GRADUATE EARNINGS PREMIA IN THE UK: DECLINE AND FALL?

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ABSTRACT

A long-standing puzzle in the economics of education concerns the observed constancy of the average earnings premium for a degree despite a prolonged period of substantial growth in the share of graduates in the working population in the UK. Focusing on birth cohorts between 1970 and 1990, we produce evidence of a recent decline in the earnings premium for graduates over non-graduates by age 26. For those born in 1990, we estimate an average graduate earnings premium of 10%, contrasting with an estimate of 17% for the 1970 birth cohort. We also find a substantial increase in dispersion around the average premium according to class of degree awarded. Combined with a falling average, this has left the earnings of 1990-born graduates awarded lower degree classes only 3% above that of non-graduates. Among the 1970-born cohort, the equivalent earnings premium was 14%. We suggest that this precipitous fall is consistent with a 'double-scarring' effect associated with the combination of increased higher education participation and a rise in the proportion of graduates awarded an upper honours degree over the span of the two cohorts.

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1. INTRODUCTION

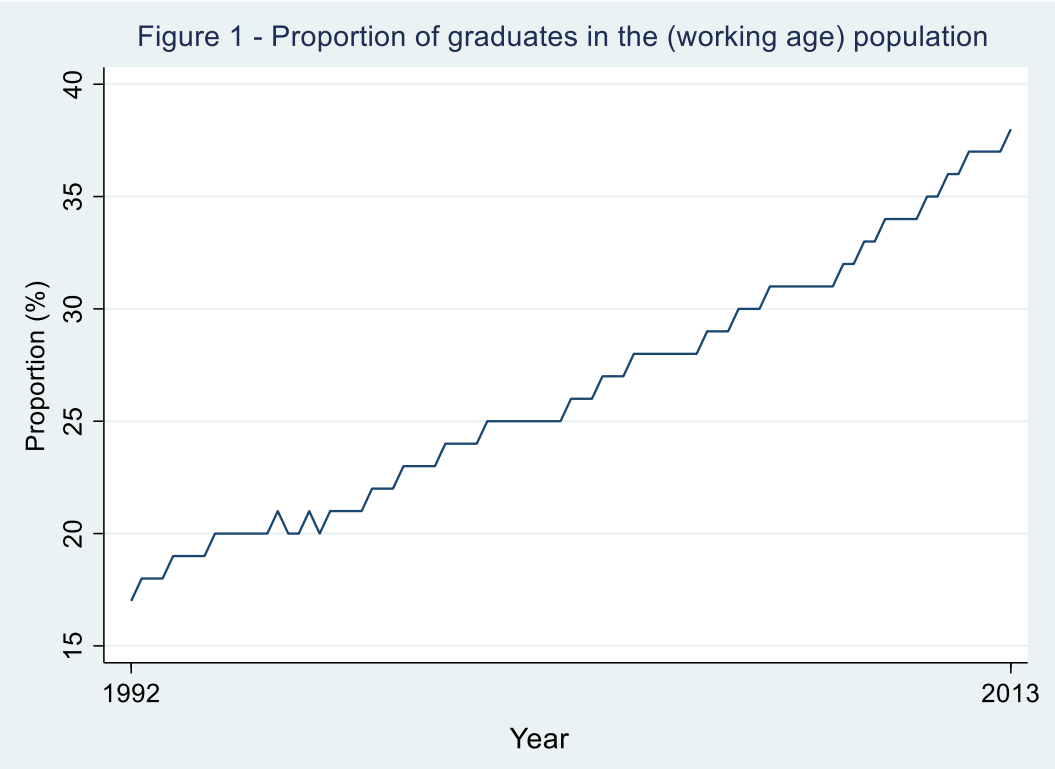
The primary purpose of this paper is to assess the magnitude of the earnings premium associated with a first degree by age 26 for UK cohorts born as recently as the early 1990s and to compare results to estimates for those born up to two decades earlier. We also examine the variation around the average graduate premium by class of degree awarded and how this has evolved over the twenty-year period. We pay particular attention to the earnings premium of those graduating with lower class degrees relative to non-graduates, as this has potential to impact significantly upon individuals' higher education participation decisions.

Previous research covering birth cohorts up to 1989 has identified a puzzle arising from the fact that substantial and persistent increases in the higher education participation rate of young people in the UK do not appear to have generated any reduction in the earnings premium of graduates relative to non-graduates [see Blundell *et al.* (2016a), Blundell *et al.* (2021), Walker and Zhu (2008)]. The premium is defined as the percentage by which the earnings of graduates exceed those of non-graduates, calculated as $(W_G - W_N)/W_N$, where W_G denotes the average earnings of graduates and W_N the average earnings of non-graduates. The explanation typically offered to resolve the puzzling constancy of the premium is that any impact of increased relative supply of graduate labour has been just offset by the increased relative demand for highly-skilled labour associated with factors such as skill-biased technological and organisational change. Our starting point is an exploration of the Next Steps data for a 1990 birth cohort, for whom we estimate an average earnings premium of 10% for graduates over non-graduates by age 26.[1] An equivalent analysis based on the British Cohort Study (BCS70) produces an estimate of the average graduate earnings premium of 17% for the birth cohort of 1970, indicating that there has been a substantial fall in the earnings premium associated with a degree between the two birth cohorts. Obtaining causal estimates of the graduate premium by OLS using the two cohort studies rests on being able to suitably control for confounding factors (e.g. cognitive ability), accurate earnings and qualifications data, as well as contending with possible self-selection into employment. We therefore discuss the rich set of covariates we are able to include in our modelling approach, alongside providing evidence to alleviate concerns around possible measurement error and composition bias.

[1] For simplicity, we refer to cohort members in Next Steps as a 1990 birth cohort, though participants in the study were born between 1st September 1989 and 31st August 1990 (reflecting a school year in England) and would have been either 25 or 26 years of age at the time of participating in the latest survey.

We also examine Labour Force Survey (LFS) data, creating cohorts born in or close to each of 1970 and 1990, and report corroborating evidence of a large reduction in the graduate earnings premium across these two cohorts. We pursue further the question of the timing of the decline in the premium by creating a series of successive birth cohorts within LFS. We locate the fall as having occurred only for those born in the period 1988-93. That prior research evidence has been based on cohorts born no later than 1989 is consistent with why a recent decrease in the graduate earnings premium has not been identified previously. Confirming whether the fall we have identified is short-term or more deeply structural will have to await data for later birth cohorts: our estimates for those born in 1990 are based on the latest sweep of the Next Steps survey conducted in 2015-16, while estimates for those born through the period 1988-93 exploit LFS data for years 2014-18.

As the Office for National Statistics (ONS, 2013) highlights, in the time between the graduation of the 1970 and the 1990 birth cohorts, there was an almost linear expansion in the proportion of graduates in the working age population – rising from 17% in 1992 to 38% by 2013 (Figure 1). This is the source of the puzzle regarding previous findings of stability in the graduate earnings premium in the face of the increasing relative supply of graduates. At first sight, it might seem surprising that the fall we are finding in the average graduate earnings premium is occurring only for the later 1988-93 birth cohorts given that the higher education participation rate was growing most rapidly among the earlier cohorts (see, for example, Figure 2 in Blundell *et al.,* 2016b), but this is likely to reflect two factors. First, the timing of any fall in the average premium depends on *relative* movements in supply and demand for graduates. Second, the proportion of graduates in the labour force *stock* has continued to increase even as the *flow* of graduates into the labour force has begun to stabilise, as shown in Figure 1.

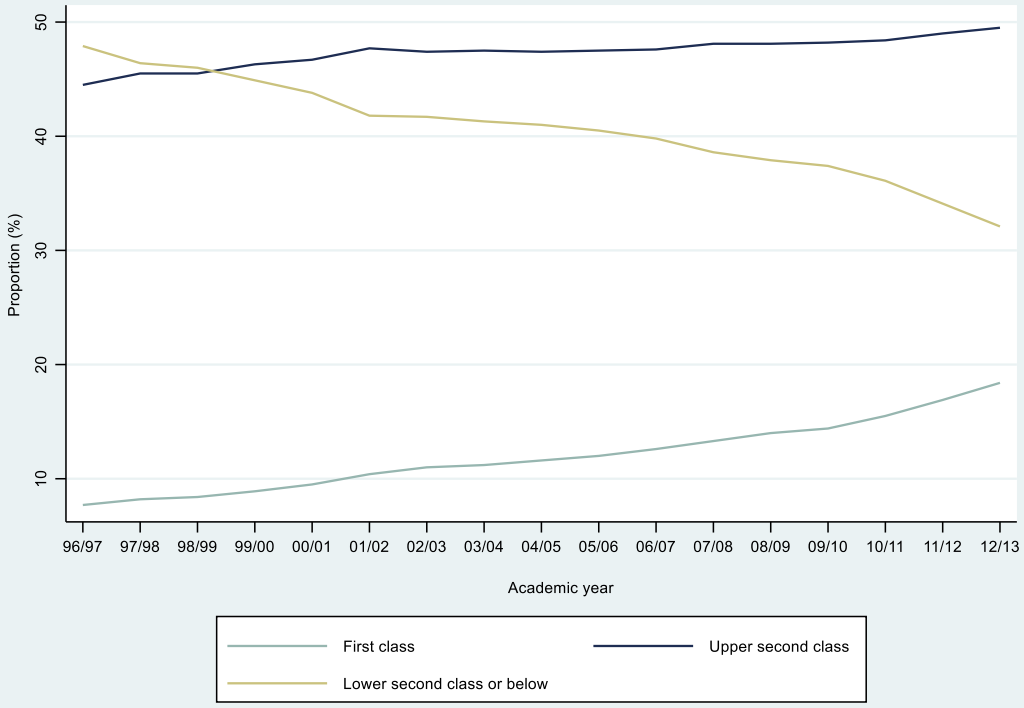


Regarding variation around the average graduate earnings premium by the class of degree awarded, Naylor *et al.* (2016) exploit data from the 1990 Graduate Cohort Studies (GCS) and LFS surveys to estimate the earnings premium for an upper honours degree over a lower degree class for those born between 1970 and 1982.[2] Despite the proportion of graduates awarded at least an upper honours degree having continuously risen over the last two decades - predominantly driven by a rise in the award of first class degrees (Figure 2) - we are not aware of estimates of premia by class of degree for those born more recently than the very early 1980s. Hence, there is no up-to-date evidence on the impact either of increased higher education participation or of the changing proportions by degree classification on earnings premia by class of award. In the current paper, we use Next Steps data for the 1990 birth cohort to examine the earnings premium for upper honours relative to lower degree classes. We estimate the premium for an upper honours over a lower degree class to be 10% by age 26. Replicating our analysis on BCS70 data, we estimate the equivalent premium to have been 6% for the earlier birth cohort of 1970. The combination of a falling average graduate earnings premium and increasing dispersion around the average according to broad class

[2] Throughout this paper, we define those with an 'upper honours degree class' as graduates with a first or upper second class award in their undergraduate degree. Those with a 'lower degree class' consist of graduates with a lower second, third or pass/ordinary first degree.

of degree awarded necessarily implies a fall in the earnings premium for graduates awarded a lower degree class relative to non-graduates: indeed, our estimates indicate that this premium has fallen from 14% to just 3% between the 1970 and the 1990 birth cohorts.

Figure 2 - The proportion of classified first degrees by class of award in HESA records



Theoretical models predict that changes in higher education participation are likely to impact on dispersion around the average graduate earnings premium according to degree class awarded. Building on Blackburn and Neumark (1993), Ireland *et al*. (2009) apply a signalling framework and demonstrate that the greater is the proportion of a cohort obtaining a degree the more highly will the labour market value the signal of having graduated among the higher performing graduates: equivalently, the ‘scarring effect’ associated with the award of a lower class of degree deepens. Increases in higher education participation are capable, then, of explaining a worsening earnings position of those awarded lower degree classes relative to non-graduates through a combination of two forces: (i) the fall in the average graduate earnings premium resulting from the increased relative supply of graduates and (ii) the increase in dispersion around the average associated with a scarring effect.

In addition to the impact of the increase in higher education participation, a second source of scarring of graduates awarded a lower degree class stems from a rise in the proportion of graduates awarded an upper honours degree, which is likely to lead to a fall in the earnings premium associated with a lower degree class relative to non-graduates. This is because, *ceteris paribus*, a rise in the proportion of graduates with upper honours degrees will be associated with a reduction in the expected ability of those with lower degree classes. Based on the Universities' Statistical Record, 53% of 1991 graduates (which will predominantly comprise those born in 1970) were awarded upper honours degrees. From Higher Education Statistics Agency (HESA) data, this had risen to 64% among 2010/11 graduates (corresponding to the modal graduation year for those in the 1990 birth cohort).

Over time, the cost of financing higher education in the UK (particularly in England) has shifted away from government and towards the individual. In England, prior to 1998 when tuition fees were first introduced (thus affecting those born around 1980), the state carried full responsibility for paying the educational cost of a degree. By 2006, tuition fees had risen to £3,000 per annum (impacting on those born around 1988). Currently, tuition fees are over £9,000. The falling premium for graduates with a lower degree class combined with the growing costs of study could therefore impact adversely on the capacity of higher education to enhance social mobility if those from less advantaged backgrounds are either deterred from participation or experience less positive outcomes on graduation as a result of their degree award. We note that Naylor and Smith (2001) and Crawford (2014), have found that those from disadvantaged backgrounds are less likely to graduate with an upper honours degree.

The structure of the rest of the paper is as follows. Section 2 presents empirical estimates of the average graduate earnings premium for both 1990 and 1970 cohorts, based on data from Next Steps, BCS70 and LFS, while also considering the timing of the changes. Section 3 presents estimates of the earnings premium for upper honours relative to lower degree classes for each of the two birth cohorts, based on data from Next Steps and BCS70: estimates are also reported for the premium for graduates awarded a lower class of degree relative to non-graduates. Data from the Longitudinal Destinations of Leavers from Higher Education (LDLHE) and LFS surveys are then exploited in order to investigate more precisely the timing of changes in premia across birth cohorts by broad and separate classes of degree.[3] Section 4 closes the paper with conclusions and further remarks.

[3] In the LDLHE questionnaire, individuals are asked about their annual earnings and mode of employment. While there was a question on hours worked in the latter versions of the survey, only a very small proportion of respondents supplied a response, rendering this

2. AVERAGE GRADUATE EARNINGS PREMIA: DATA, METHODS AND RESULTS

Section 2.1 presents analysis of the graduate earnings premium by age 26 for the 1990 birth cohort based on data from Next Steps and Section 2.2 presents equivalent analysis for the 1970 birth cohort based on BCS70. Section 2.3 then provides complementary evidence from the LFS for those born in or close to each of 1990 and 1970. We conclude this section by generating additional birth cohorts within the 1980-1993 interval, which allows us to provide more precise evidence on the timing of changes in the graduate earnings premium between the two birth cohorts and consequently explain why our findings differ from previous literature in this area.

Cohort studies are regarded as highly suitable datasets for the analysis of returns to education. As noted by Dearden (1999), one of the common issues faced by researchers wishing to estimate the graduate premium using secondary data sources is the absence of variables that could impact on both the decision to participate in higher education and future labour market outcomes. The typical example given in the literature is around innate ability which, if not suitably accounted for, can lead to (upwardly) biased estimates. However, cohort studies are unusual in the breadth and depth of information they collect. Ability test scores are typically administered to cohort members during early childhood and thus form part of the final dataset.[4] Alongside this, a wealth of data is gathered on both cohort members and parents, including detailed information on household background (e.g. parental education/occupation, household income, accommodation type, etc). Furthermore, both parents and offspring are asked questions that indicate their attitudes towards education, with cohort members additionally supplying data on non-cognitive skills, such as their locus of control and appetite for taking risks.

2.1 THE AVERAGE GRADUATE EARNINGS PREMIUM FOR THE BIRTH COHORT OF 1990: NEXT STEPS

We start by exploiting Next Steps data for a cohort of individuals born in 1990. Previous work based on cohort data has focused on individuals born either in 1958 (National Child Development Study:

variable unsuitable for use in any analysis. This precludes the creation of an hourly pay measure in LDLHE. For consistency, the dependent variable in our regressions in this paper is the annual earnings of full-time workers. Where possible, we conduct a sensitivity analysis using hourly pay and find the premia to be very similar in nearly all instances, thus alleviating concerns around compositional bias. The relevant code can be found in our do-files and results can also be supplied upon request.

[4] With the first sweep of Next Steps having been at the age of 13-14, one of the notable omissions is early years test scores that provide an insight into the cognitive ability of the individual. However, the study has been linked to the National Pupil Database (NPD) – an administrative record that captures Key Stage test scores at the age of 11. Work by Bourne (2016) and Crawford *et al.* (2014) highlights the suitability of Key Stage measures as a proxy for cognitive ability.

NCDS) or in 1970 (BCS70) [see, for example, Blundell *et al.* (2005) and Naylor *et al.* (2016)]. Analysis of Next Steps data enables us to look at a more recent cohort for whom we have earnings data as recently as the period 2015-2016, when cohort members were aged either 25 or 26. As this cohort ages, subsequent waves will enable further analysis of the evolution of earnings premia and hence of the persistence of effects uncovered in the current paper.

Next Steps (formerly known as the Longitudinal Study of Young People in England) covers a set of individuals born in England between 1st September 1989 and 31st August 1990. The purpose of forming this dataset was to enable researchers and policymakers to understand the transitions young people make from secondary school into higher education and/or employment. A representative sample of around 16,000 young people at selected state and independent schools first took part when they were in Year 9 (aged 13-14), with yearly sweeps taking place until 2010. Parents were also asked to participate, though they were interviewed in the first four surveys only. The most recent sweep, administered between August 2015 and September 2016, explored the early adulthood outcomes of the cohort, generating information on academic qualifications gained (including classification of first degree) and current employment.

We restrict the sample of interest in Next Steps to those in full-time employment. The supplementary material we supply alongside this paper provides full details regarding the selection of the final sample used for the analysis, constituting 1,733 observations on individual cohort members, among whom 43% of individuals had a first degree qualification. Nationally for this cohort, Heywood (2011) reports that the participation rate in higher education by the age of 22 was around 39%, thus our sample appears to be reasonably representative by education level. The mean (median) earnings of graduates in our sample is £24,977 (£24,000), while the corresponding figure for non-graduates is £21,592 (£19,760): hence the raw difference implies a graduate earnings premium of 16% (21%). One of the issues often raised about survey data is the misreporting of earnings and qualifications information by respondents, with the latter resulting in attenuation bias in estimates of the return to a degree based on OLS. However, in their analysis of NCDS, Battistin *et al.* (2014) highlight the similarity between transcript files and self-reported qualifications data at the age 23 survey. Dearden (1999) notes that measurement error in the reporting of qualification information is less of a risk the shorter the time gap between qualification and the conduct of the survey, hence our observations at age 26 should be reasonably accurate. Furthermore, the Longitudinal Education Outcomes (LEO) dataset – an administrative data source developed through linking UK education, benefit and tax records – is now commonly utilised for examining (gross) graduate earnings. Based on LEO data,

the gross median earnings of 2010/11 qualifiers (the modal year of graduation for the Next Steps cohort) was £22,500 and £25,000 three and five years after graduation, respectively, with this range containing the median earnings of graduates in Next Steps. Due to the inability to distinguish between part-time and full-time workers in LEO, alongside non-graduate females being more likely to be in part-time work [see Belfield *et al.* (2018) and Boero *et al.* (2019)], it is not possible to use LEO to assess the potential accuracy of non-graduate earnings in Next Steps in the same way. Nevertheless, the aforementioned findings mitigate worries around measurement error, particularly given qualifications information is captured in Next Steps at a similar age to that considered by Battistin *et al.* (2014).

Given the rich data we have available to us in Next Steps and reduced concerns around the accurate reporting of earnings and qualifications information by respondents, we follow Mincer and employ OLS to estimate the graduate premium, as represented by the following equation:

$$w_i = \alpha + \beta_1 E_i + X_i' \beta_2 + \varepsilon_i \qquad [1]$$

where w_i represents the natural logarithm of gross annual earnings ($w_i = \ln W_i$) at approximately 26 years of age, X_i predominantly represents a set of personal and family characteristics (including the cognitive and non-cognitive ability of the cohort member) and $E_i = [1, 0]$ for graduates and non-graduates, respectively. Table 1 reports estimated coefficients and the associated graduate earnings premium from a series of models distinguished by the sets of control variables included in the regressions.[5]

[5] Homoscedastic standard errors are reported in parentheses. Note that none of our results reported in this paper change if we use robust standard errors. Following Solon *et al.* (2015), we use unweighted data for our regression analysis, but weighted data for our descriptive statistics tables in the accompanying supplementary material.

Table 1: The average graduate premium based on earnings at age 25-26 in Next Steps (1990 birth cohort). The dependent variable is the log of (gross) annual earnings of full-time workers.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Estimated coefficient	0.146*** (0.0189)	0.136*** (0.0185)	0.136*** (0.0181)	0.104*** (0.0174)	0.104*** (0.0178)	0.136*** (0.0181)	0.133*** (0.0184)	0.0972*** (0.0196)
Implied premium	16%	15%	15%	11%	11%	15%	14%	10%
R-squared	0.0454	0.110	0.159	0.226	0.227	0.248	0.256	0.282
Sample size	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733
Cohort member personal characteristics		x	x	x	x	x	x	x
Cohort member non-cognitive skills			x	x	x	x	x	x
Parental/Household background				x	x	x	x	x
Parental attitudes towards education					x	x	x	x
Job tenure						x	x	x
Cohort member health							x	x
Cognitive ability								x

In Model 1, with no controls, the estimated coefficient of 0.146 implies a graduate earnings premium of 16%: this is given by $[\exp(\hat{\beta}_1)-1]$ as the dependent variable is the natural logarithm of the earnings variable. We note that the inclusion of additional controls (particularly those relating to household background and cognitive ability) tends to reduce the estimated premium. This reflects the fact that these covariates are positively correlated with both higher education participation and earnings. The one exception to this is the addition of the work tenure variable, which causes the estimated premium to rise. This occurs because, on average, graduates at age 26 will have had less opportunity to develop work tenure than non-graduates who would have completed full-time education up to 5 years earlier. Our preferred specification incorporates the full set of controls listed

under Model 8: hence, our estimate of the average graduate earnings premium by age 26 for this cohort of individuals born in 1990 is 10%.

In Section 2.2, we replicate our analysis of Next Steps data on individuals born in 1970 using BCS70 data in order to compare estimates of the graduate earnings premium across the two birth cohorts separated as they are by two decades.

2.2 THE AVERAGE GRADUATE EARNINGS PREMIUM FOR THE BIRTH COHORT OF 1970: BCS70

BCS70 tracks a representative sample of approximately 17,000 people born in the UK in early April 1970. Cohort members themselves were interviewed for the first time at the age of 10, completing the British Ability Scales (BAS) assessments (which we draw upon as a measure of cognitive ability in our analysis), while their parents took part in the survey from the child's birth up to the point they reached the age of 16. At age 26, cohort members participated in a further sweep, where data on education and employment outcomes were gathered. This included the highest academic qualification held and earnings. While degree classification information is not available in the age 26 sweep, this is obtained by linking to the age 30 survey. One of the limitations of the age 26 survey is that the question on remuneration refers to net rather than gross earnings – with the latter typically used in the estimation of the graduate premium. This is a further motivation for corroborating our findings through complementary analysis of LFS data.

Following our approach in the analysis of Next Steps, we limit our BCS sample to those defined as being in full-time employment and focus on annual earnings.[6] 20% of the final sample of 3,771 individual cohort members have a first degree qualification, which aligns with higher education participation rates in the UK at the time, as noted in Naylor *et al.* (2016). The mean (median) net annual earnings in our sample for analysis are £12,660 (£11,865) for graduates and £10,580 (£9,880) for non-graduates, implying a graduate earnings premium of 20% in the raw data. This contrasts with a figure of 16% (based on mean earnings) for the 1990 birth cohort as reported in Section 2.1. As with Table 1 for our analysis of Next Steps, Table 2 reports estimated coefficients and the associated graduate earnings premium based on regression equation [1] for a set of models developed through the successive addition of control variables, which are as similar as possible to those included in the analysis of Next Steps data.

[6] See the accompanying supplementary material for a discussion of the comparability of Next Steps and BCS70 datasets for the purposes of estimating graduate earnings premia.

Table 2: The average graduate premium based on earnings at age 26 in BCS70 (1970 birth cohort). The dependent variable is the log of (net) annual earnings of full-time workers.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Estimated coefficient	0.189*** (0.0127)	0.184*** (0.0123)	0.179*** (0.0123)	0.151*** (0.0127)	0.150*** (0.0128)	0.163*** (0.0134)	0.161*** (0.0134)	0.154*** (0.0136)
Implied premium	21%	20%	20%	16%	16%	18%	17%	17%
R-squared	0.0550	0.138	0.150	0.199	0.200	0.207	0.209	0.213
Sample size	3,771	3,771	3,771	3,771	3,771	3,771	3,771	3,771
Cohort member personal characteristics		x	x	x	x	x	x	x
Cohort member non-cognitive skills			x	x	x	x	x	x
Parental/Household background				x	x	x	x	x
Parental attitudes towards education					x	x	x	x
Job tenure						x	x	x
Cohort member health							x	x
Cognitive ability								x

With reference to Model 8, we estimate that at age 26, the average graduate earnings premium for this cohort of individuals born in 1970 is 17%. Hence, we find evidence that the average graduate earnings premium for the 1990 birth cohort is substantially lower than that of 1970 birth cohort: having declined from 17% to 10% across the two cohorts. This fall of 7 percentage points exceeds the fall of 4 percentage points (from 20% to 16%) observed in the raw data. This primarily arises from the fact that for the 1990 birth cohort a larger proportion of the raw disparity in earnings between graduates and non-graduates is explained by cognitive ability, suggesting that the influence of this

variable on the likelihood of graduating and/or on remuneration increased across the two birth cohorts.

2.3 THE AVERAGE GRADUATE EARNINGS PREMIUM FOR THE BIRTH COHORTS OF 1990 AND 1970: LFS DATA

Given the progressive nature of the UK income tax system, one would anticipate that the estimate for the fall in the graduate premium that we report in the preceding section may have been higher had gross earnings been available for the BCS70 sample. In this section of the paper, we investigate this further by producing estimates of the graduate earnings premium for both 1970 and 1990 birth cohorts using a common data source which captures both cohorts – that is, the LFS.

The LFS is administered by the ONS and serves the principal purpose of providing a representative sample of data that can enable a detailed examination of the UK labour market. Since 1992, the survey has been run quarterly, encompassing around 60,000 households. It operates under a rotating panel design, whereby households are interviewed for five successive quarters before dropping out of the sample. Earnings information was gathered only in wave 5 up to spring 1997, after which it has been collected in both waves 1 and 5. Most importantly for our analysis, there is consistency in the way the gross weekly earnings variable is derived, which we then convert into an annualised figure. A weakness of the LFS when compared to the birth cohort studies is the relative paucity of information on personal characteristics (including cognitive/non-cognitive ability) and family background, though data are available on the highest academic qualifications held by respondents (with questions on the class of degree awarded having been introduced in the mid-2000s).

We begin by pooling all quarters of the LFS between 1995 and 1997, with the sample being restricted to those aged 25 or 26. Hence, this incorporates those born between 1969 and 1972, approximating the BCS70 cohort. While cohort members in Next Steps participated in the latest sweep in either 2015 or 2016, we amalgamate all LFS quarters between 2014 and 2017, before constraining the sample to those aged 25 or 26. Consequently, this captures those born between 1988-1992. A wider birth cohort range has to be utilised in the LFS to ensure sufficient sample size for the analysis we wish to undertake. The real median earnings of graduates born 1988-1992 in the LFS ranges between £22,776 and £23,786, with these figures being similar to those we observe in Next Steps

and LEO.[7] With no administrative earnings data available in the mid-1990s, no such source can be used to assess the LFS earnings data around that time. However, the 1996 New Earnings Survey (NES) collected gross earnings information on full-time employees directly from employers (and therefore could be considered to possess more accurate earnings information). ONS (2017) data on the 1996 NES shows that the mean earnings of full-time females aged 25-29 was in the region of £15,000, while the corresponding statistic for full-time males is around £17,000. In our 1995-1997 LFS data, we find earnings to be just under £17,000 for full-time males and slightly above £14,000 for full-time females, hence the earnings data in the 1995-1997 LFS seem reasonable.

Due to the limited number of controls available in the LFS, we replicate model 1 (with no covariates) of Tables 1 and 2 based on the birth cohort studies. Results are given in Table 3 below.

Table 3: The average graduate premium based on earnings at age 25-26 in LFS. The dependent variable is the log of (gross) annual earnings of full-time workers.

	[1]	**[2]**
Birth cohort	**1988-1992**	**1969-1972**
Estimated coefficient for 'graduate'	0.118*** (0.0175)	0.245*** (0.0157)
Implied premium	13%	28%
R-squared	0.0312	0.100
Sample size	1,405	2,189

As shown in column [2] of Table 3, the estimated graduate premium of 28% based on gross annual earnings for those born around 1970 in LFS is higher than the equivalent estimate of 21% reported in Table 2 from the analysis of BCS70, as expected. For those born close to 1990, we observe the premium in LFS to be 13%, as reported in column [1] in Table 3, which is relatively close to the estimate of 16% based on Next Steps. Overall, the results confirm our previous finding of a fall in the graduate premium across the two cohorts. The decrease of 15 percentage points (28% to 13%)

[7] We provide a full set of descriptive statistics on earnings across all the datasets we utilise in our supplementary material.

exceeds the decline we estimate using the birth cohort studies: one reason for this is likely to be associated with the lack of a gross earnings measure in the age 26 survey of BCS70.

2.4. THE PUZZLE RESOLVED?

Through pooling all quarters of the LFS between 1994 and 2006, Walker and Zhu (2008) examine whether there is any evidence of a change in the graduate premium over time. Among those aged 25-27 (hence corresponding to those born between approximately 1967 and 1981), they find the premium to have remained stable over the period considered. More recently, Blundell *et al.* (2016a) have drawn on the same dataset to analyse the evolution of the ratio of graduate to non-graduate median earnings between the ages of 25-29 over the last two decades (thus covering those born between approximately 1965 and 1989), noting that the graduate to non-graduate earnings premium has remained almost constant at 35%. Both of these studies use hourly pay as their dependent variable and include postgraduates in their definition of those with a degree. Non-graduates are classified slightly differently, with Walker and Zhu (2008) limiting this category to those with at least 2 A-level qualifications. Blundell *et al.* (2016a) also include those with GCSEs and below degree-level qualifications in their definition of the non-graduate group.

We extend the work by Walker and Zhu (2008) and Blundell *et al.* (2016a), by considering more recent birth cohorts in order to examine whether our finding of a fall in the graduate premium for the 1990 cohort is such a recent phenomenon that it has not been detected in the previous research. To do this, we first bring together all quarters of the LFS between the years 2006 and 2018, before reducing the sample to those aged 25 to 26. This results in a dataset containing the gross annual earnings (of full-time employees) and highest qualification held of those born between 1980 and 1993. Previously, our OLS models using LFS data replicated model 1 in Tables 1 and 2. We now refine this for the 2006-2018 LFS data to include a birth cohort dummy (equal to 1 if the individual was born between 1988 and 1993) and an interaction term indicating whether the respondent was a graduate born in this latter period, with results presented in Table 4.

Table 4: The change in the average graduate premium among those born between 1980 and 1993 based on earnings at age 25-26 in LFS. The dependent variable is the log of (gross) annual earnings of full-time workers.

Estimated coefficient for 'graduate'	0.206*** (0.0119)
Estimated coefficient for 'birth cohort 1988-1993'	-0.0271* (0.0158)
Estimated coefficient for 'graduate*birth cohort 1988-1993'	-0.0812*** (0.0201)
Implied premium for 'birth cohort 1980-1988'	23%
Implied premium for 'birth cohort 1988-1993'	13%
R-squared	0.0771
Sample size	4,958

We see that, relative to those born in the period 1980-1988, the graduate premium has fallen by 10 percentage points (from 23% to 13%) for those born in the period 1988-1993, illustrating that the decline is a recent phenomenon, hence providing an explanation for our findings differing from those of Walker and Zhu (2008) and Blundell *et al.* (2016a). We interpret these results as representing initial evidence consistent with the hypothesis that the continued rise in the proportion of graduates in the UK labour force has finally begun to impact on the earnings premium of graduates over non-graduates, resolving the puzzle of the long-term constancy of the relative pay of graduates. Our finding of a decline in the average graduate premium also appears to align with the results of recent work carried out by Belfield *et al.* (2021). Drawing on LEO data for those born between 1985 and 1991, they find no significant premium for a degree around the age of 26 for males.[8] Using the LFS for those of a similar age, but born around 1970, Walker and Zhu (2008) estimated the return for males to be in the region of 25%. Though they did not have access to the range of controls available in the cohort studies, we note from Table 2 of our analysis that the premium appears fairly robust to the inclusion of relevant covariates. Belfield *et al.* (2021) find the premium at age 30 to be around 11% for males (once drop-outs from higher education are excluded), after controlling for factors such as attainment, socioeconomic background and school fixed effects. Using the BCS70 and a similar

[8] For reasons we discuss above concerning the inability to distinguish between part-time and full-time workers in LEO (and non-graduate females being more likely to be in the former mode of employment), Belfield *et al.* (2021) note that the results for females should be treated with caution.

group of controls, Naylor *et al.* (2016) observe the male graduate premium at age 30 for those born in 1970 to be 15%. Taken together, these results are therefore consistently suggestive of a decrease in the premium.

It might seem surprising that the graduate earnings premium is falling only among the later birth cohorts given that the higher education participation rate was rising most steeply for the earlier cohorts. We note, however, that even though the increase in participation was levelling off for those born after 1980, it is nonetheless the later cohorts which have the highest participation rates. Hence the *inflow* of these cohorts into the labour market will increase the proportion of graduates within the overall labour force *stock*, as they replace the *outflow* of retirees from earlier birth cohorts. That is, the relative supply of graduates within the labour market continues to increase well beyond the point at which the higher education participation rate ceases to rise. In addition, the relative earnings of graduates and non-graduates is determined not by relative supply alone but by the interaction of relative supply and relative demand: based on our findings, the impact on relative earnings of changes in relative demand for graduates appears to have been finally overtaken by rising relative supply for those born from the late 1980s.

Our results also resonate with recent evidence on the magnitude of the graduate earnings premium (also referred to as the college wage premium, CWP) for those aged between 25 and 34 in the US. Ashworth and Ransom (2019) report that, after two decades of growth, the CWP began to level-off from 1970 onwards. Furthermore, they observe a decline in the CWP for those born after 1977, based on their analysis of the National Longitudinal Survey of Youth 1997 and the Survey of Income and Program Participation. The authors suggest that this could be due to the demand for skilled labour flattening or perhaps even falling among more recent birth cohorts.[9]

[9] Figure 2 in Blundell *et al.* (2016b) also illustrates the rising participation in higher education (and hence supply of graduates) within the US.

3. GRADUATE EARNINGS PREMIA BY CLASS OF DEGREE AWARDED

Our main finding in Section 2 is that between the birth cohorts of 1970 and 1990, there was a fall of around 7 percentage points in the average graduate earnings premium. From our preferred specifications in Next Steps and BCS70 data, which incorporate a full battery of control variables, we estimate that the earnings premium for graduates over non-graduates fell from 17% for the 1970-born to 10% for the 1990-born. There are, of course, variations around the average graduate earnings premium according to factors such as degree subject studied and university attended, as noted by Belfield *et al.* (2018). Within a university degree course, there is also likely to be dispersion around the average premium according to the class of degree awarded to the graduate. This has implications for the extent to which higher education can enhance social mobility. Callender and Mason (2017) highlight the positive association between aversion to debt and deprivation. Consequently, the rising private costs of study, alongside a lower expectation of financial rewards, could deter higher education participation among those from poorer backgrounds. Furthermore, with disadvantaged students more likely to graduate with a lower degree class, greater disparities may arise in the earnings of graduates by socioeconomic status.

In Section 3.1, we use Next Steps to estimate for the 1990 birth cohort at age 26 (i) the premium for an upper honours degree relative to no degree (ii) the premium for a lower class degree relative to no degree and (iii) the implied premium for an upper honours degree relative to a lower class of degree. Section 3.2 presents equivalent results for the 1970 birth cohort from BCS70 data and compares results across the two cohorts. Section 3.3 addresses the issue of the timing of changes in the premium for an upper honours relative to a lower class of degree by exploiting LDLHE and LFS datasets. Section 3.4 focuses solely on graduates and analyses premia by separate degree classes, distinguishing between first class honours, upper second class honours and a lower degree class.

3.1 PREMIA BY CLASS OF DEGREE FOR THE 1990 BIRTH COHORT: NEXT STEPS

In our Next Steps sample, earnings of graduates at age 26 vary substantially by degree classification. As we reported above, mean annual earnings were £24,977 for graduates and £21,592 for non-graduates, implying a graduate earnings premium of 16% in the raw data. However, this masks variation in the average earnings of graduates by class of degree. Graduates awarded an upper honours degree received mean annual earnings of £25,942 compared to £22,816 for those with a

lower class of degree, implying an upper honours premium of 14% relative to a lower degree class in the raw data. The premium for an upper honours degree relative to non-graduates is 20%, with a premium of just 6% for a lower degree class relative to no degree in the raw data. The distribution of degree classes among graduates in Next Steps is consistent with what we observe in administrative HESA records (see Figure 2) for academic year 2010/11 (the modal year of graduation for the 1990 birth cohort), with a slightly higher proportion of graduates with at least an upper second class degree in Next Steps (69%) compared with the HESA data (64%).

Table 5 reports estimated coefficients based on a modified version of regression equation [1] in which the default category remains non-graduates, but graduates are now separated into two groups - those awarded an upper honours degree and those awarded a lower class of degree:

$$w_i = \alpha + \beta_U E_{iU} + \beta_L E_{iL} + X_i' \beta_2 + \varepsilon_i \qquad [2]$$

where w_i represents the natural logarithm of gross annual earnings (of full-time workers) by age 26 years, as in equation [1]. X_i represents the same set of controls included in equation [1], but we now distinguish degree award level with the binary variables $E_{iU} = [1,0]$ (where 1 denotes graduates awarded upper honours, U) and $E_{iL} = [1,0]$ (where 1 represents those awarded lower degree classes, L). Relative to non-graduates, the earnings premium for those awarded upper honours (that is, $[W_U - W_N]/W_N$) is measured from the estimation of regression [2] as $[\exp(\hat{\beta}_U) - 1]$. Similarly, the earnings premium for those awarded a lower degree class relative to non-graduates, $[W_L - W_N]/W_N$, is measured by $[\exp(\hat{\beta}_L) - 1]$. We refer to these as the upper honours graduate earnings premium and the lower degree class graduate earnings premium, respectively. We will also report the earnings premium for upper honours relative to a lower degree class, $[W_U - W_L]/W_L$, calculated as $\left[\exp(\hat{\beta}_U) - \exp(\hat{\beta}_L)\right] / \exp(\hat{\beta}_L)$. Note that this is not simply the difference between $[\exp(\hat{\beta}_U) - 1]$ and $[\exp(\hat{\beta}_L) - 1]$, as the base is no longer the earnings of non-graduates, though the two calculations will produce very similar results for small values of $\hat{\beta}_L$.

From Model 1 in Table 5, we see that, relative to non-graduates, the estimated premium associated with an upper honours degree is 21% and that for a lower degree class is 5%. The upper honours premium relative to a lower degree class is 15%. Once we control for the full set of characteristics

included in our preferred specification - Model 8 - we estimate these premia for this 1990 birth cohort to be 14% (upper honours degree class relate to non-graduates), 3% (lower degree class relative to non-graduates) and 10% (upper honours relative to lower degree class), respectively.

The fall in the upper honours earnings premium (relative to a lower degree class) from 15% in model 1 to 10% in model 8 occurs predominantly due to controlling for household/family background and cognitive ability. In particular, this reduces the earnings premium associated with an upper honours award (relative to non-graduates), though it has little impact on the corresponding lower degree class premium. In section 2, we observed a similar pattern for the average graduate premium from the successive addition of controls in the Next Steps data. Our results here indicate that the findings in section 2 are being driven by the positive correlation between family background/cognitive ability, earnings and being awarded an upper honours degree. We note from this that there is substantial dispersion around the average graduate earnings premium of 10% reported in Section 2.1. Relative to non-graduates, those with an upper honours degree have earnings that are 14% higher, though the figure is just 3% (and not statistically significant) for those with a lower degree class. We now turn to the question of the extent to which these premia for the 1990 birth cohort differ from those of the 1970 cohort.

Table 5: The graduate premium by classification awarded based on earnings at age 25-26 in Next Steps (1990 birth cohort). The dependent variable is the log of (gross) annual earnings of full-time workers.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Estimated coefficient for upper honours	0.188*** (0.0209)	0.178*** (0.0199)	0.178*** (0.0193)	0.143*** (0.0187)	0.142*** (0.0190)	0.174*** (0.0193)	0.169*** (0.0196)	0.130*** (0.0207)
Implied upper honours premium (relative to non-graduates)	21%	19%	19%	15%	15%	19%	18%	14%
Estimated coefficient for lower degree class	0.0506* (0.0282)	0.0435 (0.0268)	0.0428 (0.0262)	0.0260 (0.0251)	0.0252 (0.0255)	0.0591** (0.0256)	0.0595** (0.0256)	0.0344 (0.0255)
Implied lower degree class premium (relative to non-graduates)	5%	4%	4%	3%	3%	6%	6%	3%
Implied upper honours premium (relative to lower degree class)	15%	14%	14%	12%	12%	12%	12%	10%
R-squared	0.0605	0.125	0.173	0.236	0.237	0.258	0.265	0.289
Sample size	1,733	1,733	1,733	1,733	1,733	1,733	1,733	1,733
Cohort member personal characteristics		x	x	x	x	x	x	x
Cohort member non-cognitive skills			x	x	x	x	x	x
Parental/Household background				x	x	x	x	x
Parental attitudes towards education					x	x	x	x
Job tenure						x	x	x
Cohort member health							x	x
Cognitive ability								x

3.2 PREMIA BY CLASS OF DEGREE FOR THE 1970 BIRTH COHORT: BCS70

We observed in Section 2.2 that mean net annual earnings in our sample of individuals in BCS70 are £12,660 for graduates and £10,580 for non-graduates, implying a graduate earnings premium of 20% in the raw data. Those with an upper honours degree report mean net annual earnings of £13,015, while the figure for graduates with a lower degree class is £12,301, implying an upper honours earnings premium of 6% relative to a lower degree class. Relative to non-graduates and based on the raw data, the upper honours graduate earnings premium is 23%, while the lower degree class graduate earnings premium is 16%.

We also noted in Section 2.2 that 20% of the BCS70 sample obtained a degree. Among these graduates, 7% were awarded a first class degree, 44% an upper second class degree and 49% a lower class degree. The Universities' Statistical Record for 1991 (the modal year for graduation for this birth cohort) reports that 9% of graduates were awarded a first class degree, 44% an upper second class degree and 47% a lower class degree in this year. Hence, the BCS sample appears to be representative by degree classification. We note that comparing the 1970 and 1990 birth cohorts, the share of graduates awarded an upper honours degree rose from 53% to 64%, with the share awarded a lower degree class falling from 47% to just 36%.

Table 6 reports results based on regression equation [2] using BCS70 data to replicate as closely as possible the analysis reported in Table 5 for the 1990 birth cohort. Based on Model 8, our preferred specification with controls for the full set of characteristics, we estimate the premia for this 1970 birth cohort to be 20% for an upper honours and 14% for a lower degree class (both relative to non-graduates) and hence derive an upper honours premium of 6% (relative to a lower class degree).

In contrast to Next Steps, we see here that the addition of household background has a similar impact on both the upper honours and lower degree class premiums (relative to non-graduates), with all other controls having minimal or no impact on the estimates. Hence, the upper honours premium relative to a lower degree class essentially does not change with the inclusion of relevant covariates. We note that there is much less dispersion around the average graduate earnings premium for this cohort compared to that for the later 1990 birth cohort.

Comparing the results from Next Steps with those of BCS70, we find that the premium for an upper honours relative to a lower degree class rose by 4 percentage points - from 6% to 10% - over the two decades between the two birth cohorts. Equivalently, the earnings ‘penalty’ associated with the award of a lower degree class relative to upper honours increased by 4 percentage points.

Table 6: The graduate premium by classification awarded based on earnings at age 26 in BCS70 (1970 birth cohort). The dependent variable is the log of (net) annual earnings of full-time workers.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Estimated coefficient for upper honours	0.218*** (0.0170)	0.217*** (0.0164)	0.211*** (0.0163)	0.179*** (0.0166)	0.177*** (0.0166)	0.190*** (0.0171)	0.189*** (0.0171)	0.182*** (0.0173)
Implied upper honours premium (relative to non-graduates)	24%	24%	23%	20%	19%	21%	21%	20%
Estimated coefficient for lower degree class	0.158*** (0.0171)	0.151*** (0.0164)	0.146*** (0.0164)	0.124*** (0.0165)	0.123*** (0.0165)	0.136*** (0.0171)	0.134*** (0.0171)	0.127*** (0.0172)
Implied lower degree class premium (relative to non-graduates)	17%	16%	16%	13%	13%	15%	14%	14%
Implied upper honours premium (relative to lower degree class)	6%	7%	7%	6%	6%	6%	6%	6%
R-squared	0.0568	0.140	0.152	0.200	0.202	0.208	0.211	0.214
Sample size	3,771	3,771	3,771	3,771	3,771	3,771	3,771	3,771
Cohort member personal characteristics		x	x	x	x	x	x	x
Cohort member non-cognitive skills			x	x	x	x	x	x
Parental/Household background				x	x	x	x	x
Parental attitudes towards education					x	x	x	x
Job tenure						x	x	x
Cohort member health							x	x
Cognitive ability								x

Summarising, those among the 1990 birth cohort graduating with a lower degree class have suffered relative to their counterparts in the 1970 birth cohort from the combination of two phenomena: (i) a

fall of 7 percentage points in the average graduate earnings premium (from 17% to 10%, as reported in Section 2.2) relative to the 1970 birth cohort, and (ii) the increased dispersion around the average implied by the rise of 4 percentage points in the upper honours premium relative to a lower degree class. The magnitude of this combined impact is witnessed in the premium for a lower class of degree, relative to non-graduates, falling by a precipitous 11 percentage points, from 14% to 3%.

We have shown in Section 2 that the average graduate earnings premium is falling only among those born in or close to 1990. We now turn to the question of the timing of the increased dispersion around the average by broad class of degree.

3.3 THE TIMING OF CHANGES IN PREMIA BY BROAD CLASS OF DEGREE: LDLHE DATA

Using gross hourly pay in the 1990 GCS of graduates for a cohort born close to 1970, Naylor *et al.* (2016) estimate that the premium for an upper honours degree relative to a lower degree class was 8%-9% for graduates by ages 26-28, which is similar to our findings based on BCS70 (Table 6).[10] Additionally, they find tentative evidence (due to the small sample sizes) from the LFS that the premium was 12% for those aged 28-31 who were born in the early 1980s.[11] Collectively, these results indicate that the premium for an upper honours degree relative to a lower degree class increased over time among those born between 1970 and 1982. Here, we extend that analysis by estimating the magnitude of the upper honours premium relative to a lower degree class for a series of cohorts born after 1980.

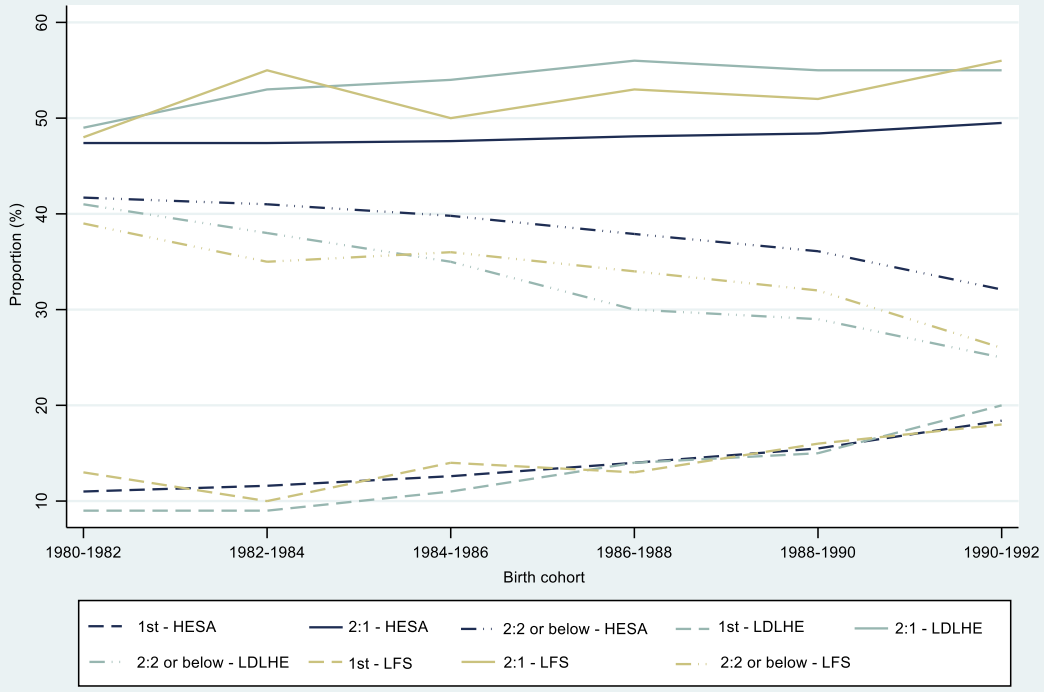
To investigate the further evolution of earnings premia by broad class of degree, we utilise two datasets – linked LDLHE-HESA data and the 2006-2018 LFS (discussed in section 2) – to examine changes in the premium for those born within the period 1980-1993. LDLHE refers to a bi-annual survey run by HESA for graduating cohorts between 2002/03 and 2012/13. Originally, HESA managed the Destinations of Leavers from Higher Education (DLHE) survey, which captured data on outcomes six months after graduation. As this was recognised to be a very early career point, graduates of the 2002/03 academic year were selected as the initial cohort to take part in LDLHE, which surveyed respondents who had participated in DLHE forty-two months after course completion. The final cohort to participate in LDLHE were qualifiers in 2012/13, leading to a total of six collections. Alongside the large sample size, a key advantage of the LDLHE survey is that it can

[10] This finding appears robust to the inclusion of a wider set of controls.
[11] The limitations of the LFS meant only a few controls could be included in the OLS models employed to estimate the premium.

be linked to administrative records held by HESA, which provide data on the class of degree awarded. In contrast to the cohort studies and LFS data, the degree classification awarded to the graduate is supplied directly by the university to HESA. To ensure greater comparability with LFS and the birth cohort studies, we restrict our sample of interest to those aged 18 or 19 on entry to higher education and who subsequently graduated within three to four years of beginning their full-time first degree course. Consequently, they will have been aged 25 or 26 at the time the LDLHE survey was administered.[12]

Figure 3 compares the distribution by degree class for LDLHE and LFS with the appropriate year(s) of graduation from the HESA data. We see there is generally good alignment between the sample and population distributions by class of award, with the main difference being that both surveys appear to capture a slightly higher proportion of graduates with an upper second class degree (as we also observe in Next Steps).

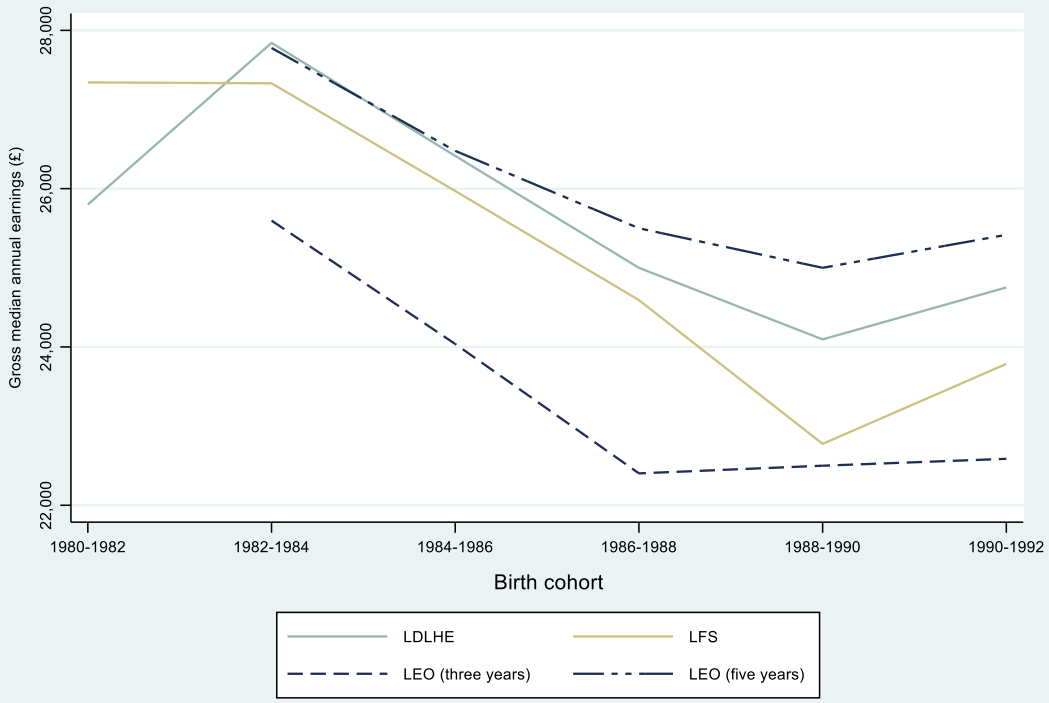
Figure 3 - The proportion of classified degrees by separate class of award in HESA, LDLHE and LFS



[12] We also remove those who obtained another first degree or a postgraduate qualification from our sample.

With regards to the real median annual earnings of graduates in the two datasets, Figure 4[13] displays the trend over time, alongside that observed in LEO data. Our rationale for including LEO analysis in this figure is to explore the similarities between the administrative and survey (self-reported) data, thus enabling us to comment on potential measurement error in the earnings information within LDLHE and LFS. We see in Figure 4 that LEO (five years after graduation), LDLHE and LFS all exhibit the same pattern, with real earnings falling among those born between 1982 and 1990, after which we observe an indication of recovery. The trajectory of earnings in LEO (three years after graduation) is slightly different, with a very modest rise in earnings evident for those born after 1988. We note that earnings in LDLHE (gathered 42 months after one qualifies) are higher than in LEO (three years after graduation) throughout the timeframe considered. This is despite changes in the way graduates were questioned about their earnings in LDLHE over the six collections. In earlier years, graduates were requested to provide their gross annual earnings, whereas in the last two LDLHE surveys, they were asked to supply their earnings and the period for which the figure referred to. One of the possible reasons for the higher earnings reported in LDLHE could be the fact that LEO cannot differentiate between full and part-time workers.

Figure 4 - Gross real median annual earnings of (full-time employed) graduates



[13] Published LEO figures refer to median earnings only, which is the reason behind why we cannot utilise the mean in this instance.

For both LDLHE and LFS, we regress the log of gross annual earnings of graduates on a dummy variable for whether the graduate was awarded upper honours or a lower degree class. This is a variant of equation [1] in which $E_i = [1, 0]$ (where 1 denotes an upper honours and 0 represents a lower degree class, respectively). As our objective is to examine whether there was any change in the premium among those born between 1980 and 1992, we add a set of five birth cohort dummies[14] as well as a corresponding set of dummies formed by interacting birth cohort and degree award. Given the absence of a rich set of controls in LFS, we do not include any further covariates in our model.[15] Results are provided in Table 7.

In LDLHE, the interactive dummies are all significant at the 1% level. We see that, relative to the default case of a graduate born in the period 1980-82 and awarded a lower degree class, a graduate of this same cohort but awarded upper honours would have enjoyed an earnings premium of 12%, which is in line with estimates presented by Naylor *et al.* (2016). For the 1982-84 cohort, this premium rises to 16%. The key finding is that the premium is remarkably constant thereafter (i.e. for graduates born in the interval 1982-1992). Therefore, we find no evidence of a change in the premium for the award of an upper honours over a lower class of degree for those born after 1982 and thus conclude that the increase in this premium occurred solely in the earlier period - that is for those born between 1970 and 1982. Based on LFS, we find no evidence of a statistically significant change over the period (1980-1993 born), including for those born in the very early 1980s, though this is based on far smaller sample sizes, resulting in the estimates being less precise. In Model 1 of Table 5 based on Next Steps, we report the upper honours premium relative to a lower degree class to be 15%, which is very similar to the premium we find in LDLHE for a corresponding birth cohort. This also adds further reassurance around the degree classification data reported in Next Steps, which is self-reported by the individual (rather than supplied by the university).

[14] In LFS, the final of the six birth cohorts covered the years 1990-1993. We use 1980-1982 as our reference category in our econometric analysis.
[15] Sex, ethnicity, disability and job tenure are available in both LDLHE and LFS. Their inclusion leads to little change in the results.

Table 7: The premium for an upper honours award relative to a lower honours award based on earnings at age 25-26 in LDLHE and LFS. The dependent variable is the log of (gross) annual earnings of full-time workers.

	LDLHE		LFS	
	Estimated coefficient	**Implied Premium**	**Estimated coefficient**	**Implied Premium**
Upper honours	0.109*** (0.0103)	12%	0.0992*** (0.0285)	10%
Upper honours*Birth cohort 1982-1984	0.0387*** (0.0130)	16%	-0.0369 (0.0417)	6%
Upper honours*Birth cohort 1984-1986	0.0455*** (0.0130)	17%	-0.0561 (0.0434)	4%
Upper honours*Birth cohort 1986-1988	0.0444*** (0.0123)	17%	0.0283 (0.0438)	14%
Upper honours*Birth cohort 1988-1990	0.0507*** (0.0120)	17%	0.0567 (0.0438)	17%
Upper honours*Birth cohort 1990-1992	0.0517*** (0.0117)	17%	0.0250 (0.0400)	13%
R-squared	0.0556		0.0594	
Sample size	59,830		2,997	

We conclude that while evidence provided in this paper and in previous research demonstrates that the average graduate earnings premium was broadly constant for most birth cohorts from 1970, falling only for cohorts in the period 1989-93, the increase in the premium associated with the award of upper honours relative to a lower degree class occurred primarily for the earlier birth cohorts – those of 1970-1982. We now address the question of why dispersion by degree class around the average graduate premium might have risen only for the earlier cohorts.

We consider two influences on the upper honours-lower degree class premium: (i) the rising participation of young people in higher education and (ii) the increase over time in the proportion of graduates awarded an upper honours degree. Within a signalling framework, the rise in higher education participation, *ceteris paribus*, will raise the upper honours-lower degree class premium

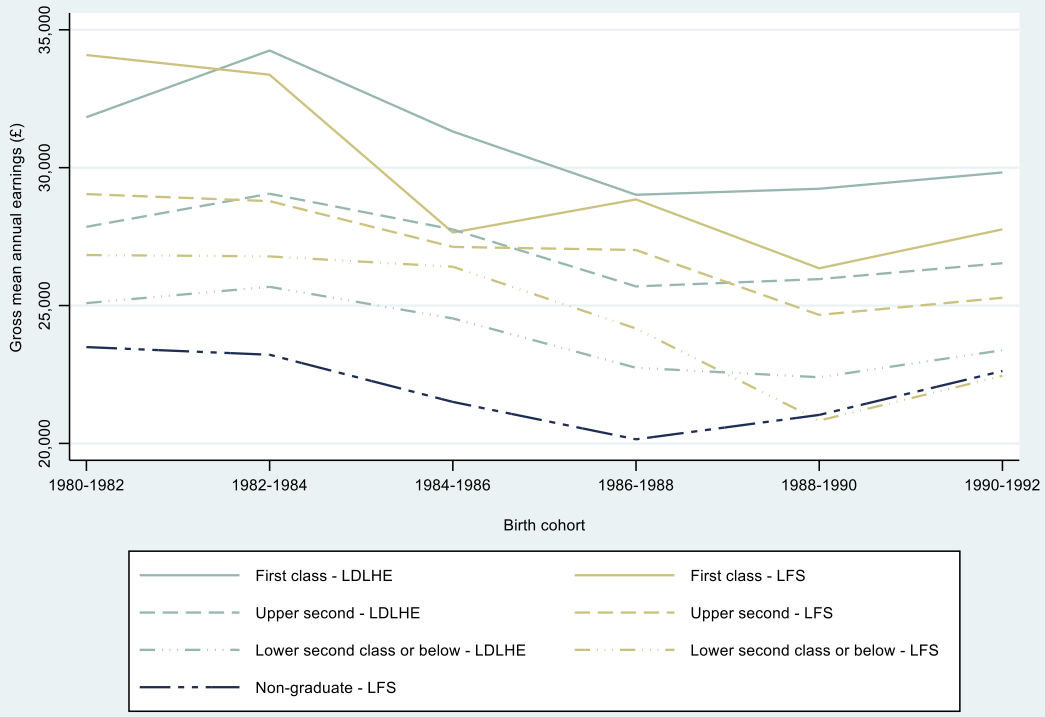
[Ireland *et al.* (2009)], the intuition being that the value of the upper honours is greater with a higher proportion of graduates within a cohort. As higher education participation increased most rapidly among the earlier cohorts, this is consistent with these cohorts experiencing the widening dispersion in graduate earnings by degree class. The evidence of Figure 2 shows that the relative increase in the share of upper honours awarded occurred more rapidly among the later cohorts. This phenomenon would be expected to lower the premium for an upper honours relative to a lower degree class and was thus acting to offset any impact of increased participation for the later (but not for the earlier) cohorts, consistent with the evidence.

Finally, consider the lower degree class premium relative to non-graduates. This premium would have been impacted adversely both by the rising higher education participation rate and the increasing proportion of graduates with an upper honours degree. The rise in participation is associated both with a fall in the average graduate earnings premium and with an increase in the premium for an upper honours relative to a lower degree class, which results from the greater value of the upper honours signal or, equivalently, the deeper scarring of those with a lower degree class. These two effects were combining in the earlier period of rapid growth in participation (primarily affecting birth cohorts of the early 1970s) to reduce the lower degree class premium relative to non-graduates. In the later periods, higher education participation continued to grow, albeit at a slower rate, and hence there would have been ongoing downward pressure on the lower degree class premium relative to non-graduates. In addition to this, the later period was characterised by a decreasing proportion of graduates being awarded lower degree classes: this would have generated a second scarring effect on graduates awarded a lower degree class and hence exerted further downward pressure on the lower degree class premium relative to non-graduates in the later birth cohorts.

3.4 EARNINGS PREMIA BY SEPARATE CLASS OF DEGREE AWARDED

As noted previously, the growth in the proportion of upper honours awards over the past two decades has not occurred evenly, with the increase particularly driven by the rise in the percentage of first class awards. Hence, in estimating premia by separate degree class in this section of the paper, we restrict our LDLHE/LFS samples to graduates and distinguish between those with a first class honours, upper second class honours and lower second class degree or below.

Figure 5 - Gross real mean annual earnings of (full-time employed) graduates by separate class of award



When considering the (real) mean earnings of graduates by degree class in LDLHE (Figure 5), we note that the trend in earnings over time is very similar for each of the three degree classes considered, though between the 1980-1982 and 1982-1984 birth cohorts, those with a lower second class award experience a lower increase in their earnings compared with those with a first or upper second class degree. Indeed, we find that the raw premium for an upper second compared to a lower degree class rose from 11% to around 13% among those born in this period, with constancy usually observed thereafter. Meanwhile, the raw premium for a first relative to an upper second generally remains steady throughout and is found to be in the region of 13-14% for those born in the early 1980s and 1990s. A different pattern is observed within the LFS data, although this might be because of a much smaller sample size. The extent of the fluctuations in earnings of graduates with first class degree awards is greater, with the earnings of those with upper second class awards falling continuously for those born between 1980 and 1990. Graduates with lower degree classes born between 1980 and 1986 display near equivalent mean earnings, though a sharp fall is then evident for those born in the latter half of the decade.

Table 8: The premium for a first and upper second class degree based on earnings at age 25-26 in LDLHE and LFS. The dependent variable is the log of (gross) annual earnings of full-time workers.

	LDLHE		LFS	
	Estimated coefficient	**Implied Premium**	**Estimated coefficient**	**Implied Premium**
First class (relative to upper second)	0.118*** (0.0191)	13%	0.103** (0.0437)	11%
First class*Birth cohort 1982-1984	0.0199 (0.0225)	15%	-0.00338 (0.0658)	10%
First class*Birth cohort 1984-1986	0.0133 (0.0217)	14%	-0.0593 (0.0643)	4%
First class*Birth cohort 1986-1988	0.00962 (0.0209)	14%	-0.0258 (0.0644)	8%
First class*Birth cohort 1988-1990	0.00923 (0.0205)	14%	-0.0191 (0.0623)	9%
First class*Birth cohort 1990-1992	0.00336 (0.0200)	13%	0.000900 (0.0549)	11%
Upper second (relative to lower honours)	0.0935*** (0.0105)	10%	0.0772*** (0.0299)	8%
Upper second*Birth cohort 1982-1984	0.0299** (0.0133)	13%	-0.0309 (0.0433)	5%
Upper second*Birth cohort 1984-1986	0.0329** (0.0133)	13%	-0.0439 (0.0455)	3%
Upper second*Birth cohort 1986-1988	0.0311** (0.0126)	13%	0.0337 (0.0457)	12%
Upper second*Birth cohort 1988-1990	0.0365*** (0.0123)	14%	0.0587 (0.0459)	15%
Upper second*Birth cohort 1990-1992	0.0339*** (0.0120)	14%	0.0216 (0.0417)	10%
R-squared	0.0754		0.0678	
Sample size	59,830		2,997	

We adopt a slightly modified approach to that used in the previous section (3.3). While those with a lower degree class remain the reference category, we separate those with a first from graduates with an upper second. The two group categories are then interacted with the five birth cohort dummies.

We see from Table 8 that none of the interaction terms is significant in the LFS data, but this might be due to the relatively small sample size. Focusing on LDLHE, while the interaction terms involving a first class degree are insignificant, the interaction terms with the upper second class dummy are all significant at the 1% or 5% level. Indeed, there appears to have been an increase in the premium for an upper second relative to a lower degree class between the 1980 and 1982 birth cohorts, before stabilising thereafter. Consequently, the rise in the premium observed in section 3.3 (Table 7) for the broader upper honours degree class seems to have been predominantly the result of the rising premium for an upper second relative to a lower degree class.

We view this evidence as consistent with a labour market signalling interpretation in which the rapid growth in higher education participation among cohorts born in the 1970s led to an increase in the value attached to graduating with a minimum of an upper second class degree. Those with lower degree classes were increasingly scarred. This interpretation is supported by evidence that the response of employers to the rising number of graduates entering the workforce was to increasingly filter out applicants who graduated with less than an upper second [see, for example, ISE (2010)]): though there is no evidence of any widespread tendency for employers to stipulate the award of first class honours in their recruitment criteria.

4. CONCLUSIONS AND FURTHER REMARKS

Exploiting data from Next Steps, we have estimated the average graduate earnings premium relative to non-graduates by age 26 for a cohort of young people born in 1990 to be 10%. From BCS70 data for a 1970 birth cohort, we estimate the equivalent graduate earnings premium to have been 17%, from which we conclude that the graduate earnings premium fell by around 7 percentage points across these two birth cohorts. Complementary analysis based on LFS data corroborates this finding of a fall in the graduate earnings premium. We also show evidence that the decline in the premium impacted only on those born close to 1990: specifically, on those born over the period 1988-93. That the decline is restricted to these later-born cohorts explains why it has tended not to be detected in previous research. Our evidence suggests that the previously puzzling constancy of the graduate earnings premium over a long period of rising higher education participation may no longer hold, with the increasing relative supply of graduates within the labour market finally producing a decline in the average earnings of graduates relative to non-graduates.

We have also estimated the extent of dispersion around the average graduate earnings premium by broad class of degree awarded, distinguishing between upper honours and lower degree classes. From Next Steps, we estimate the premium for an upper honours over a lower degree class to be 10% by age 26 for those born in 1990: this is 4 percentage points higher than the equivalent premium of 6% for those born in 1970, based on BCS70 data. From analysis of LDLHE, we conclude that this increase in the earnings premium for an upper honours over a lower degree class is associated with those born between 1970 and 1982: there was no increase in the premium for those born during the period 1982 to 1992. We interpret the rise in this premium for the earlier birth cohorts as attributable at least in part to the rapid growth among early 1970s birth cohorts in the higher education participation rate. In a labour market signalling framework [Ireland *et al*. (2009)], this will have increased the value of the signal associated with being a more highly-ranked graduate: intuitively, when there are more graduates, it is more important to 'stand out from the crowd'. Equivalently, the scarring associated with the award of lower degree classes deepens with the rising higher education participation rate. We find that the earnings premium for an upper honours over lower degree classes did not continue to rise for birth cohorts over the period 1982-1992 despite continued, albeit slower, growth in the participation rate. We suggest that this is consistent with the fact that for these later birth cohorts, there was an acceleration in the share of graduates awarded upper honours, which would have tended to exert downward pressure on the upper honours-lower degree class premium, *ceteris paribus*.

The combination of the decline in the average graduate earnings premium together with the increased premium for an upper honours relative to a lower degree class across the 1970 and 1990 birth cohorts has necessarily resulted in a fall in the earnings premium for those awarded a lower degree class relative to non-graduates. Our estimates imply a fall in this premium of 11 percentage points, from 14% for the 1970 birth cohort to just 3% for those born in 1990. The magnitude of the fall in the earnings premium associated with the award of a lower degree class (relative to non-graduates) is likely to reflect two sources of labour market scarring, arising from (i) the impact of the growth in higher education participation among those born in the early 1970s, which would have contributed to the increased premium for an upper honours relative to a lower degree class and (ii) the increase in the share of graduates awarded upper honours degrees, occurring more rapidly among those born in the 1980s, which would have further scarred the diminishing number of those graduates awarded a lower degree class.

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SUPPLEMENTARY MATERIAL A: DETAILED DESCRIPTIONS OF DATASETS AND SAMPLE SELECTIONS

DEFINITION OF GRADUATES AND NON-GRADUATES

Throughout, we classify graduates as those individuals whose highest level of qualification is a first degree. Individuals with higher education qualifications below degree level are excluded. Furthermore, those with a postgraduate degree are not included within this group or indeed any aspect of our analysis. The rationale behind this is that given we are utilising earnings at age 26, postgraduates are likely to have spent very little time in the labour market, hence their earnings data are likely to be noisy.

Non-graduates are defined as those for whom the highest level of qualification obtained was either A levels or GCSEs. Those who held qualifications equivalent to either A levels or GCSEs were also included as part of this group.

In Next Steps, cohort members were asked whether they were in higher education during sweeps 6 and 7. They were then additionally requested to report whether they had ever been to university in sweep 8. We therefore assume that those who state they have been in higher education, but who are recorded with a highest academic qualification of A-level, GCSE (or equivalent) are drop-outs from university. These individuals are omitted from our analysis.

In BCS and LFS, we are unable to identify drop-outs from university among our non-graduate sample.

CLEANING OF EARNINGS DATA

Next Steps

Our focus is limited to the earnings of full-time workers (defined in the dataset as those working more than 30 hours per week). The supplied gross weekly earnings variable was converted into an annual figure by multiplying by 52. Those reporting a yearly sum that was below the minimum wage were removed from the analysis, amounting to 2% of the sample. The top 2% of earners were also subsequently excluded. Please note that we do not convert earnings in this dataset from a nominal to a real value, given we use 2015 as a base year (and 2015/16 being the period in which sweep 8 was administered).

BCS70

We are initially provided with a corrected net weekly earnings variable, which we transformed into an annualised figure by multiplying by 52 for those in employment for at least 30 hours per week. With no minimum wage in place during 1996, we trim the top and bottom 1% of earnings to remove outliers. We use nominal earnings throughout.

LFS

For the 1995-1997 LFS dataset, we multiply the (wave 5) gross weekly earnings variable by 52 for full-time workers, after which we trim the top and bottom 1% of earnings, given the absence of a minimum wage during this period. Earnings in this period are examined in nominal terms.

Within our 2006-2018 dataset (which is also used to form the 2014-2017 LFS subset in Table 3), we firstly convert the gross weekly earnings variable for full-time workers surveyed in wave 1 into an annualised figure by multiplying by 52. In each LFS year, we then exclude those earning below the minimum wage (based on a 30 hour week), followed by removing the top 1% of earners. We then transform earnings from a nominal to a real value using the Consumer Prices Index including owner occupiers housing costs, with 2015 chosen as the base year.[16]

LDLHE

For each of the six cohorts, we focus on the annual earnings of UK domiciled full-time workers employed in the UK and begin by removing all those found to be earning less than the minimum wage (based on a 30 hour week). For the first three cohorts (representing those born between 1980 and 1986), we subsequently remove the top 1% of earners. For the final three cohorts (covering those born between 1986 and 1992), we exclude the top 2% of earners, given a more extreme set of earnings at the top end. Earnings are then transformed from a nominal to a real value using the same approach as described above.[17]

[16] https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l522/mm23

[17] Please note that we clean the earnings variable in LDLHE prior to removing duplicates (resulting from some individuals studying multiple subjects in higher education). Cleaning after removing the duplicates does not change our results reported in tables 7 and 8 (the cut-off points at the top end of the distribution differ by only £2,000 at most and would lead to a change in the sample size of 40). The HESA rounding methodology is applied throughout this paper. See https://www.hesa.ac.uk/about/regulation/data-protection/rounding-and-suppression-anonymise-statistics for further details.

LEO

This data has been sourced directly from the Department for Education and relates to UK domiciled first degree graduates from English higher education providers. We have converted earnings from nominal to real values using the same method as we adopt for LFS and LDLHE. Please note that while earnings data from Department for Education (2016) are for those in paid employment only, the figures from Department for Education (2021) will also take into consideration any earnings from self-employment. However, as the paper by the Department for Education (2017) illustrates, the inclusion of the self-employed appears to have little impact on median earnings.

SUPPLEMENTARY MATERIAL B: PROPORTION OF GRADUATES IN THE POPULATION

Table A1: Proportion of graduates in the population [sourced from ONS (2013)]

Quarter and year	Proportion (%)
Q2 1992	17
Q3 1992	18
Q4 1992	18
Q1 1993	18
Q2 1993	19
Q3 1993	19
Q4 1993	19
Q1 1994	19
Q2 1994	20
Q3 1994	20
Q4 1994	20
Q1 1995	20
Q2 1995	20
Q3 1995	20
Q4 1995	21
Q1 1996	20
Q2 1996	20
Q3 1996	21
Q4 1996	20
Q1 1997	21
Q2 1997	21
Q3 1997	21
Q4 1997	21
Q1 1998	22
Q2 1998	22
Q3 1998	22
Q4 1998	23
Q1 1999	23
Q2 1999	23
Q3 1999	23
Q4 1999	24
Q1 2000	24
Q2 2000	24
Q3 2000	24
Q4 2000	25
Q1 2001	25
Q2 2001	25
Q3 2001	25

Q4 2001	25
Q1 2002	25
Q2 2002	25
Q3 2002	25
Q4 2002	26
Q1 2003	26
Q2 2003	26
Q3 2003	27
Q4 2003	27
Q1 2004	27
Q2 2004	28
Q3 2004	28
Q4 2004	28
Q1 2005	28
Q2 2005	28
Q3 2005	28
Q4 2005	28
Q1 2006	29
Q2 2006	29
Q3 2006	29
Q4 2006	30
Q1 2007	30
Q2 2007	30
Q3 2007	31
Q4 2007	31
Q1 2008	31
Q2 2008	31
Q3 2008	31
Q4 2008	31
Q1 2009	31
Q2 2009	32
Q3 2009	32
Q4 2009	33
Q1 2010	33
Q2 2010	34
Q3 2010	34
Q4 2010	34
Q1 2011	34
Q2 2011	35
Q3 2011	35
Q4 2011	36
Q1 2012	36
Q2 2012	37
Q3 2012	37

Q4 2012	37
Q1 2013	37
Q2 2013	38

SUPPLEMENTARY MATERIAL C: DISTRIBUTION OF DEGREE CLASSES

Table A2: The proportion of first degree qualifications by classification awarded based on HESA data

Academic year	First class degree (%)	Upper second class degree (%)	Lower second class degree or below (%)
1996/97	7.7	44.5	47.9
1997/98	8.2	45.5	46.4
1998/99	8.4	45.5	46.0
1999/00	8.9	46.3	44.9
2000/01	9.5	46.7	43.8
2001/02	10.4	47.7	41.8
2002/03	11.0	47.4	41.7
2003/04	11.2	47.5	41.3
2004/05	11.6	47.4	41.0
2005/06	12.0	47.5	40.5
2006/07	12.6	47.6	39.8
2007/08	13.3	48.1	38.6
2008/09	14.0	48.1	37.9
2009/10	14.4	48.2	37.4
2010/11	15.5	48.4	36.1
2011/12	16.9	49.0	34.1
2012/13	18.4	49.5	32.1
2013/14	20.1	50.1	29.8
2014/15	22.0	49.5	28.5
2015/16	23.6	49.6	26.8
2016/17	25.8	49.1	25.1
2017/18	27.8	48.5	23.7

SUPPLEMENTARY MATERIAL D: DESCRIPTIVE STATISTICS

BCS70

Table A3: Summary statistics for earnings of BCS70 sample (£)

	Median	Mean	Sample size
Graduate	11,865	12,660	765
First or upper second class degree	12,009	13,015	385
First class degree	14,291	14,462	51
Upper second class degree	12,009	12,794	334
Lower second class degree or below	11,577	12,301	380
Non-graduate	9,880	10,580	3,006

LFS 1995-1997

Table A4: Summary statistics for earnings of LFS sample 1995-1997 (£)

	Median	Mean	Sample size
Graduate	15,600	16,710	796
Non-graduate	12,012	13,099	1,393

NEXT STEPS

Table A5: Summary statistics for earnings of Next Steps sample (£)

	Median	Mean	Sample size
Graduate	24,000	24,977	903
First or upper second class degree	25,000	25,942	618
First class degree	26,000	27,398	150
Upper second class degree	24,379	25,453	468
Lower second class degree or below	21,500	22,816	285
Non-graduate	19,760	21,592	830

LDLHE

Table A6: The proportion of first degree qualifications by classification awarded in the LDLHE sample

Birth cohort	First class degree (%)	Upper second class degree (%)	Lower second class degree or below (%)	Sample size
1980-1982	9	49	41	3,830
1982-1984	9	53	38	6,920
1984-1986	11	54	35	7,655
1986-1988	14	56	30	10,760
1988-1990	15	55	29	13,135
1990-1992	20	55	25	17,530

Table A7: Summary statistics for earnings of entire LDLHE sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	25,799	27,088	3,830
1982-1984	27,842	28,266	6,920
1984-1986	26,414	27,040	7,655
1986-1988	25,000	25,284	10,760
1988-1990	24,096	25,414	13,135
1990-1992	24,752	26,407	17,530

Table A8: Summary statistics for earnings of first or upper second class degree graduates in LDLHE sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	27,027	28,488	2,300
1982-1984	29,002	29,825	4,625
1984-1986	27,747	28,385	5,420
1986-1988	26,042	26,364	7,760
1988-1990	25,100	26,668	9,690
1990-1992	25,743	27,419	13,515

Table A9: Summary statistics for earnings of first class degree graduates in LDLHE sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	30,713	31,829	300
1982-1984	32,483	34,249	810
1984-1986	29,967	31,314	1,155
1986-1988	27,604	29,018	1,750
1988-1990	28,112	29,235	2,255
1990-1992	27,723	29,827	3,710

Table A10: Summary statistics for earnings of upper second class degree graduates in LDLHE sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	26,536	27,855	2,000
1982-1984	27,958	29,056	3,810
1984-1986	26,637	27,760	4,265
1986-1988	25,000	25,694	6,010
1988-1990	25,100	25,959	7,435
1990-1992	24,752	26,537	9,805

Table A11: Summary statistics for earnings of lower second class degree or below graduates in LDLHE sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	24,570	25,089	1,530
1982-1984	24,942	25,680	2,300
1984-1986	23,307	24,534	2,235
1986-1988	21,875	22,743	3,000
1988-1990	21,084	22,400	3,450
1990-1992	22,178	23,381	4,015

LFS 2006-2018

Table A12: The proportion of first degree qualifications by classification awarded in the LFS between 2006 and 2018

Birth cohort	First class degree (%)	Upper second class degree (%)	Lower second class degree or below (%)	Sample size
1980-1982	13	48	39	537
1982-1984	10	55	35	495
1984-1986	14	50	36	423
1986-1988	13	53	34	421
1988-1990	16	52	32	431
1990-1993	18	56	26	690

Table A13: Summary statistics for earnings of all graduates in LFS sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	27,342	28,881	537
1982-1984	27,331	28,555	495
1984-1986	25,971	26,948	423
1986-1988	24,592	26,283	421
1988-1990	22,776	23,711	431
1990-1993	23,786	24,974	690

Table A14: Summary statistics for earnings of first or upper second class degree graduates in LFS sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	29,402	30,160	325
1982-1984	27,870	29,508	320
1984-1986	26,722	27,245	271
1986-1988	25,470	27,372	277
1988-1990	24,596	25,050	291
1990-1993	24,764	25,887	511

Table A15: Summary statistics for earnings of first class degree graduates in LFS sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	32,899	34,085	69
1982-1984	29,461	33,372	51
1984-1986	27,778	27,649	60
1986-1988	26,054	28,849	59
1988-1990	26,104	26,351	69
1990-1993	25,951	27,765	124

Table A16: Summary statistics for earnings of upper second class degree graduates in LFS sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	27,661	29,043	256
1982-1984	27,331	28,787	269
1984-1986	26,167	27,127	211
1986-1988	25,025	27,014	218
1988-1990	24,024	24,661	222
1990-1993	24,143	25,283	387

Table A17: Summary statistics for earnings of lower second class degree or below graduates in LFS sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	24,722	26,832	212
1982-1984	26,148	26,783	175
1984-1986	24,556	26,408	152
1986-1988	22,479	24,166	144
1988-1990	20,644	20,829	140
1990-1993	21,332	22,451	179

Table A18: Summary statistics for earnings of non-graduates in LFS sample (£)

Birth cohort	Median	Mean	Sample size
1980-1982	21,037	23,494	368
1982-1984	21,234	23,217	319
1984-1986	19,969	21,506	313
1986-1988	18,742	20,149	310
1988-1990	19,188	21,034	259
1990-1993	20,751	22,625	392

LEO

Table A19: Real median earnings of first degree graduates based on Longitudinal Education Outcomes data (£) [sourced from Department for Education (2016) and *Department for Education (2021)]*

Graduate cohort	3 years after graduation (tax year)	Real median earnings	5 years after graduation (tax year)	Real median earnings
2004/05	2008/09	25,597	2010/11	27,778
2006/07	2010/11	24,038	2012/13	26,477
2008/09	2012/13	22,403	2014/15	25,500
2010/11	2014/15	22,500	2016/17	*25,000*
2012/13	2016/17	*22,587*	2018/19	*25,417*

SUPPLEMENTARY MATERIAL E: DISCUSSION OF THE CONTROLS UTILISED IN THE NEXT STEPS AND BCS70 DATASETS FOR THE PURPOSES OF ESTIMATING EARNINGS PREMIA.

In creating the OLS regression models using the Next Steps and BCS70 data sources, we have tried to ensure the controls included are as similar as possible. Here, we supply more detail on the nature of the covariates relied upon in conducting our analysis. To maintain sample size, missing information dummies were used where appropriate.

COHORT MEMBER PERSONAL CHARACTERISTICS

Sex: In both Next Steps and BCS70, this information on the cohort member is taken from the age 25-26 survey.

Ethnicity: In Next Steps, we rely upon data collected from the cohort member at age 25-26. For BCS70, the ethnicity of the cohort member is gathered from the parent interview that takes place at age 10.

Special Education Needs (SEN): In Next Steps, the main parent is asked whether the child has been identified as having SEN at age 13-14. In BCS70, the teacher interview at age 10 covers whether the child attends a special school. These types of schools cater specifically for those with SEN.

School type: The Next Steps dataset provides a derived variable indicating whether the cohort member attended an independent school at age 13-14. In BCS70, the interview with the Head of the School at age 10 is used to ascertain the type of school the cohort member attended.

COHORT MEMBER NON-COGNITIVE SKILLS

School attitudes: In Next Steps, the cohort member is asked a series of questions relating to their views on school at age 13-14. We use these responses to form a continuous variable (mean) on their school attitudes that ranges from 1 to 4, with a higher score indicating more positive attitudes. In BCS70, we use two (Carolac) questions on schooling asked to the pupil at age 10. These relate

to whether they feel sad when it is time to leave school and if they believe studying for tests is a waste of time.[18]

Locus of control: At age 25-26 in Next Steps, the cohort member is asked a series of questions relating to this non-cognitive skill. We take their responses to four questions to form a continuous variable (mean) that ranges from 1 to 4. A larger value indicates higher internal locus of control. At age 26 in BCS70, cohort members are asked if they feel they have free choice/control over their life, which we use to proxy their locus of control.

Risk-seeking behaviour: At age 25-26 in Next Steps, individuals are asked how willing they are to take risks on a scale of 0-10. We use this information to form a categorical variable containing three groups. In BCS70, as no comparable variable exists, we use smoking behaviour at age 10 to proxy for risky behaviour.

Patience: At age 25-26 in Next Steps, individuals are asked to rate their patience on a scale of 0-10. We use this information to form a categorical variable containing three groups. In BCS70, the mother is asked when the child is age 10 to rate on a scale of 0-100 the extent to which the child's requests must be met immediately. This is also used to form a categorical variable consisting of three groups.

PARENTAL/HOUSEHOLD BACKGROUND

Parental education: When the child is age 13-14 in Next Steps, the main parent[19] is asked to supply information on their highest educational qualification. In BCS70, mothers are asked in the parental interview at age 10 to discuss their qualifications.

Parental occupation: At age 13-14 in Next Steps, the main parent provides detail on their occupation. We rely upon a derived NSSEC indicator in our model. In BCS70, we use mother occupation information captured when the cohort member is age 10.

[18] While there are differences in the age at which we have been able to capture non-cognitive skills in BCS and Next Steps (as well as there being discrepancies in how we are able to proxy for a particular type of skill), we note that the inclusion of non-cognitive skills has a very small influence on the coefficients of interest.
[19] This main parent is defined as being the individual most involved with the education of the cohort member. Analysis of Next Steps indicates that this tends to be the mother.

Family income: At age 13-14 in Next Steps, we utilise a derived variable illustrating the gross household income. For BCS70, we rely on gross weekly family income at age 10.

Household tenure: This is captured from household members when the cohort member is age 13-14 in Next Steps. In BCS70, this information is provided by the parent when the child is age 10.

Household type: This information is obtained through the parent in both surveys (age 10 in BCS70 and age 13-14 in Next Steps). It indicates whether the cohort member is part of a single parent household.

Age of parent: This data was provided by the parent in both surveys. It was obtained in the birth survey in BCS70, whereas it was gathered when the cohort member was age 13-14 in Next Steps.

Siblings: A variable indicating the number of siblings at age 13-14 in the household was used in Next Steps. In BCS70, the number of children in the household at age 10 was utilised (as reported by the parent).

Region of residence: In Next Steps, region was collected when the child was age 14-15, whereas in BCS70, this information was picked up at age 10.

PARENTAL ATTITUDES TOWARDS EDUCATION

Parental attitudes towards education: In Next Steps, the main parent is asked questions relating to their views on education. We include two variables in our final model. The first one relates to how involved the main parent is in the school life of the child. Meanwhile, the second variable assesses the parent's opinion on whether leaving school at 16 limits future career opportunities. In BCS70, the teacher is asked when the child is age 10 to provide their view on whether the mother shows an interest in their child's education.

JOB TENURE

Job tenure: Both Next Steps and BCS70 contain variables that inform one of the length of time the cohort member has spent in their current job. In Next Steps, we are told when the individual started their current job. As the majority of respondents completed the survey in late 2015 or during 2016,

we proxy work tenure by subtracting the year they started their job from 2016. Meanwhile, in BCS70, a variable is readily available on length of service.

COHORT MEMBER HEALTH

Weight/BMI: Both Next Steps and BCS ask individuals during the age 25-26 survey to give their perception on their weight.

Disability: In Next Steps, a derived variable at age 25-26 is available on whether the cohort member is disabled according to the Equality Act 2010 definition. In BCS70, individuals at age 26 are asked whether they suffer from a long-term health problem.

GHQ12/Malaise score: In Next Steps, a derived variable relating to the cohort member's GHQ12 score is available at age 25-26. In BCS70, a grouped malaise score is provided at age 26.

COGNITIVE ABILITY

Cognitive ability: We rely upon fine graded English and Maths scores at Key Stage 2 from the National Pupil Database in Next Steps. The British Ability Scale assessments are used as the measure of cognitive ability in BCS. In both datasets, we first create a single continuous measure of ability using principal component factor analysis, as suggested in Bourne (2016). In the regression models we generate, a categorical measure of ability is utilised, which separates individuals into quartiles.

SUPPLEMENTARY MATERIAL F: REFERENCES OF DATA SOURCES UTILISED IN ANALYSIS[20]

NEXT STEPS

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Butler, N., Bynner, J., University of London, Institute of Education, Centre for Longitudinal Studies. (2016). *1970 British Cohort Study: Ten-Year Follow-Up, 1980*. [data collection]. *6th Edition.* UK Data Service. SN: 3723, http://doi.org/10.5255/UKDA-SN-3723-7

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LABOUR FORCE SURVEY

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