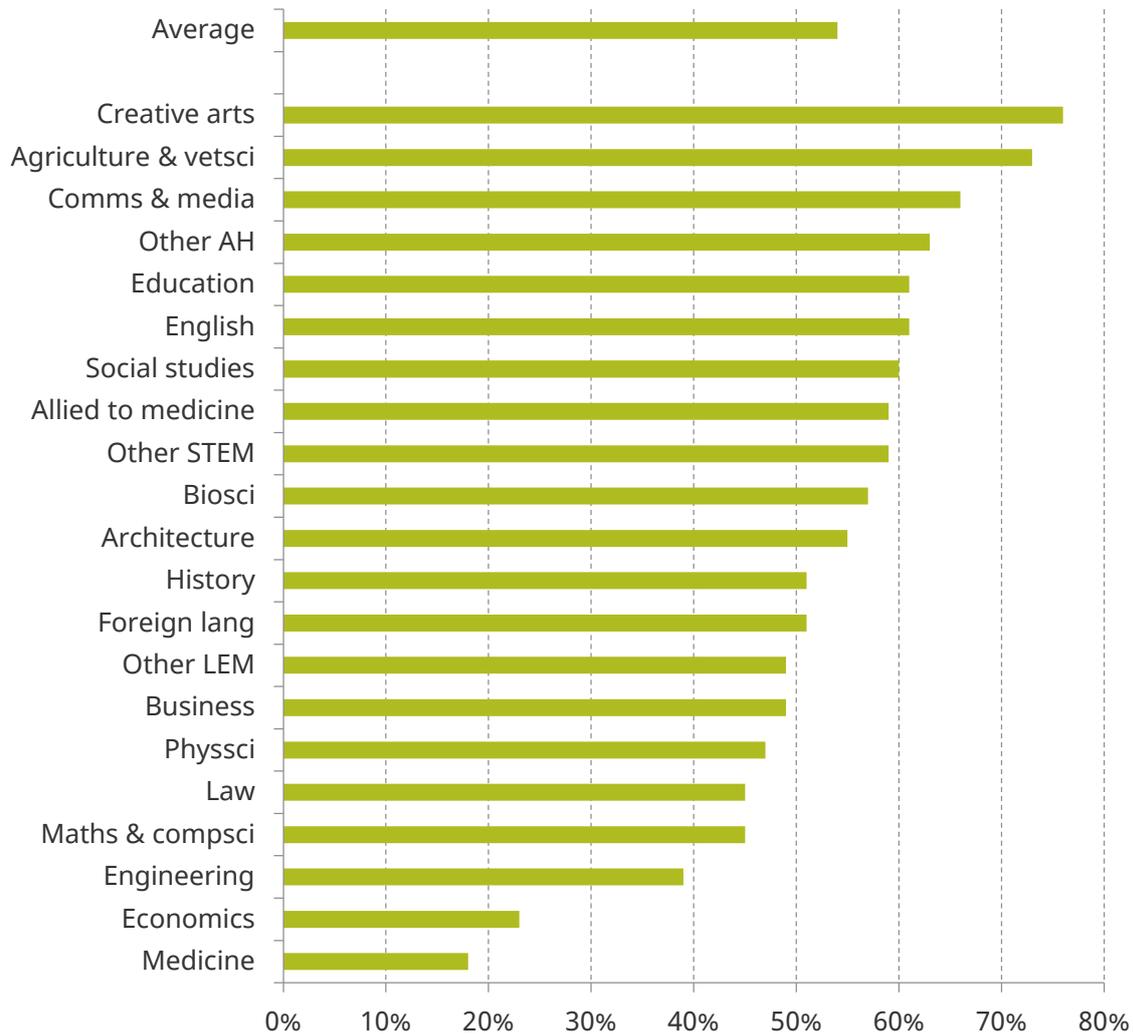
Government spending by subject

We now turn to our estimation of overall government spending by subject area. In this section and everything that follows when reporting results, we pool across men and women. As we have already seen in Figure 1, earnings vary considerably by subject, and this is likely to translate into significant differences in the overall government loan subsidy, which includes *both tuition and maintenance loans*. We use our model of lifetime earnings to estimate this for the 2017 cohort of students in Figure 3.

We observe very large differences ranging from below 20% to around 75%. For medicine and dentistry courses (henceforth, medicine), which typically produce the highest-earning graduates, we estimate that the government only expects to write off around 18% of the loans issued.[26] This highlights the very high earnings of this group, as the longer course length means they graduate with substantially larger debts than those from other disciplines.

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[26] These estimates are inherently uncertain, as they rely on forecasts of earnings up to 30 years in the future and on cohorts of students who went to university several years ago. We do not provide formal confidence intervals here but note that the estimates should be treated with caution. We also note that the smaller subject areas (such as economics) will be more susceptible to sampling error and will therefore have inherently less certain estimates.

Figure 3. RAB charge by subject

Subject	RAB charge
Average	~54%
Creative arts	~76%
Agriculture & vetsci	~73%
Comms & media	~66%
Other AH	~63%
Education	~61%
English	~61%
Social studies	~60%
Allied to medicine	~59%
Other STEM	~59%
Biosci	~57%
Architecture	~55%
History	~51%
Foreign lang	~51%
Other LEM	~49%
Business	~49%
Physsci	~47%
Law	~45%
Maths & compsci	~45%
Engineering	~39%
Economics	~23%
Medicine	~18%

Note: See Table A2 for subject classifications and definitions of STEM, LEM and AH.

Source: Calculations based on HMRC administrative data sets.

The estimated loan subsidy is just 23% for economics, while for engineering it is 39%. Conversely, for creative arts courses, we estimate that the government will write off around 75% of the loans that it issues. The numbers are around 70% for agriculture and communications, while the government can expect to write off more than half of all the loans it issues to students studying English,[27] social studies, subjects allied to medicine and education.

The ordering of the size of the loan write-off corresponds closely to the ordering of median earnings by subjects that we saw in Figure 1, which is as we would expect: because of the lack of variation in tuition fees across subjects in 2017, it is generally those

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[27] This covers all degree subjects with JACS code starting with Q (see Table A2 for full subject classifications), which includes classics and linguistics degrees. As more than 75% of the degree courses in this group are English degrees, we will refer to this group as English degrees for the sake of brevity in the remainder of this report.

with the lowest lifetime earnings who have the highest loan write-offs (depending also on how our model forecasts their earnings through the remainder of the life cycle).

We now convert the average loan subsidies by subject into cash terms to estimate the overall government spending by subject. However, it is important to recognise that loan write-offs are

Figure 4. Long-run government spending by subject per borrower
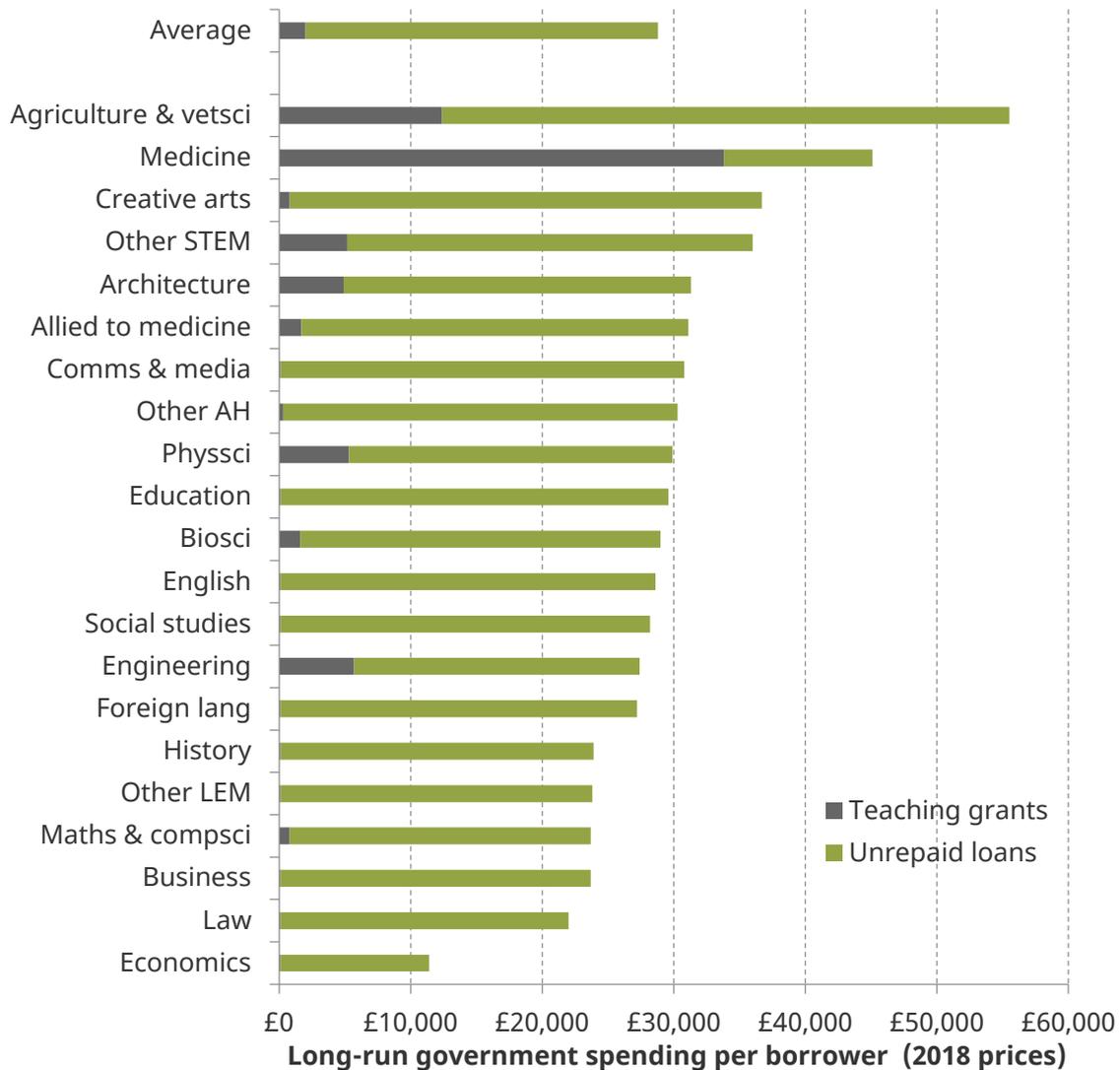
Note: All figures have been discounted using the government rate of discounting and are in 2018 prices. See Table A2 for subject classifications.

Source: Calculations based on HMRC administrative data sets.

not the only cost incurred by the government, which also provides teaching grants to subjects it deems 'high-cost'-teaching subjects. These are typically science subjects, which include some laboratory teaching time. In Figure 4, we estimate overall government

spending for each subject per borrower,[28] including *both* teaching grants and loan write-offs.

We estimate that the present-day value of the overall cost to government of providing undergraduate HE – including teaching grants and both unpaid fee and maintenance loans – is around £29,000 per *borrower* (noting that around 10% of the students do not borrow). This is around £3,000 more than we have previously estimated,[29] due to the higher loan write-offs.[30] Behind this average, there is significant variation by subject. The average long-run cost to government of putting each student through an undergraduate degree in agriculture or veterinary science is more than £55,000,[31] while for economics it is just £11,000.

Other subjects that have high long-run costs to government are creative arts (£37,000 per student) and medicine (£45,000). This is driven by different factors: creative arts graduates have relatively low earnings and hence high loan write-offs, while for medicine the vast majority (around 75%) of the long-run cost to government is from teaching grants, due to the high earnings of medical graduates and because medical students receive the largest teaching grants.

In Figure 5, we show the implied estimates of the *overall* long-run government contribution for each subject, multiplying the total cost per student by the number of students. An example of where this is important is agriculture & veterinary science, which has a high long-run cost per borrower but has a small number of students. We estimate the total long-run cost to government of providing HE to be around £9 billion per cohort of students starting HE each year.[32] Figure 5 shows how this total spending is broken down into the 18 subject areas. For this exercise, we distribute the miscellaneous 'other' categories into the 18 subject areas so that we can give a more realistic picture of the overall distribution of spending (see note to the figure for more detail). Clearly, the variation in the total cost is driven by both differences in the average cost per student and variation in the number of students taking each subject. To help with understanding this, the figure also shows the number of students for each subject area.

Overall, the variation in student numbers dominates the variation in average cost, meaning the largest subject areas are the most costly to government. Business, biological sciences, subjects allied to medicine and creative arts are the four largest subject areas

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[28] This excludes the teaching grants paid for students who do not take out student loans. Our estimates here are all based on borrowers. Of course, there are no loan subsidies for those who do not choose to borrow.

[29] See C. Belfield, C. Farquharson and L. Sibieta, *2018 Annual Report on Education Spending in England*, IFS, Report R150, 2018, https://www.ifs.org.uk/publications/13306.

[30] Note carefully that this is the cost to government, and excludes the student's own contribution to the cost of their education.

[31] Agriculture and veterinary science is an unusual subject grouping. Veterinary science courses are typically longer (often five years) and we know from other sources (see C. Belfield, J. Britton, F. Buscha, L. Dearden, M. Dickson, L. van der Erve, L. Sibieta, A. Vignoles, I. Walker and Y. Zhu, *The Impact of Undergraduate Degrees on Early-Career Earnings*, Department for Education Research Report, 2018, https://www.ifs.org.uk/publications/13731) that their graduates also earn more than agriculture graduates. Here we are unable to distinguish between the two and so randomly assign people within this group to one of the two courses. This might overstate the long-run cost. We also note that the sample sizes for this group are very small. For these reasons, the £55,000 number should be treated with caution.

[32] This is similar to our previous estimates in C. Belfield, C. Farquharson and L. Sibieta, *2018 Annual Report on Education Spending in England*, IFS, Report R150, 2018, https://www.ifs.org.uk/publications/13306.

and are also the four most costly subjects to government. Creative arts is the fourth-largest subject area but has the largest overall cost at £1.2 billion, accounting for 13% of overall government spending on HE. This is similar to biological sciences and subjects allied to medicine and only slightly larger than business (£1.0 billion), and in practice uncertainty in our estimates means these differences would not be statistically significant. Taken together, these four subjects account for half of all government spending on HE.

At the other end of the scale, we see that less than 1% of total government spending goes to economics courses, while foreign languages, agriculture/veterinary sciences and architecture all receive very small shares. From Figure 5, we also estimate that around 48% of total government spending per cohort of students is on STEM subjects, around 15% is on LEM subjects and 37% is on AH subjects.

The short-run impact that the estimates in Figure 5 have on the deficit is hugely affected by the recent announcement that the accounting treatment of student loans is set to change, following the ONS review. Under the old system, grant spending counted towards the deficit today, while the write-offs on loans issued today only count towards the deficit at the end of the term of the loan, after 30 years (unless the loan book is sold in the meantime, in which case they never count). Under the new system, both grant spending *and* expected loan write-offs count towards the deficit today. This means the deficit impact of HE, overall and across subjects, has changed dramatically. Under the old system, only the grey bars in Figure 5 counted towards the deficit today, while under the new system, both the grey and green bars count. Many subjects therefore are set to go from adding almost nothing, to adding several hundred million to the short-run deficit. For creative arts, we estimate the short-run deficit impact will increase from around £25 million under the old accounting treatment, to £1.2 billion under the new treatment. Changes such as this could dramatically increase the scrutiny certain subjects are put under by policymakers concerned with the short-run deficit, despite the fact that the review does not actually change anything about the long-run cost.

Figure 5. Total long-run government spending by subject
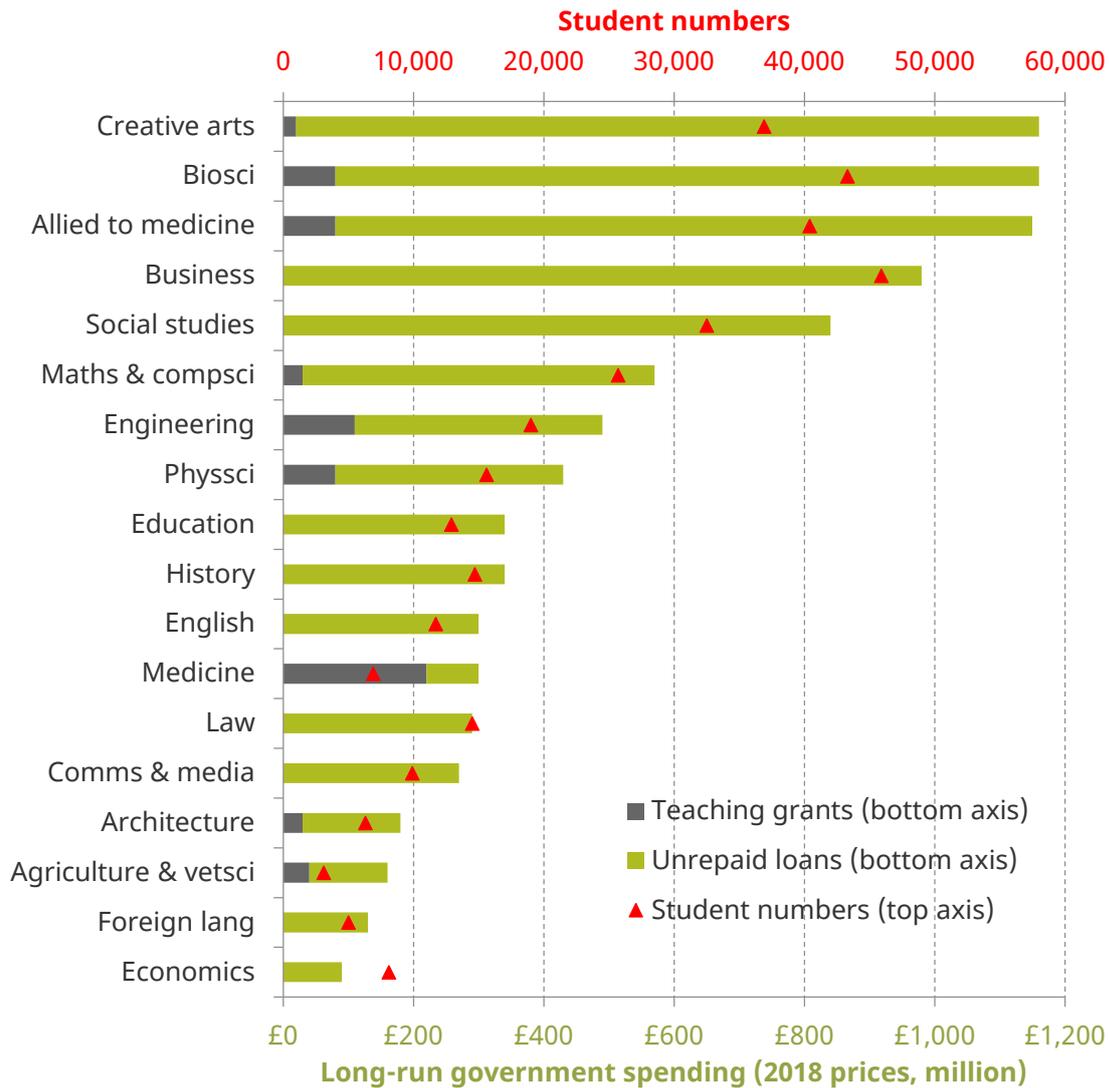
Note: See Table A2 for subject classifications. All figures have been discounted using the government rate of discounting and are in 2018 prices. We assume a total of 352,470 students. This is the number of first-degree first-year full-time England-domiciled undergraduates in the UK in 2017–18 according to the latest HESA statistics (https://www.hesa.ac.uk/data-and-analysis/students/what-study) (excluding the 625 individuals studying combined subjects). In order to obtain student numbers by subject, we reweight the individuals in our 1999 HMRC cohort to achieve a similar distribution across subjects to what we see in the most recent HESA data. For the purpose of this figure, we reassign individuals in the 'other AH/STEM/LEM' groups to the subjects within that subject group (AH/STEM/LEM) proportionally to the size of the subject. We assume 90% of students of each subject take out loans and that those students take out the full loan they are eligible for. For the remaining 10% of students, the government cost is assumed to solely consist of teaching grants.

Source: Calculations based on HMRC administrative data sets.

The figures estimated so far are based on the loan write-offs and teaching grant spending that accrue to specific subjects. However, in practice, universities can allocate their incomes as they see fit – and indeed it is very likely that universities cross-subsidise between subjects.[33] This means that the amount actually spent on students studying each of these subjects may differ from the figures presented here. However, each university's ability to cross-subsidise between subjects will depend on the range of courses they offer and the relative size of these courses. This is important to bear in mind when considering the wider impact of reforms that affect the funding levels in specific subjects.

Government spending on HE across the different systems

The figures above show the large variation in spending levels across subject areas under the HE system currently in place. However, as discussed above, the system has gone through significant changes over the last 20 years. Since 1999, tuition fees have increased substantially from just over £1,000 to more than £9,000 per year, while teaching grants have simultaneously been heavily cut. Meanwhile, the repayment conditions on student loans have been changed on several occasions. In this subsection, we investigate how those changes have affected the story presented in the previous one.

Figure 6 shows how the overall average taxpayer cost per borrower of providing HE changed under the systems in place in 1999, 2005, 2011 and 2017 (chosen to give a snapshot of the system every six years and to coincide with the major reforms in 1998, 2006 and 2012). Crucially, this figure *holds the composition of students and their subsequent lifetime earnings constant*, so that this is a direct comparison of the systems, ignoring the potential impacts of the system on students' university choices or labour supply. Another way of thinking about this is that these are our estimates of what government spending would have looked like had the system not been changed since the 1999, 2005 and 2011 systems respectively.[34] All of our comparisons are in fixed (2018) prices.

The figure estimates that under the 1999 system (a historical low point in terms of per-student funding[35]), the HE system would cost the taxpayer around £21,000 per borrower. About 80% of this cost was in the form of direct teaching grants to universities and maintenance grants to students, with the remainder consisting of expected maintenance loan write-offs (since there were no loans for tuition fees under this system). The overall picture is very similar for the 2005 system, although spending per borrower is up to nearly £25,000. However, for the 2011 system, the loan subsidy increases considerably. This is largely driven by the 2006 'top-up fees' reform that almost trebled tuition fees, resulting in

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[33] See paragraph 46 of https://publications.parliament.uk/pa/cm201012/cmselect/cmbis/885/88505.htm. Universities also cross-subsidise between teaching and research funding (see V. Olive, *How Much Is Too Much? Cross-Subsidies from Teaching to Research in British Universities*, Higher Education Policy Institute (HEPI) Report 100, 2017, https://www.hepi.ac.uk/wp-content/uploads/2017/11/HEPI-How-much-is-too-much-Report-100-FINAL.pdf).

[34] It is important to note that we take the systems as they were when the cohort of students entered them. An important example of this is the 2005 cohort. Although this cohort actually became eligible for tuition fee loans from 2006 onwards, this was not the planned system upon their entry to HE. We therefore assume that if the 2005 system were in place today, tuition fee loans would not be available at any point for these students. We also have to make assumptions about how fees and grants would have been uprated in the absence of reform.

[35] See C. Belfield, C. Farquharson and L. Sibieta, *2018 Annual Report on Education Spending in England*, IFS, Report R150, 2018, https://www.ifs.org.uk/publications/13306.

roughly a doubling in expected student loan write-offs. The level of grants had fallen by less than 10% in real terms, meaning the average cost of providing HE increased by around 15% to around £29,000 per borrower. This aligns with the increased provision of resources to universities over this period discussed in previous research.[36]

Figure 6. Long-run government spending per borrower over time

Note: All figures have been discounted using the government rate of discounting and are in 2018 prices. For the 2017 cohort, grants are made up only of teaching grants; in 2011 and 2005, they also include maintenance grants; and in 1999, they also include fee support. We hold the composition of the cohorts and the lifetime earnings of graduates constant.

Source: Calculations based on HMRC administrative data sets.

The final bar in Figure 6 shows our estimated government contribution for the 2017 system. Despite the dramatic increase in tuition fees in 2012, the overall government contribution to HE in 2017 *per borrower* is nearly exactly the same as it would have been had there been no reforms to the system since 2011. Note that this is not true of the cost *per student*: due to the higher teaching grants – which the government pays for borrowers and non-borrowers alike – the total cost per student would be more than £1,500 higher under the 2011 system today than it is under the 2017 system.

It is important to note that the nature of the costs is very different between the 2011 and 2017 systems, as we observe a dramatic increase in the share attributed to loan write-off (some of which is attributable to the large increase in the repayment threshold, from £21,000 to £25,000, in 2017). The 2017 figure is therefore much more uncertain, as it is more dependent on forecasts of graduate earnings. It should also be kept in mind that while the expected government cost under the two systems is quite similar, graduate contributions are much larger under the 2017 system, resulting in more funding for universities.

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[36] C. Belfield, J. Britton, L. Dearden and L. van der Erve, 'Higher education funding in England: past, present and options for the future', IFS, Briefing Note BN211, 2017, https://www.ifs.org.uk/publications/9334.

Government spending on different subjects across systems

The broad transition from grants to loans over the last 20 years affects the implied government spending on different subjects considerably. Figure 7 shows our estimates of how government spending on a subset of subjects – specifically, economics, engineering and creative arts – varies under the different systems, breaking down government spending by grant spending and expected loan write-offs as before.

Figure 7. Long-run government spending per borrower over time by subject
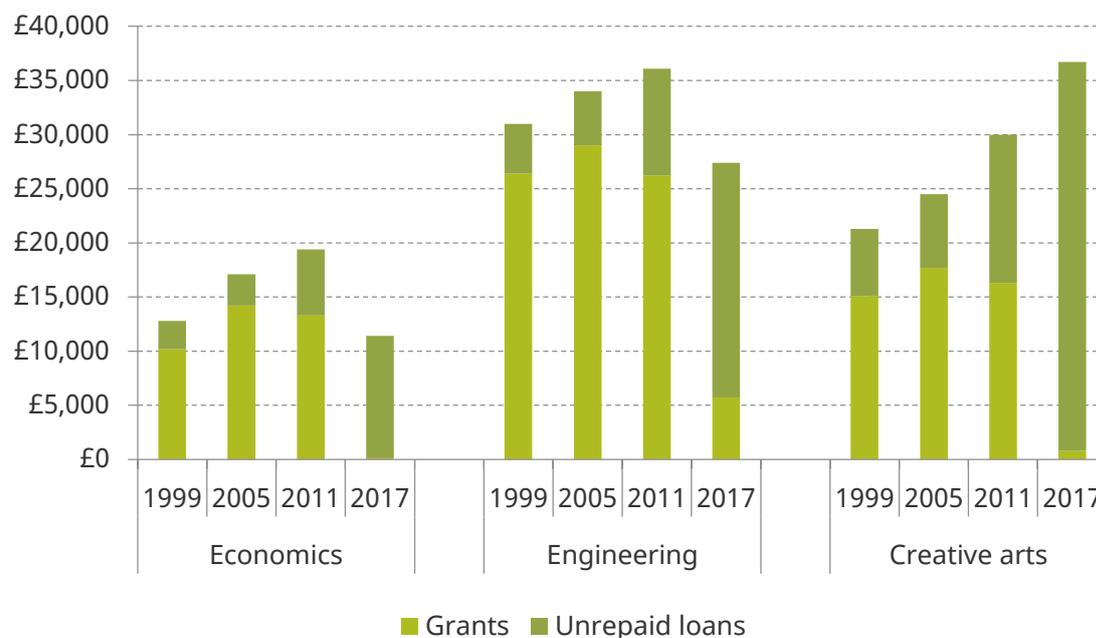
Note: All figures have been discounted using the government rate of discounting and are in 2018 prices. For the 2017 cohort, grants are made up only of teaching grants; in 2011 and 2005, they also include maintenance grants; and in 1999, they also include fee support.

Source: Calculations based on HMRC administrative data sets.

As measured by the per-borrower cost to government, in 2017 creative arts was the second most expensive course to provide, behind only 'agriculture & veterinary science' (which we do not put a lot of emphasis on here due to the small sample sizes). It has not always been so high: under the 1999 system, it would have only cost the taxpayer £21,000 per student, compared with £31,000 to fund an engineering student, for example.

Between 1999 and 2011, the cost of providing all subjects increased, reflecting the increase in resources provided to universities over this period. However, the reforms between 2011 and 2017 have had strikingly different impacts on the different subjects. The cost to government of providing economics and engineering degrees fell by around £8,000 per borrower during this period, while the equivalent figure for creative arts degrees *increased* by more than £6,000. While in 1999 creative arts degrees were around 30% cheaper for the taxpayer than engineering degrees, by 2017 they were 30% more expensive.

This starkly highlights the unintended consequences of the 2012 tuition fee reforms: it was widely anticipated that price competition between universities would result in market-

driven price variation. Because that did not materialise and instead fees remained largely constant across the different course areas, it is the courses with the lowest graduate lifetime earnings that typically receive the largest government subsidies.

Figure 8 summarises the changes across the broader STEM, LEM and AH subject groupings. This again highlights the point that while overall government spending on HE has increased considerably as a result of the reforms over the last 20 years, in fact spending on STEM courses is similar in 2017 to what it would have been in the absence of any changes since 1999, at just over £4 billion. This is down slightly from its peak of around £5 billion under the 2011 system. While spending on STEM has remained broadly flat, spending on other areas has increased. Consequently, the share of the total government spending on HE going towards STEM courses has declined from 57% to 48%, while the share spent on AH courses has increased from 30% to 37%.

Figure 8. Total long-run per-cohort government spending under different HE systems (all students, including grants and loan write-offs)
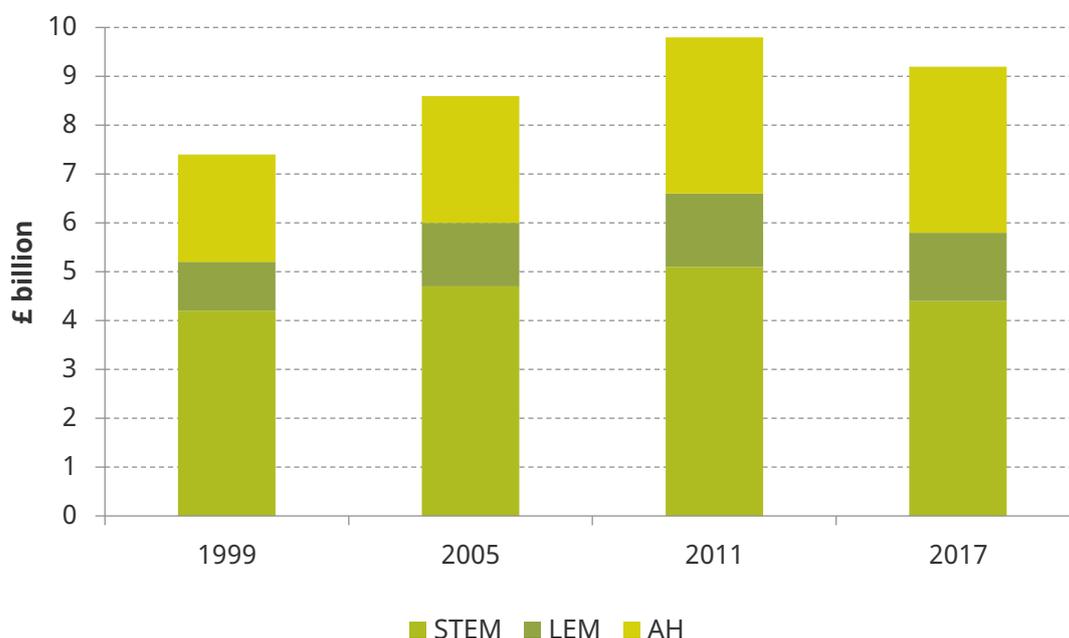
Note: All figures have been discounted using the government rate of discounting and are in 2018 prices. We assume a total of 352,470 students. This is the number of first-degree first-year full-time England-domiciled undergraduates in the UK in 2017–18 according to the latest HESA statistics (https://www.hesa.ac.uk/data-and-analysis/students/what-study) (excluding the 625 individuals studying combined subjects). In order to obtain student numbers by subject, we reweight the individuals in our 1999 HMRC cohort to achieve a similar distribution across subjects to what we see in the most recent HESA data. We hold the composition of the cohorts and the lifetime earnings of graduates constant. We assume a 90% take-up rate of loans. The government cost for the remaining 10% of students solely consists of any teaching grants and any other grants (fee support, HE grant and maintenance grants).

Source: Calculations based on HMRC administrative data sets.

Government spending by institution type

As highlighted in earlier research,[37] there is also significant variation in graduate earnings by HE institution. As for subjects, in a system funded predominantly through student loans, this suggests that the implied government spending will vary considerably across institutions. Investigating this is particularly relevant, as the cross-subsidisation that almost inevitably goes on across subjects (within universities) is not very likely to happen across universities.

Figure 9 shows the range in average government spending per borrower at each of 114 institutions in our data.[38] We see considerable variation: at the universities with the highest-earning graduates (those towards the left in Figure 9), and hence the lowest loan

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[37] C. Belfield, J. Britton, F. Buscha, L. Dearden, M. Dickson, L. van der Erve, L. Sibieta, A. Vignoles, I. Walker and Y. Zhu, *The Impact of Undergraduate Degrees on Early-Career Earnings*, Department for Education Research Report, 2018, https://www.ifs.org.uk/publications/13731.

[38] Due to sample size restrictions, we can only show institutions that meet a minimum required threshold in our sample. As our analysis sample is a 10% random sample of graduates, and universities may have grown since 1999, there will be universities with more students above the threshold that we are still unable to show.

subsidy, the government subsidy is less than £20,000 per borrower over the course of the degree. At the other end of the scale, at the universities with the lowest-earning graduates (and towards the right in Figure 9), the subsidy is around £40,000 per borrower.

Figure 9. Long-run government spending by institution per borrower (including grants and loan write-offs)
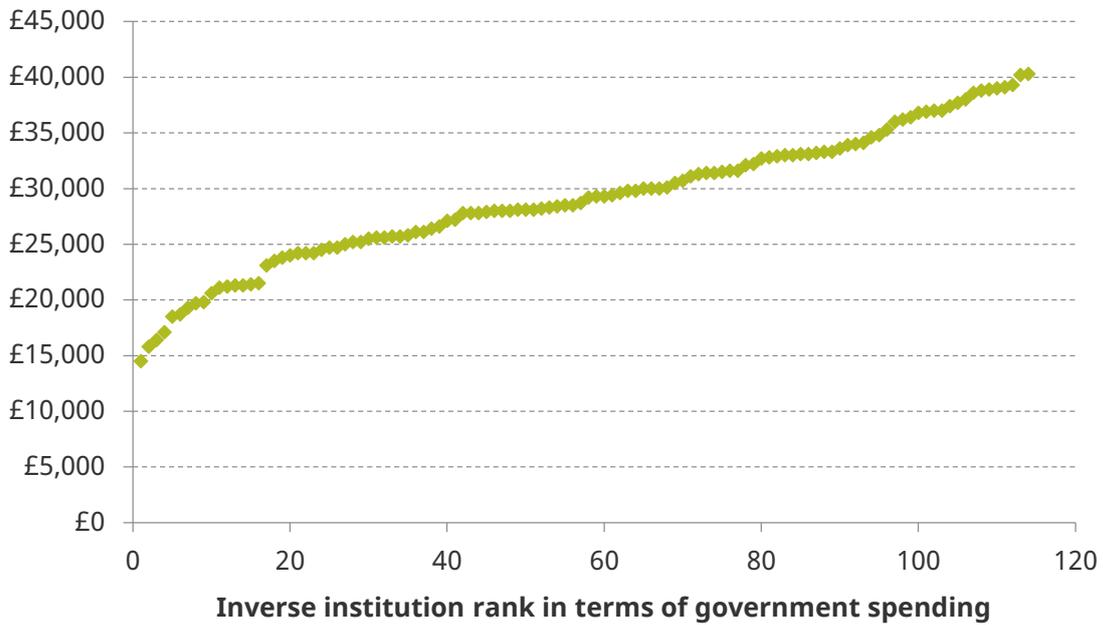
Inverse institution rank in terms of government spending

Note: All figures have been discounted using the government rate of discounting and are in 2018 prices. Only institutions that meet a minimum required sample size threshold in the 1999 cohort are shown for data disclosure reasons.

Source: Calculations based on HMRC administrative data sets.

Figure 10. Long-run government spending by institution type per borrower (including grants and loan write-offs)
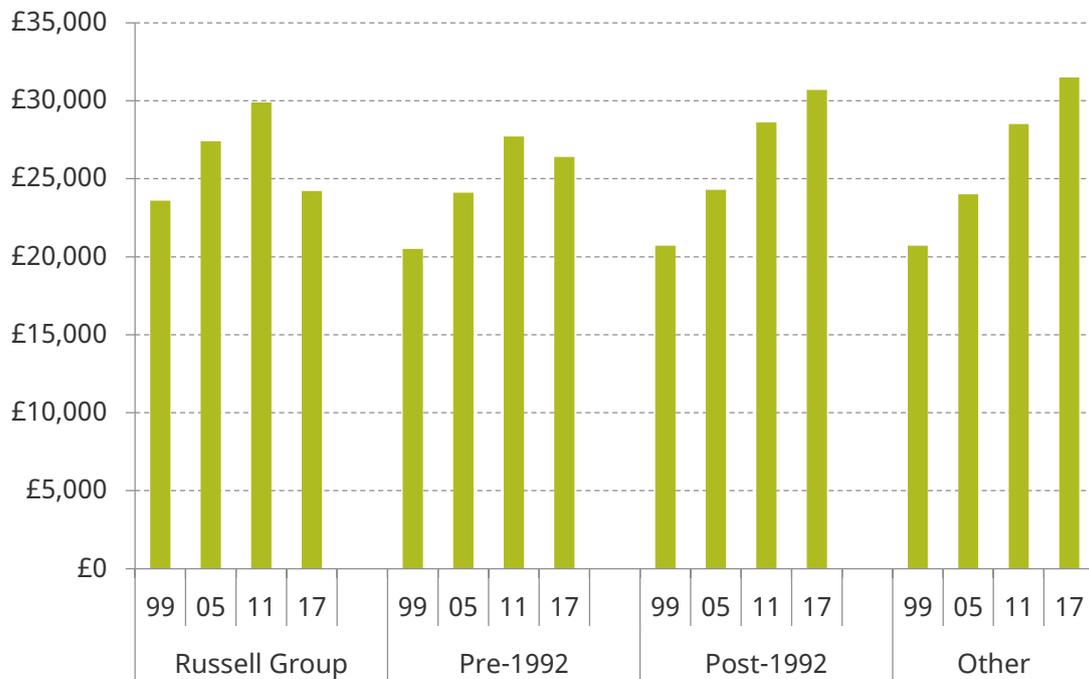
Note: All figures have been discounted using the government rate of discounting and are in 2018 prices. See table 12 in the appendix data tables at https://www.gov.uk/government/publications/undergraduate-degrees-labour-market-returns for a list of the universities included in each of the university groups.

Source: Calculations based on HMRC administrative data sets.

Figure 10 shows how this breaks down by university type, dividing universities into four groups: Russell Group, the 'pre-1992' group, the 'post-1992' group and 'other' specialist universities.[39] Under the 1999 system, government spending was somewhat larger on Russell Group universities than on other university types (due to Russell Group universities being more likely to offer expensive-to-teach courses, such as medicine and other sciences). This pattern had reversed by 2017: long-run government spending under the 2017 system is around £24,000 per head at Russell Group universities and more than £30,000 for 'post-1992' and 'other' universities. This reflects the higher earnings of graduates from Russell Group – and, to a lesser extent, pre-1992 – universities.

It is important to keep in mind that this *variation in government subsidy is not the same as variation in funding levels*. This is because graduates also contribute to the cost of their education by repaying their student loans. Once this is accounted for, the variation in overall funding per university is very small due to the lack of variation in tuition fees.

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[39] For a complete list of institutions in these groups, see table 12 in the appendix data tables at https://www.gov.uk/government/publications/undergraduate-degrees-labour-market-returns.

Figure 11. Share of graduates in the public sector by subject
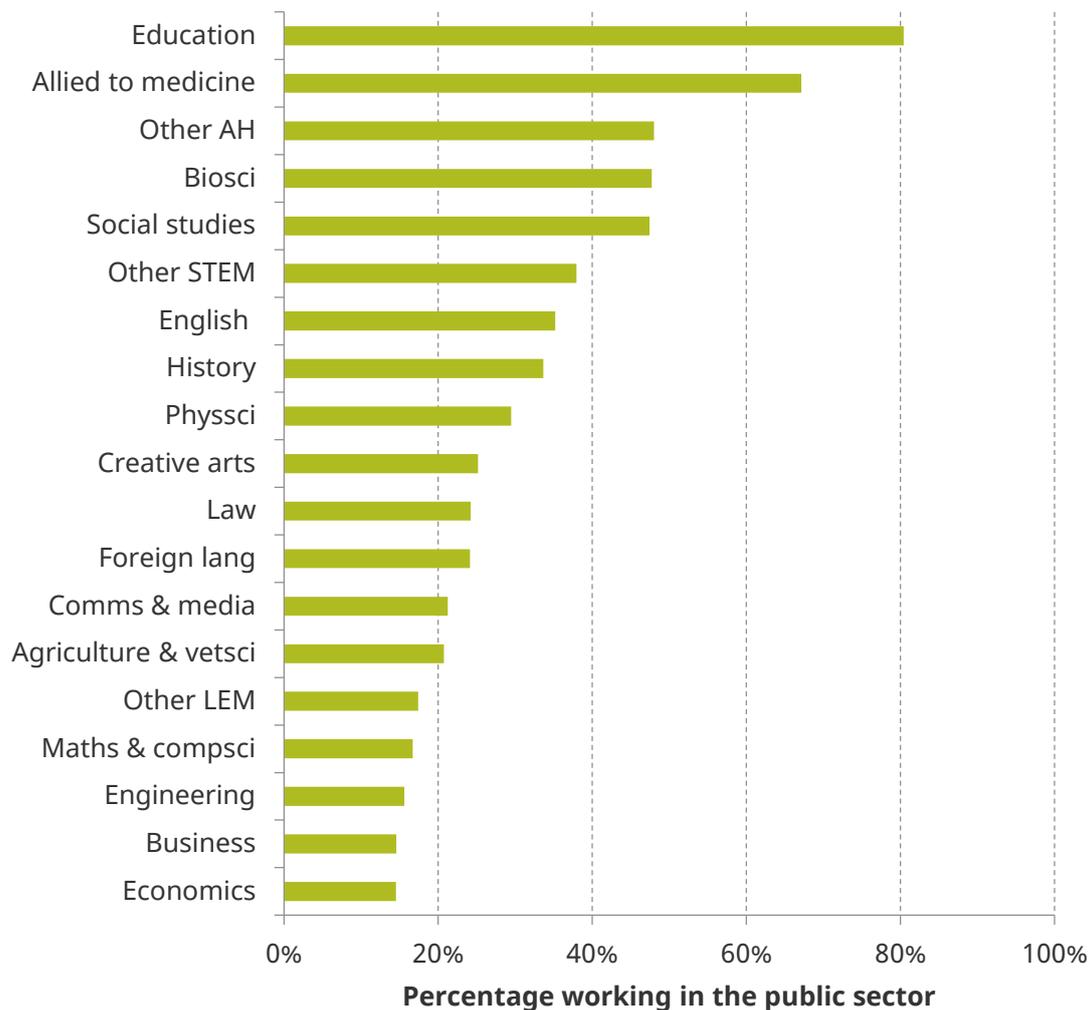
Note: Medicine and architecture numbers are suppressed for disclosure reasons. Public sector workers are defined as those working in public administration, education and health based on the Standard Industrial Classification (SIC). See Table A2 for subject classifications.

Source: Calculations based on HMRC administrative data sets.

Wider returns to higher education

It is important to acknowledge at this point that the impact HE has on earnings is not the only benefit of studying at university. Different subjects might provide differential social benefits by improving health and political engagement, reducing crime or adding to society more generally. One important example of this can be shown by considering the share of graduates from each subject area who go on to work in the public sector, which we show in Figure 11. As expected, medicine & dentistry,[40] education and 'allied to medicine' provide the largest shares of graduates working in the public sector. The share is around 80% for education, while around two-thirds of those from subjects allied to

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[40] For whom we cannot show the exact share of graduates working in the public sector for sample disclosure reasons, due to a small share of individuals not working in the public sector.

medicine enter the public sector. However, it is also the case that more than 40% of biological and social scientists go into public sector jobs. The lowest-cost subject (economics) only places 15% of graduates in the public sector, but the most expensive subject (creative arts) does not place many more – only 25% of graduates. Of course, this is just one of many social returns, but Figure 11 alludes to the wider social value of the different subject areas that we are considering.

4.   Alternative policies

Under the current HE finance system in England, almost all universities charge the maximum tuition fee of £9,250. This has several important consequences. First, as has been documented in previous research, students graduate with high income-contingent debt levels. Second, debt write-offs make up the vast majority of the government subsidy. As a result, the subsidy is implicitly targeted towards the courses with the lowest graduate lifetime earnings. The high cost of debt write-offs limits the government's ability to increase teaching grants which it could target more directly to specific courses. Finally, it means that all students face the same up-front fee for studying one of a variety of different courses that have substantially different costs of teaching and earnings returns.[41]

Another related issue is generated by the recent removal of all student number caps. Until 2014, the government set tight limits on the number of students that universities could admit, which allowed it to control spending. While the removal of these caps increases student choice, it does potentially expose the government to large increases in spending: a large expansion in the number of students doing subjects that lead to low lifetime earnings could significantly increase the government cost. This is especially true today compared with 2011, for example, given the higher cost to government associated with many of the lower-earning courses (for example, see Figure 7). In practice, however, HESA data suggest that student numbers have shifted towards STEM in recent years.[42]

In this section, we explore a set of potential reforms that impact some of these factors, showing how they affect overall government spending and the breakdown of the government subsidy between different subjects. We investigate the potential impact of reducing the fee cap to £6,000 and increasing it to £12,000 for all subjects. The impact of these changes on the distribution of graduate repayments has been well documented – for example, fee cuts clearly benefit graduates who go on to have the highest lifetime earnings the most[43] – but there is little information on how this would affect government spending on different subject areas.

We then explore two variable fee cap scenarios: first, we look at the impact of reducing the fee cap for non-science subjects, with no replacement income for universities; and second, we investigate the impact of reducing the fee cap for science subjects, protecting university income by replacing all of the lost fee income with teaching grants. Finally, we show the fee caps that would be required to keep the total government subsidy below £25,000 per borrower for all subjects. Crucially, in all these scenarios, we do not account for any change in the composition of students that may occur as a result of the reforms. The results should therefore be treated as illustrative, and in practice it is essential that the full behavioural responses of students (choosing whether, where and what to study) and universities (choosing which courses to offer and the number of students to admit) should be considered before instigating such reforms. We discuss these in more detail at the end of the section.

[41]   C. Belfield, J. Britton, F. Buscha, L. Dearden, M. Dickson, L. van der Erve, L. Sibieta, A. Vignoles, I. Walker and Y. Zhu, *The Impact of Undergraduate Degrees on Early-Career Earnings*, Department for Education Research Report, 2018, https://www.ifs.org.uk/publications/13731.

[42]   https://www.hesa.ac.uk/data-and-analysis/students/what-study.

[43]   C. Belfield, J. Britton, L. Dearden and L. van der Erve, 'Higher education funding in England: past, present and options for the future', IFS, Briefing Note BN211, 2017, https://www.ifs.org.uk/publications/9334.

Uniform changes to the fee cap

We first explore reforms that adjust the current fee cap that applies to all subjects. We assume that for both fee increases and fee reductions, universities would all set their fees at the maximum level, and also that the student composition is unaffected. This latter assumption is perhaps more controversial in the case of a large fee increase, although it should be kept in mind that the trebling of the tuition fee cap in 2012 did not result in a significant reduction in student numbers, despite almost all universities setting fees at the maximum level for all subjects.

Figure 12 depicts our estimated impacts on long-run government subsidy per borrower from a reduction in the fee cap to £6,000 per year and from an increase in the fee cap to £12,000 per year under this set of assumptions. The overall findings are predictable. Reducing the fee cap, and so cutting university resources, saves the government just over £7,000 per borrower due to smaller loan write-offs. This shows that in the long run, the vast majority of fees between £6,000 and £9,250 is paid by the government. On the other hand, increasing the fee cap to £12,000 increases the government cost by a little less than £7,000 (noting that the fee increase we estimate is smaller than the fee reduction). This shows that a fairly small number of students are forecast to have sufficiently high earnings to repay some of the extra debt that they accrue under this policy.

Uniform changes to the fee cap

Figure 12. Impact on government subsidy per borrower of changing fee caps
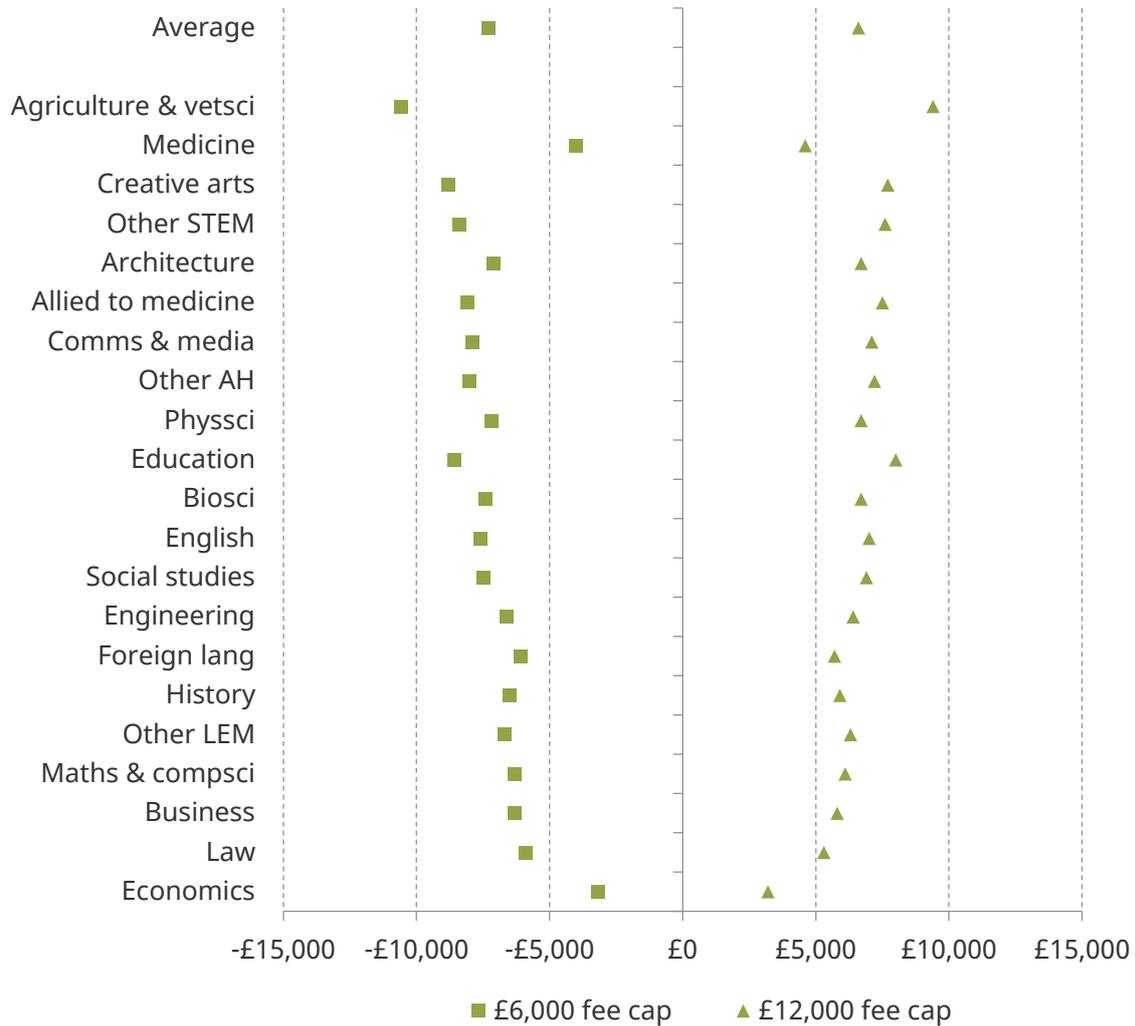
Note: See Table A2 for subject classifications. All figures have been discounted using the government rate of discounting and are in 2018 prices. We assume no behavioural response: student population and number of students studying each subject are assumed to stay constant. Subjects are ordered by their overall per-borrower cost in 2017.

Source: Calculations based on HMRC administrative data sets.

A major advantage of our model is that it is able to show that these two reforms have differential impacts on the cost of different subjects. As seen in Figure 12, fee changes have very different impacts on long-run government spending in different subject areas. For example, increasing the fee cap to £12,000 increases the cost of providing creative arts courses by nearly £8,000 per borrower but increases the cost of economics courses by only around £3,000. This is a result of the higher-earning economics students repaying more of the additional student loan provided to cover the higher fees. For medicine, despite the longer course length, the increase in fee cap increases the long-run government cost by less than £5,000 per borrower. We see that, overall, the effects of reductions and increases in fee caps of similar magnitudes are roughly symmetrical.

Figure 13 shows the impact of changes to the fee cap on the distribution of government spending by broad subject area. Under the 2017 system, each cohort of students going through HE costs the government around £9.2 billion. Around 48% of this spending goes towards STEM subjects, 15% goes towards LEM subjects and 37% goes towards AH subjects. A £6,000 fee cap would reduce the government contribution to around £7 billion, while a £12,000 fee cap would increase it to a little under £11.5 billion. However, the figure shows that the share of government spending going to each subject area is not dramatically changed by these two reforms.

To change the shares for each subject area more significantly, there are two clear approaches the government could take. First, it could adjust teaching grants – indeed, if all the savings to government from £6,000 fees were used as extra teaching grants for STEM courses, then around 62% of government spending would be on STEM (noting that this would result in a reduction in average university funding due to the loss of contributions from high-earning graduates). Second, the government could bring in fee caps that vary by subject discipline, which we consider next.

Figure 13. Impact of changes to the fee cap on the distribution of long-run government spending (including grants and loan write-offs)
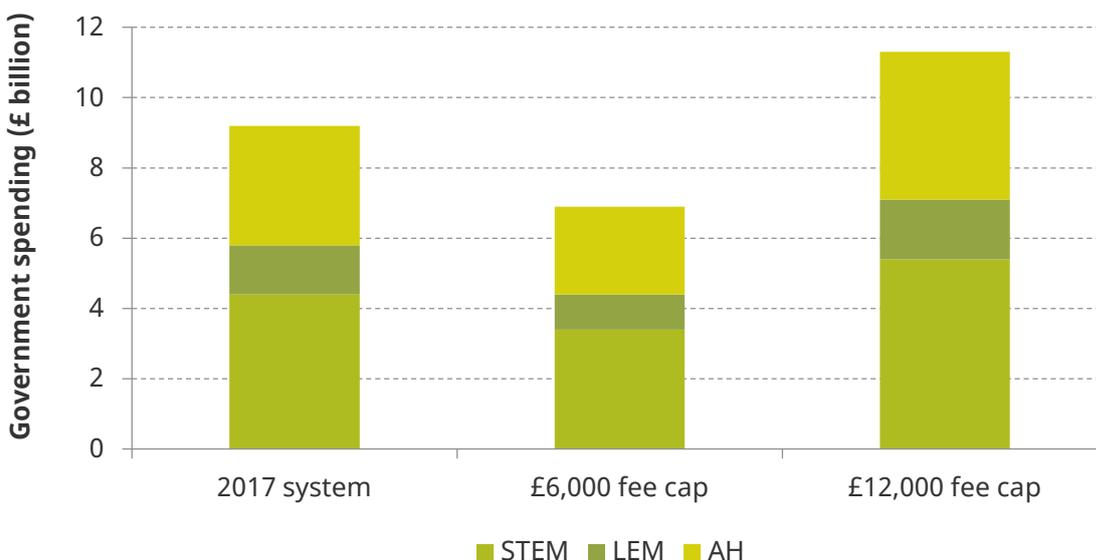
Note: See Table A2 for subject classifications. All figures have been discounted using the government rate of discounting and are in 2018 prices. We assume no behavioural response: student population and number of students studying each subject are assumed to stay constant.

Source: Calculations based on HMRC administrative data sets.

Variable fee caps

We now turn to investigating variable tuition fee caps, which have been discussed as a possibility in England for several years. They exist elsewhere in the world, most notably in Australia, which also has an income-contingent loan system similar to the UK's. A possible advantage of having variable fee caps is that it can limit the amount of spending from the government on particular areas.

In Figure 14, we consider the impact of reducing the fee cap to £6,000, first for all non-STEM subjects and then for all non-STEM, non-LEM subjects (i.e. arts and humanities), on the distribution of government spending on the different subject areas. In both cases, we keep the STEM fee cap constant. The government might consider these policies desirable if it believes too much spending is being allocated to non-STEM areas under the current system. It is worth noting that without an equivalent increase in the teaching grants universities receive, reductions of the fee caps will lead to a reduction in overall university funding.

The figure shows that a cut in fee levels for non-science subjects would reduce government spending from £9.2 billion to £8 billion. It would increase the share of government spending on STEM courses (the level of which would be unchanged) from 48% to 56%, while reducing the share spent on LEM courses from 15% to 13% and on AH courses from 37% to 31%. Meanwhile, cutting fees for only AH subjects would reduce spending to £8.3 billion and would cut the share allocated to AH subjects to 30%. Clearly, this reform would reverse much of the increase in the share of government spending on arts and humanities subjects that we have seen over the last 20 years (outlined in Figure 8 above).

If prospective students base their choice of what to study at university on the fee level of the course, the government might choose to introduce variable fee caps for another reason – to incentivise more students to take STEM degree courses. To investigate this, we model a

Figure 14. Impact of reducing fees for non-STEM subjects on distribution of long-run government spending (including grants and loan write-offs)
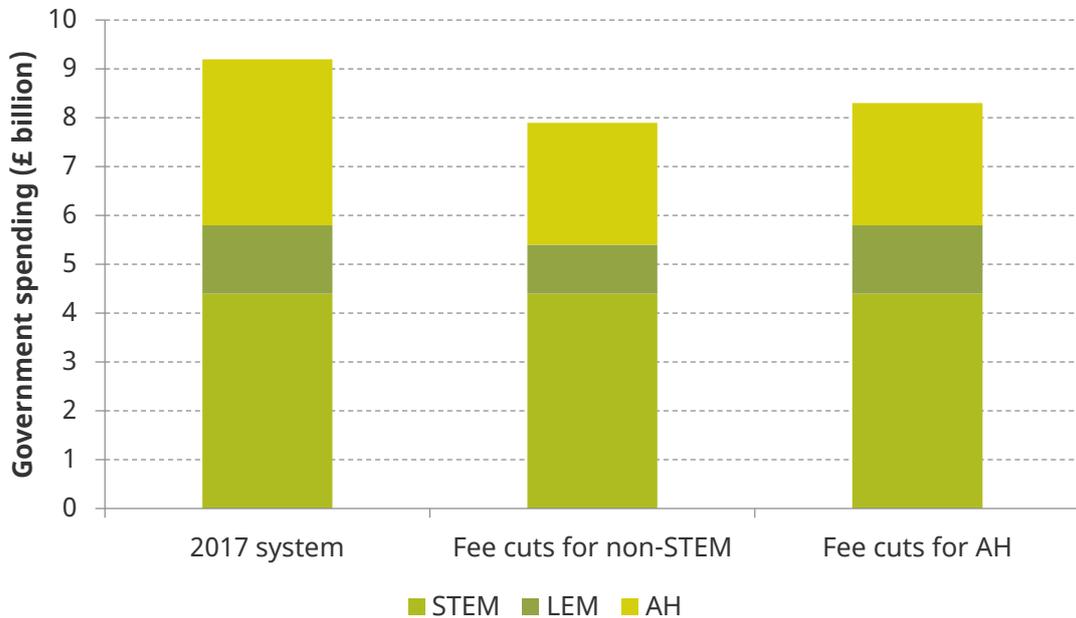
Note: See Table A2 for subject classifications. All figures have been discounted using the government rate of discounting and are in 2018 prices. We assume no behavioural response: student population and number of students studying each subject are assumed to stay constant.

Source: Calculations based on HMRC administrative data sets.

Figure 15. Impact on total government spending per borrower of reducing fees for science subjects to £6,000 (lost tuition fee income replaced with teaching grants)
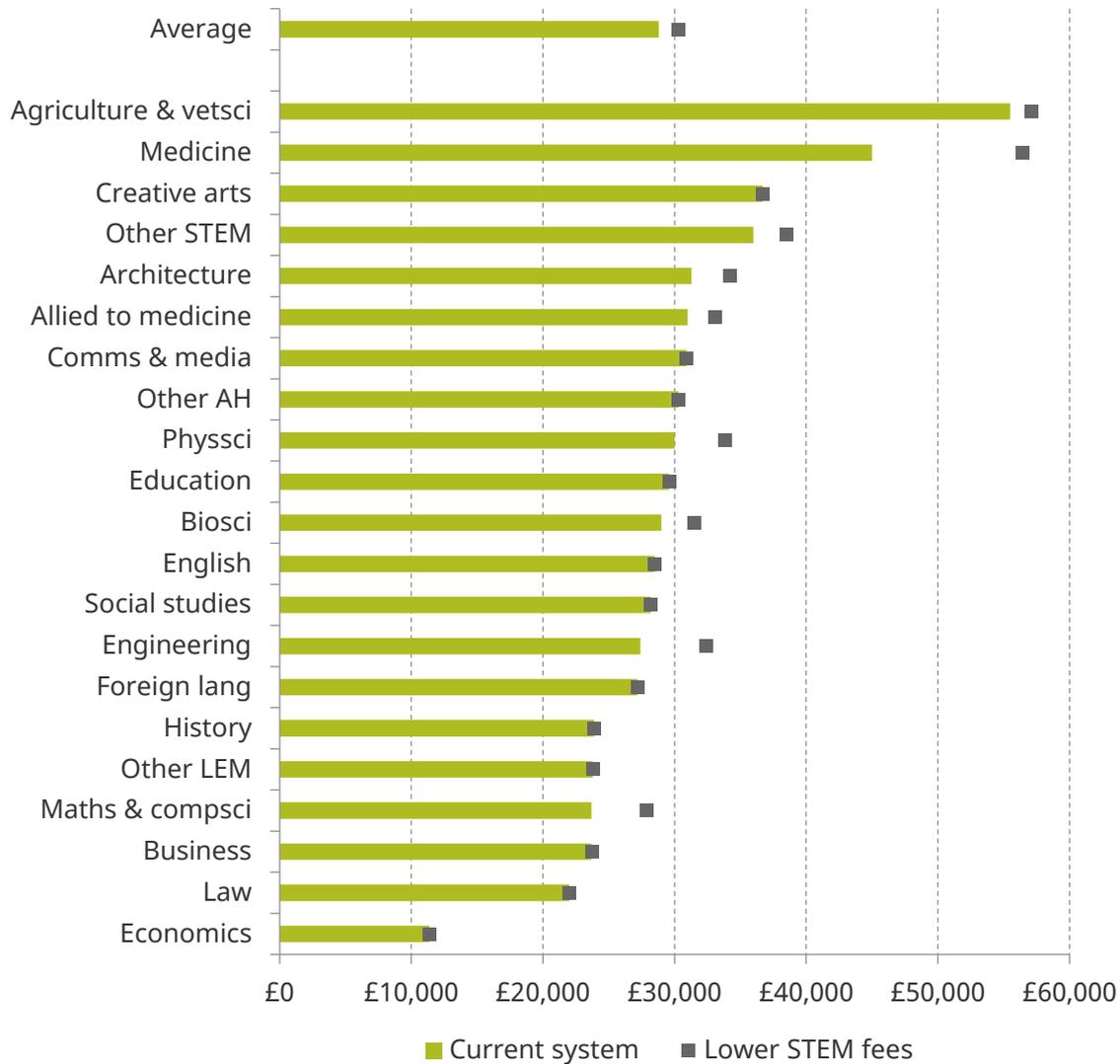
Note: See Table A2 for subject classifications. All figures have been discounted using the government rate of discounting and are in 2018 prices. Estimated spending includes up-front grants and long-run loan write-offs.

Source: Calculations based on HMRC administrative data sets.

scenario where the fee cap for STEM subjects is reduced to £6,000 per year. The government is unlikely to want to cut resources for STEM subjects (and hence incentivise universities to offer fewer places), so we assume that 100% of the lost fee income is replaced by increased teaching grants. The impact of this potential reform on the long-run government cost of providing different HE courses is shown in Figure 15.

As tuition fees loans – some of which are expected to be repaid – are replaced by teaching grant income – which is not – this reform increases the expected long-run cost of providing HE. However, it increases the overall long-run cost by less than £2,000 per

student. This is because, even though STEM graduates have higher earnings on average,[44] it is still the case that very few people are forecast to fully repay their loans under the current system. Consequently, marginally lowering their loan size does not reduce repayments significantly. The exception is for medicine and dentistry students, who have very high earnings on average and commonly attend university for five years, exacerbating the impact of this reform; this reform would increase the cost of providing medicine degrees from £45,000 to £56,000.

Capped expenditure

As we have seen, recent changes to the HE funding system in England have dramatically altered the distribution of government spending on different subject areas. One way to change this is to have a blanket cut in fees for various subject areas, as considered above. However, an alternative approach is to set fees based on projected repayments of graduates. Specifically, the government could set a maximum expected long-run cost of providing a degree and set the subject-level fee cap accordingly. This reform is similar in spirit to the one proposed by Barr and Shephard (2010).[45]

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44 C. Belfield, J. Britton, F. Buscha, L. Dearden, M. Dickson, L. van der Erve, L. Sibieta, A. Vignoles, I. Walker and Y. Zhu, *The Impact of Undergraduate Degrees on Early-Career Earnings*, Department for Education Research Report, 2018, https://www.ifs.org.uk/publications/13731.

45 N. Barr and N. Shephard, 'Towards setting student numbers free', unpublished paper, London School of Economics, 2010, https://econ.lse.ac.uk/staff/nb/Barr_Setting_numbers_free_101217.pdf.

Figure 16. Fee levels implied if government spending per borrower is capped at £25,000 (lost tuition fee income not replaced by teaching grants)
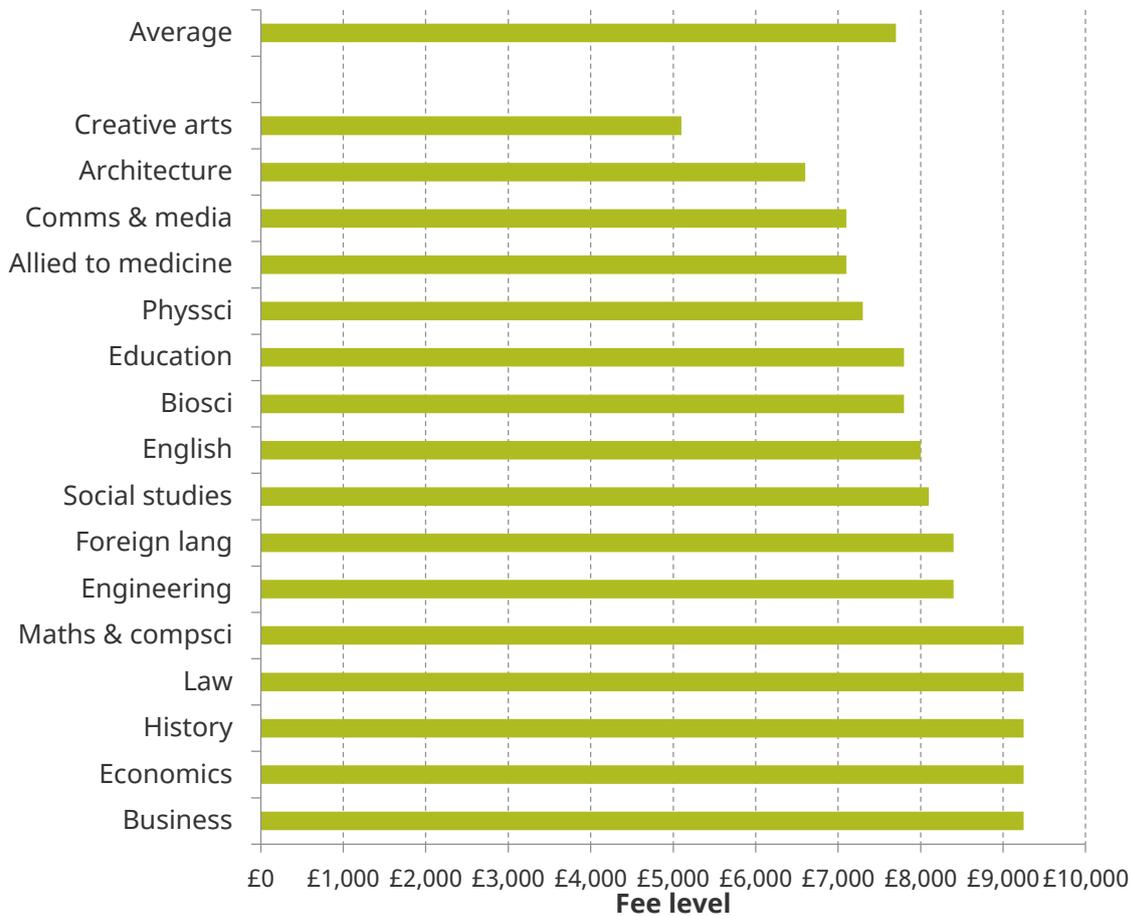
Note: Fee levels if overall government cost (teaching grants + loan subsidy) per borrower is capped at £25,000 for each subject. See Table A2 for subject classifications. All figures have been discounted using the government rate of discounting and are in 2018 prices. We assume no compositional changes in the student body and no changes in graduates' earnings as a result of the change in fees. Medicine and agriculture have been excluded.

Source: Calculations based on HMRC administrative data sets.

In Figure 16, we show the maximum fee levels that would result if the government imposed a maximum expected long-run cost of £25,000 per borrower. None of the subjects with current long-run costs of less than £25,000 is affected, but the higher-cost subjects face lower fee caps to constrain the long-run cost of providing the course.[46]

Our model suggests that in order to cap expenditure at £25,000, the government would have to cut fee levels for a large number of courses. In some cases, these cuts are significant: for example, creative arts would require a large reduction in fee levels to just over £5,000, while architecture, communications & media and subjects allied to medicine would all require cuts to around £7,000. This is largely driven by the low earnings of

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[46] Medicine is excluded from this analysis as universities currently receive teaching grants in excess of £25,000 for this subject and so no positive level of tuition fees would reduce the cost below this level. We also exclude agriculture & veterinary science for similar reasons. We also drop the miscellaneous categories (other STEM, other LEM and other AH) here.

graduates of these subjects (less so for architecture, which receives larger teaching grants than the other areas). On the other hand, for maths, law, history, economics and business, the expected costs are already below £25,000, so fees could be kept at their current level.

A key potential advantage of this reform, aside from saving the government money, is that it would reduce government exposure to large expansions of courses that come with high cost. With the recent removal of the cap in student numbers, it is possible that courses with very high expected government write-offs could expand, causing the distribution of government spending to shift towards lower-earning subjects even further. From the perspective of students, these reforms would reduce the debt on graduation and their expected lifetime repayments. If universities are indeed making a large surplus on these courses under the current system, this would bring the fees that those students face more in line with the costs of providing their course, which it could be argued is fairer.

However, if there is a large reduction in overall funding, there is a concern that the finances of some universities might become unsustainable. Furthermore, going down the route of linking fees to graduates' outcomes has some other potentially perverse implications. To the extent that it may result in universities being incentivised to select students who have high earnings potential, it could have serious implications for social mobility.

Behavioural responses to variable fee caps

We have discussed these variable fee cap reforms under a stylised assumption of no changes in behaviour. However, in practice, it is likely that there would be both demand-side (students) and supply-side (universities) responses which are difficult to predict and which may have perverse consequences.

For example, let us consider the case of fee cuts for non-STEM subjects, which the government might consider if it wants to reduce spending on non-STEM areas. Our static analysis above suggests that this would indeed do that. However, if non-science degrees now come with a cheaper sticker price and less debt, student demand for non-science courses may increase. It may attract people to switch out of STEM into non-STEM subjects, which is potentially at odds with the stated government intention of increasing the number of students taking STEM degrees. It may be particularly undesirable if those from poorer households are more likely to be affected by student debt, resulting in reduced access to STEM courses for those coming from poorer households. It could also increase demand for non-STEM courses from people who do not currently choose to go to university.

However, this response from students is uncertain. The design of the student loan system is such that a cut in tuition fees to £6,000 would not have much impact on average repayments of graduates – indeed, many would be completely unaffected. Students may therefore be concerned that reduced tuition fees might result in a reduction in the quality of the student experience, without any real reduction in cost. It is therefore entirely possible that the fee reduction could increase demand for STEM courses.

In practice, there are of course two sides to the market, and realised student numbers will also be affected by the number of places universities choose to offer. For almost all

universities, a cut in fees for non-STEM courses without a corresponding increase in teaching grants would mean a significant reduction in funding. This is important in light of the evidence suggesting that, on average, universities are roughly breaking even overall on undergraduate teaching of domestic students (while making a considerable surplus on international students).[47]

A large cut in fees could put several universities at risk of failure. This would depend on several factors, including the number of international and postgraduate students they attract, as well as their incomes from other sources, but one key input will be the total cost of teaching non-STEM courses. If the cost exceeds the revenue from students under the new lower fees, then it is likely that universities would want to reduce the number of non-STEM courses. However, if revenue still exceeds costs, universities may choose to increase their student numbers, assuming there is sufficient demand.

Another important point is that the cut in fees for non-STEM courses may unintentionally reduce the amount spent on the more-expensive-to-teach science courses. Or it could mean universities start reducing their costs, and hence result in a reduction in quality.

Negative teaching grants

An alternative reform to cutting fees for non-STEM courses that would avoid some of the issues associated with the behavioural responses discussed above would be to charge HEIs for the ability to make the income-contingent loan system available to their students studying subjects that on average result in low lifetime earnings and hence high government subsidies.[48] For example, if this charge (which can be thought of as a 'negative teaching grant') were applied to HEIs for all their AH students, then tuition fees would remain constant across subjects but the marginal revenue that HEIs would receive would be lower from their AH students and government costs would fall. The saving might, for example, be used to provide grants to HEIs to support STEM and/or LEM subjects. This would tilt government resources back towards STEM and LEM, while also increasing incentives for HEIs to teach STEM and LEM subjects. This approach to funding is similar to the one proposed in Barr and Shephard (2010).[49] It would help reduce the behavioural responses of students, as the fees (and hence repayments) they face would be unchanged. However, the responses of universities would still be difficult to predict.

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[47] See Office for Students, 'Annual TRAC 2016-17, sector analysis', January 2019, https://www.officeforstudents.org.uk/publications/annual-trac-2016-17-sector-analysis/.

[48] An example of this would be a £3,000 charge to HEIs per AH student per year. In order to avoid HEIs having an incentive to disproportionately accept wealthier students, who tend not to take up loans, or overseas students who do not qualify for loans, the charge would be applied to all students, whether they take up loans or not.

[49] N. Barr and N. Shephard, 'Towards setting student numbers free', unpublished paper, London School of Economics, 2010, https://econ.lse.ac.uk/staff/nb/Barr_Setting_numbers_free_101217.pdf.

5. Student loans for teachers

Another feature of our data is that we are able to observe something about the occupations graduates go into once they have left university (in the form of five-digit SIC 2007 codes). Here we make use of this information to evaluate the impact of changing student loans policy for teachers. Student loan debt among teachers was highlighted in the 2017 Conservative party manifesto, which promised to 'offer forgiveness on student loan repayments while they are teaching',[50] with the intention of improving retention of teachers. Similar ideas have also been discussed for nurses. In practice, the policy is exactly equivalent to a small pay rise (for borrowers still in repayment) equal to the amount they would have paid in student loan repayments,[51] and indeed there is some evidence, for teachers at least, that higher pay does lead to higher retention rates,[52] although this evidence is far from conclusive.

In this section, we use our graduate earnings model to analyse the potential impact of another reform that affects teachers: scrapping the tuition fees for PGCEs and providing the funding directly to PGCE providers in grants.

Currently, the typical student who completes an undergraduate degree graduates with more than £50,000 of debt (see Table A4 in the appendix). Those who go on to study for a PGCE to qualify as a teacher accrue an extra £9,250 of tuition fee debt, as well as additional maintenance loans and interest charges. We estimate that a student who studies for a PGCE immediately after an undergraduate degree in England leaves university with around £70,000 of student loan debt.

A policy scrapping tuition fees for PGCE students would reduce this debt on graduation to just over £60,000.[53] If the £9,250 price tag on PGCE qualifications is deterring potential teachers from continuing to study and entering the profession, or alternatively if their high debt level means they may leave teaching for higher-paid professions, then this could be an effective policy to improve teacher recruitment.

The impact of this policy is substantially affected by the announcement of the ONS review[54] on the accounting treatment of student loans. Under the existing treatment, the immediate impact of this policy would be to increase the government deficit by £230 million per cohort of teachers, despite the fact that the policy actually has no impact on the initial government outlay (other than now additionally paying the fees of the small number of students who would not have taken out loans). The increase in the deficit is the

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[50] https://www.conservatives.com/manifesto.

[51] It is not completely clear whether the proposal was to defer student loan repayments or to make them on behalf of students. In practice, in a context where very few graduates fully repay their loans, this distinction makes little difference.

[52] J. Britton and C. Propper, 'Teacher pay and school productivity: exploiting wage regulation', *Journal of Public Economics*, 2016, 133, 75–89.

[53] We assume they would still borrow maintenance loans – and they would also accumulate interest on the whole of their debt at a rate of RPI + 3%. The fall from the previous figure is slightly lower than £9,250, due to deflating to 2018 prices.

[54] Office for National Statistics, 'New treatment of student loans in the public sector finances and national accounts', December 2018, https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/publicsectorfinance/articles/newtreatmentofstudentloansinthepublicsectorfinancesandnationalaccounts/2018-12-17.

result of the additional grant expenditure counting in the deficit while the existing student loans do not.

Under the new accounting treatment, what matters for the deficit today is the expected write-offs on these loans. What determines this is the amount of the PGCE loan that teachers would actually repay. Despite the fact that teachers (using our definition – see note to Table 1) earn more than the average graduate,[55] repayments on the additional PGCE loan are likely to be low. PGCE loans come on top of already large undergraduate loans and, in order to make repayments on the marginal additional loans, graduates must first clear their undergraduate debt. It has been estimated that only the top fifth (as ranked by their lifetime earnings) of graduates will achieve this.[56]

To estimate the long-run cost of replacing tuition fees for PGCEs with additional grant funding for PGCE providers, we define a set of teachers and explore how their student loan repayments would change with and without PGCE loans. We do not directly observe students taking PGCE courses or individuals in a teaching profession. Instead, we define 'teachers' as individuals who work in primary or secondary schools for six years after leaving university[57] and earn more than £12,500 per year.[58]

The results of this analysis are shown in Table 1. Scrapping PGCE fees reduces the amount of repayments teachers make on student loans by only just over £1,000 over their entire careers. As a result, the long-run cost of removing fees on PGCEs is £30 million per cohort of teachers, representing a very small increase in the cost of PGCE provision. Under the new accounting treatment of student loans, this is also now the deficit impact of the policy, which might make it more attractive to policymakers.

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[55] Our definition of teachers is likely to somewhat overstate the lifetime earnings – and hence the repayments – of teachers, which means our estimates of the cost of scrapping PGCE fee loans are likely to be an *overestimate* of the true cost.

[56] C. Belfield, J. Britton and L. van der Erve, 'Higher education finance reform: raising the repayment threshold to £25,000 and freezing the fee cap at £9,250', IFS, Briefing Note BN217, 2017, https://www.ifs.org.uk/publications/9964.

[57] We only observe industry of work between six and eleven years after graduation. Individuals are defined as teachers if they work in a school for all six years we observe industry of work.

[58] This minimum salary is introduced to exclude part-time teaching assistants.

Table 1. Impact of scrapping PGCE fees

	Current system	Scrap PGCE fee (old accounting)	Scrap PGCE fee (new accounting)
Teachers			
Average debt on graduation	69,800	60,700	60,700
Expected lifetime repayments	34,000	32,800	32,800
Long-run cost per borrower	29,500	30,700	30,700
Government			
Deficit impact		+£230m	+£30m
Impact on long-run government cost of providing HE for teachers		+£30m	+£30m

Note: Assumes 27,895 teachers, which is the number of new entrants to postgraduate initial teacher training (ITT) courses in England in 2017–18 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/663141/SFR68_2017_Text.pdf). We define teachers in our data as all those who work in education in all tax years for which we observe industry of work (2008–09 to 2013–14) and earn more than £12,500 per year. Under the 'current system' scenario, we assume that all those defined as teachers do a PGCE straight after their undergraduate degree and take out a full fee and maintenance loan during this year. Under the 'scrap PGCE fee' scenario, we assume these individuals still take out the full maintenance loan they are entitled to, but government pays for their tuition. Figures have been discounted using the government rate of discounting and are in 2018 prices.

Source: Calculations based on HMRC administrative data sets.

The fact that scrapping PGCE fees has very little impact on teachers' expected student loan repayments may mean that teachers' decision to stay in teaching may not be affected by this reform. However, if teachers' decisions to undertake teacher training are affected by the debt burden they take on, then scrapping PGCE fees may be a cost-effective way of providing a boost to teacher recruitment.

6. Conclusion

This report makes use of novel administrative data linkage to investigate how government spending on higher education is distributed amongst subgroups of borrowers. It shows that there are significant differences in the loan subsidies by gender, subject studied and HE provider. While our estimates are speculative in nature – relying on projections of graduate earnings up to 30 years into the future – they detail several important issues with the current system that have not previously been well understood.

We highlight that under the current system, the government has very little control over the distribution of its spending, as the vast majority of it mechanically accrues to those with the lowest lifetime earnings. Combined with the recent removal of student number controls, this means that the government cost of HE is significantly more exposed to changes in student choices: large increases in the number of students doing subjects or attending institutions that lead to low lifetime earnings could result in significant increases in the cost of HE to government.

These features of the current system might not be desirable, and we consequently examine a number of alternative polices. In most cases, the government increases the control it has over the distribution of spending by reforming the system. However, as shown in previous research,[59] the current English system is highly progressive, with the highest-earning borrowers repaying the most over their lifetimes. Reforms that allow the government to take back control generally come at the cost of this progressivity, as cuts to fees would reduce the repayments of high-earning graduates, without affecting the repayments of lower-earning graduates. We outline an alternative approach that involves 'negative teaching grants' being charged for courses. This would reduce government spending on certain areas and reduce exposure to expansions in numbers, without reducing progressivity or dramatically changing the costs to students.

The recently published ONS review of the accounting treatment of student loans interacts importantly with many of the issues discussed in this report. The review stated that the long-run write-offs on loans will effectively count towards deficit spending today. This work highlights the scale of the differences in those write-offs: for example, around 75% of student loans issued to creative arts students are expected to never be repaid, compared with just 18% for medical students. The review is likely to dramatically increase the attention given to student loan write-offs by policymakers, with the courses that have large estimated costs likely to be under significantly more scrutiny. Consequently, policies such as negative teaching grants for low-priority subjects are much more likely to be seriously considered.

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[59] For example, C. Belfield, J. Britton, L. Dearden and L. van der Erve, 'Higher education funding in England: past, present and options for the future', IFS, Briefing Note BN211, 2017, https://www.ifs.org.uk/publications/9334.

Appendix

Table A1. Detail of the various HE systems in England

	1999 system	2005 system	2011 system	2017 system
Maximum fees	£1,025 in 1999, increasing with RPI	£1,175 in 2005, increasing with RPI	£3,375 in 2011, increasing with RPI	£9,250 in 2017, frozen in nominal terms
Repayment threshold	Plan 1 (£18,330 in 2018)	Plan 1 (£18,330 in 2018)	Plan 1 (£18,330 in 2018)	Plan 2 (£25,000 in 2018)
Repayment rate	9%	9%	9%	9%
Interest rate on loans	RPI[a]	RPI[a]	RPI[a]	RPI + 3% during study; RPI + 0–3% subsequently
Write-off	Age 65	Age 65	25 years	30 years
Maintenance grants		✓[b]	✓	
Maintenance loans	✓	✓	✓	✓
Fee support	✓	✓		
Fee loans		[c]	✓	✓
Student number caps	✓	✓	✓	

[a] Actual policy is the minimum of base rate + 1% or RPI. We assume it is RPI in the long run.

[b] The cohort entering university in 2005–06 received a type of income-dependent grant called 'HE support'. This was less generous than the maintenance grants introduced in 2006–07.

[c] There were no fee loans when this cohort entered university. Tuition fee loans were introduced in 2006–07, and this cohort were able to take out tuition fee loans in later years of their degree.

Note: Historical Plan 1 thresholds can be found at
http://www.studentloanrepayment.co.uk/portal/page?_pageid=93,6678511&_dad=portal&_schema=PORTAL.

Table A2. Classification of subjects into broad subject groups

		Subject name	JACS principal subject code
Science	STEM (science, technology, engineering and maths)	Medicine	A
		Allied to medicine	B
		Biosci	C
		Agriculture & vetsci	D
		Physsci	F
		Maths & compsci	G & I
		Engineering	H & J
		Architecture	K
		Other STEM	
Non-science	LEM (law, economics and management)	Economics	L1
		Law	M
		Business	N
		Other LEM	
	AH (arts and humanities)	Social studies (excluding economics)	L (excluding L1)
		Comms & media	P
		English	Q
		Foreign lang	R & T
		History	V
		Creative arts	W
		Education	X
		Other AH	

Table A3. Estimated proportion of degrees in each price group by subject area

	Price group A	Price group B	Price group C1	Price group C2	Price group D
Medicine	100%[a]	-	-	-	-
Allied to medicine	-	16%	84%	-	-
Biosci	-	31%	-	69%	-
Agriculture& vetsci	26%[a]	62%	12%	-	-
Physsci	-	100%	-	-	-
Maths & compsci	-	-	70%	30%	-
Engineering	-	100%	-	-	-
Architecture	-	100%	-	-	-
Social studies	-	-	-	38%	62%
Economics	-	-	-	-	100%
Law	-	-	-	-	100%
Business	-	-	-	10%	90%
Comms & media	-	-	-	96%	4%
English	-	-	-	-	100%
Foreign lang	-	-	-	14%	86%
History	-	-	5%	-	95%
Creative arts	-	-	80%	-	20%
Education	-	-	-	43%	57%

[a] Medicine, dentistry and veterinary science degrees receive price band A HEFCE funding in clinical years and band B funding in pre-clinical years.

Note: These proportions have been estimated based on mapping Learning Directory Classification System (LDCS) subject codes and the associated price groups from annex L of HEIFES14 (http://dera.ioe.ac.uk/21102/12/HEFCE2014_24l.pdf) to principal subject codes, combined with HE enrolments of UK-domiciled students in 2016–17 by principal subject codes from HESA (https://www.hesa.ac.uk/data-and-analysis/students/table-22), and aggregated over subject areas to obtain the estimated proportion of degrees within a subject area in each price group. We then apply these proportions to all our years of interest. If the distribution of students within subject area has changed (e.g. within maths & computer science, we may expect a smaller proportion to have studied computer science in 1999–2000 than in 2016–17), the price group we associate with each subject area may not represent the actual price group distribution at the time. As our data do not contain subject information at a more detailed level than subject area, within subject area we randomly assign price groups in the above proportions to individual students. Missing subjects are assigned price groups in such proportions as to make the overall distribution of full-time equivalents (FTEs) for undergraduates by price group as close as possible to that observed in table E of the July 2017 HEFCE sector grant tables (https://webarchive.nationalarchives.gov.uk/20180405123507/http://www.hefce.ac.uk/funding/annallocns/1718/institutions/).

Table A4. Imputed average loan size by subject

	Loan on graduation (including accumulated interest) in 2018 prices
History	£50,200
Comms & media	£50,300
English	£50,600
Social studies	£50,900
Creative arts	£51,200
Other AH	£51,500
Biosci	£51,800
Economics	£52,000
Law	£52,100
Architecture	£52,200
Business	£52,500
Other LEM	£52,500
Education	£52,600
Allied to medicine	£53,500
Maths & compsci	£55,600
Other STEM	£56,800
Physsci	£57,200
Foreign lang	£58,300
Engineering	£61,000
Agriculture & vetsci	£64,900
Medicine	£71,700

Source: Authors' calculations.